RĒZEKNES TEHNOLOĢIJU AKADĒMIJA
Izglītības, valodu un dizaina fakultāte

REZEKNE ACADEMY OF TECHNOLOGIES
Faculty of Education, Language and Design

ISSN 1691-5887

SABIEDRĪBA. INTEGRĀCIJA. IZGLĪTĪBA

Starptautiskās zinātniskās konferences materiāli
2018.gada 25.-26.maijs

V daļa
MŪŽIZGLĪTĪBA
INFORMĀCIJAS TEHNOLOĢIJU IZMANTOŠANA IZGLĪTĪBĀ

SOCIETY. INTEGRATION. EDUCATION

Proceedings of the Scientific Conference
May 25th – 26th, 2018

Volume V
LIFELONG LEARNING
INFORMATION TECHNOLOGIES IN EDUCATION

Rēzekne
2018

SABIEDRĪBA, INTEGRĀCIJA, IZGLĪTĪBA. Starptautiskās zinātniskās konferences materiāli. V daļa, Augstākā Izglītība, 2018.gada 25.-26.maijs. Rēzekne, Rēzeknes Tehnoloģiju akadēmija, 2018, 484 lpp.

SOCIETY, INTEGRATION, EDUCATION. Proceedings of the International Scientific Conference. Volume V, Higher Education, May 25th-26th, 2018. Rezekne, Rezekne Academy of Technologies, 2018, p. 484.

Rekomendējusi publicēšanai Rēzeknes Tehnoloģiju akadēmijas Zinātnes daļa, 2018.gada 27.martā.
Recommended for publication by the Scientific Council of Rezekne Academy of Technologies on March, 27, 2018.

Redaktori/*Edited by* Velta Lubkina, Svetlana Ušča, Anda Zvaigzne

Šī krājuma raksti pēc konferences tiks piedāvāti iekļaušanai Thomson Reuters Web of Science datu bāzē, kā arī OpenAIRE, WordCat, Google Scholar datu bāzēs. Elektroniski izdevums pieejams http://journals.ru.lv/index.php/SIE
After the conference the papers of these proceedings will be offered for including in Thomson Reuters (ISI Web of Science), OpenAIRE, WordCat, Google Scholar. The publication is available in electronic forms at http://journals.ru.lv/index.php/SIE

Informācija par konferenci/ *Information about conference* http://conferences.ru.lv/

RTA RĒZEKNES TEHNOLOĢIJU AKADĒMIJA

KLAIPĖDA UNIVERSITY

RĪGAS STRADIŅA UNIVERSITĀTE

ISSN 1691-5887

© Rēzeknes Tehnoloģiju akadēmija, 2018
© Autoru kolektīvs, 2018

Konferences zinātniskās komitejas priekšsēdētāja/ *Chairperson of the scientific committee*

PhD Velta Lubkina, Rezekne Academy of Technologies, Latvia
PhD Ingrida Baranauskienė, Klaipėda University, Lithuania
PhD Kristīne Mārtinsone, Rīga Stradiņš University, Latvia

Konferences zinātniskā komiteja/ *Scientific committee*

PhD Elvyra Aciene, Klaipeda University, Lithuania
PhD Vilmante Aleksiene, Lithuanian University of Educational Sciences, Lithuania
PhD Iluta Arbidane, Rezekne Academy of Technologies, Latvia
PhD Ingrida Baranauskienė, Klaipėda University, Lithuania
PhD Dina Bethere, Liepaja University, Latvia
PhD Krzysztof Biel, Jesuit University Ignatianum in Krakow, Poland
PhD Solveiga Blumberga, Riga International School of Economics and Business and Business administration, Latvia
PhD Klaudyna Bociek, Olsztyn Higher School im. J. Rusiecki, Poland
PhD Diana Bogoyavlenskaya, Russian Academy of Education
PhD Ieva Brence, LLC „RISEBA University of Business, Arts and Technology", Latvia
PhD Remigijus Bubnys, Siauliai University, Lithuania
PhD Ilona Bulgakova, Rezekne Academy of Technologies, Latvia
PhD Kristaps Circenis, Rīga Stradiņš University, Latvia
PhD Ervīns Čukurs, Rīga Stradiņš University, Latvia
PhD Aleksandra Čuprika, Latvian Academy of Sport Education, Latvia
PhD Liga Danilane, Rezekne Academy of Technologies, Latvia
PhD Liāna Deklāva, Rīga Stradiņš University, Latvia
PhD Małgorzata Dubis, University of Economics and Innovation in Lublin, Poland
PhD Aija Dudkina, University of Latvia, Latvia
PhD Jānis Dzerviniks, Rezekne Academy of Technologies, Latvia
PhD Sandra Ezmale, Rezekne Academy of Technologies, Latvia,
PHD Tomasz Gabrys, Jan Dlugosz University Czestochowa, Poland,
PhD Alina Gil, Jan Dlugosz University in Czestochowa, Poland
PhD Aleksandrs Gorbunovs, Riga Technical University, Latvia
PhD Pēteris Grabusts, Rezekne Academy of Technologies, Latvia
PhD Ingūna Griškēviča, University of Liepāja, Latvia
PhD Jelena Harlamova, Rīga Stradiņš University, Latvia
MG Mart Hovi, Estonian University of Life Sciences, Estonia
PhD Dzintra Ilisko, Daugavpils University, Latvia
PhD Alens Indriksons, Rezekne Academy of Technologies, Latvia
PhD Natālija Ivanova, Institute of Humanistic and Existential Psychology HEPI, Latvia
PhD Jelena Jermolajeva, University College of Economics and Culture, Latvia
PhD Lolita Jonāne, Daugavpils University, Latvia
PhD Inese Jurgena, University of Latvia, Latvia
PhD Angelika Juško-Štekele, Rezekne Academy of Technologies, Latvia
PhD Eriks Kalvans, Rezekne Academy of Technologies, Latvia
PhD Małgorzata Karczewska, University of Zielona Góra, Poland,

PhD Judita Kasperiuniene, Vytautas Magnus University, Kaunas, Lithuania
PhD Irena Katane, Latvia University of Agriculture, Latvia
PhD Aivars Kaupuzs, Rezekne Academy of Technologies, Latvia
MG Mihails Kijasko, Rezekne Academy of Technologies, Latvia,
Dr.sc.ing. Sergejs Kodors, Rezekne Academy of Technologies, Latvia
PhD Jeļena Koļesņikova, Rīga Stradiņš University, Latvia
PhD Aleksandrs Koļesovs, University of Latvia, Latvia
PhD Brigita Kreiviniene, Klaipeda University, Lithuania
PhD Ilona Krone, University of Latvia, Latvia
PhD Alex Krouglov, London Metropolitan University, United Kingdom
PhD Aira Aija Krūmiņa, Riga Stradiņš University, Latvia
PhD Urve Läänemets, Estonian Academy of Music and Theatre, Estonia
PhD Karīne Laganovska, Rezekne Academy of Technologies, Latvia
PhD Ilona Laizāne, University of Latvia, Latvia
PhD Sanita Lazdiņa, Rezekne Academy of technologies, Latvia
PhD Jeļena Ļevina, Rīga Stradiņš University, Latvia
PhD Anna Līduma, University of Latvia , Latvia
PhD Lienīte Litavniece, Rezekne Academy of Technologies, Latvia
PhD Jeļena Ļubenko, Rīga Stradiņš University, Latvia,
PhD Sonata Maciulskyte, Klaipeda University, Lithuania
PhD Elena Makeeva, Samara State University of Social Sciences and Education, Russian Federation
PhD Marina Marcenoka, Rezekne Academy of Technologies, Latvia
PhD Heiko Marten, Rezekne Academy of Technologies, Latvia
PhD Arvydas Martinkenas, Klaipeda University, Lithuania,
PhD Kristīne Mārtinsone, Rīga Stradiņš University, Latvia
PhD Gilberto Marzano, Ecoinstitute Friuli Venezia Giulia, Italy
PhD Līga Mazure, Rezekne Academy of Technologies, Latvia
PhD Julija Melnikova, Klaipeda University, Lithuania
PhD Iveta Mietule, Rezekne Academy of Tchnologies, Latvia
PhD Sandra Mihailova, Rīga Stradiņš University, Latvia
PhD Inga Millere, Rīga Stradiņš University, Latvia
PhD Anika Miltuze, University of Latvia, Latvia
PhD Sandra Murinska, Rezekne Academy of Technologies, Latvia
PhD Efrat Neter, Ruppin Academic Center, Israel
PhD Elena Nikolaeva, Herzen State Pedagogical University, Russian Federation
PhD Henryk Noga, Pedagogical University in Cracow, Poland
PhD Luis Ochoa Siguencia, Jerzy Kukuczka Academy of Physical Education in Katowice, Poland
PhD Mārīte Opincāne, Rezekne Academy of Tchnologies, Latvia
PhD Palmira Peciuliauskiene, Lithuanian university of educational sciences, Lithuania
PhD Cristina Pielmus, “Al. I. Cuza” Police Academy, Foreign Languages Department, Bucharest, Romania
PhD Tamāra Pīgozne, University of Latvia, Latvia
PhD Anita Pipere, Daugavpils University, Latvia
PhD Solvita Pošeiko, University of Latvia, Latvia

PhD Inta Poudžiunas, Riga Higher Institute of Religious Sciences affiliated to the Pontifical Lateran University, Latvia
PhD Ilga Prudnikova, Rezekne Academy of Technologies, Latvia
PhD Aurelija Pūraitė, Mykolas Romeris University, Lithuania
PhD Liuda Radzeviciene, Siauliai University, Lithuania
PhD Inta Rimsane, Rezekne Academy of Technologies, Latvia
PhD Marite Rozenfelde, Rezekne Academy of Technologies, Latvia
PhD Liudmila Rupšienė, Klaipeda University, Lithuania
PhD Aleksejs Ruza, Daugavpils University, Latvia
PhD Alida Samusevica, Liepaja University, Latvia
PhD Roma Simulioniene, Klaipeda University, Lithuania
PhD Aelita Skarbaliene, Klaipeda University, Lithuania
PhD Daina Škuškovnika, Turiba University, Latvia
PhD Inese Spica, Scientific institution Business competence centre, Latvia,
PhD Aina Strode, Rezekne Academy of Technologies, Latvia
PhD Gunars Strods, Rezekne Academy of Technologies, Latvia
PhD Rasa Subaciene, Vilnius University, Lithuania
PhD Velga Sudraba, Rīga Stradiņš university, Latvia
PhD Guna Svence, University of Latvia, Latvia
PhD Urszula Szmatlan-Gabrys, State School of Higher Education in Oswiecim, Poland
PhD Arita Takahashi, Riga Technical University, Latvia
PhD Ženija Truskovska, Rezekne Academy of Technologies, Latvia
PhD Sarmīte Tūbele, University of Latvia, Latvia
PhD Solvita Umbraško, University of Latvia, Latvia
PhD Anda Upmane, University of Latvia, Latvia
MA Magdalena Urlińska, Ignatianum Academy in Cracow, Poland
PhD Svetlana Usca, Rezekne Academy of Technologies, Latvia
PhD Tatjana Vasiljeva, LLC „RISEBA University of Business, Arts and Technology", Latvia
PhD Žermēna Vazne, Latvian Academy of Sport Education, Latvia
PhD Helena Vecenane, Liepaja University, Latvia
PhD Velga Vevere, University College of Economics and Culture, Latvia PhD Aldona Vilkeliene, Lithuanian University of Educational Sciences, Lithuania
PhD Raina Vīra, LLC „RISEBA University of Business, Arts and Technology", Latvia
PhD Diāna Zande, Rīga Stradiņš University, Latvia
PhD Jelena Zascerinska, Centre for Education and Innovation Research, Latvia
PhD Elena Zhestkova, Lobachevsky State University of Nizhny Novgorod, Russian Federation
PhD Erika Zubule, Rezekne Academy of Technologies, Latvia
PhD Anda Zvaigzne, Rezekne Academy of Technologies, Latvia
PhD Irēna Žogla, University of Latvia, Latvia

SATURS
CONTENTS

MŪŽIZGLĪTĪBA
LIFELONG LEARNING

INFORMĀCIJAS TEHNOLOĢIJU IZMANTOŠANA IZGLĪTĪBĀ
INFORMATION TECHNOLOGIES IN EDUCATION

MŪŽIZGLĪTĪBA
LIFELONG LEARNING

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 15-24

ASSESSMENT OF DISTANCE LEARNING QUALITY CRITERIA FOR CONTINUING EDUCATION OF MEDICAL PRACTITIONERS

Baiba Avota
Latvia University of Agriculture,
Riga Medical College of the University of Latvia

Abstract. *Distance learning is a favourable form of education in all professional fields. The necessity for repeated education and continuous renewal of knowledge and skills is acknowledged to be a fundamental demand in nowadays society. Distance learning is widespread and extensively studied from several aspects in many countries. In Latvia distance learning in medical studies is an underdeveloped sphere, which requires more attention, to acquire such an education strategy goal as lifelong learning. Along with technological development and introduction of distance learning it is essential to maintain quality and efficiency of education. Quality has more importance in open and distance learning, considering the virtual characteristics and physical distance between the trainees and the teaching staff. The literature review displays the significance of the teacher and student support mechanisms, internal and external evaluation processes, as well as strengthens academic culture and provides permanent cooperation and interaction with the interested parties in order to ensure a high quality study process of the distance learning. A competence-based approach is an important aspect in the professional development of medical practitioners and the assessment of knowledge, skills and competences from the student's point of view is an important indicator of the quality of education.*
Keywords: *adult education, e-learning, lifelong learning, medical study, professional development.*

Introduction

Distance learning as a form of study in medical and health education has been used since the 1960s (Knebel, 2001). Professional development in Latvia for medical practitioners is based on the traditional patterns of curriculum, which needs to be paid more attention and which must fulfil one of the strategic objectives of education – promotion of lifelong learning, making education accessible to all. Consequently, education is looking for the best solutions, including the use of technologies in the education process, to provide not only faster delivery of information, but also the use of technology to achieve wider significance in delivering results. No less important is the need for re-education, continuous updating of knowledge and skills, which is recognized as a

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3089

fundamental demand in today's society. Distance learning, thanks to the flexible way of teaching and the modular course as well as the course structure, has become a way of meeting educational demand (Abdelhai, Yassin, Ahmad, Mohamad, Fors, & Uno, 2012; Özgür & Koçak, 2016).

Developing technologies and introducing distance learning as a form of studies, quality assurance in distance learning is a topical issue in international scientific literature (UNESCO, 2002; Swedish National Agency for Higher Education, 2008; Stracke, 2009; Delaney, Johnson, Johnson, & Treslan, 2010; Butcher, Wilson-Strydom, Uvalic-Trumbic, & Daniel, 2013; Ossiannilsso, Williams, Camiller, & Brow, 2015; Vlachopoulos, 2016). The purpose of any quality organization process is to obtain well-trained and competent healthcare staff, traditional training or regular education has several limitations in this respect, though. For example, training often interferes with the work of a learner, especially when the training takes place outside the workplace. It is also possible that the knowledge and skills acquired during the training may not be applicable to actual work situations in the workplace. In such situations, training may even lead to a drop in quality rather than an upsurge (Knebel, 2001).

There is a topical question that arises frequently among medical professionals: “Will the distance learning course be as high-quality as the traditional, on-going course?” Publications provide insights on the effectiveness and quality of distance learning, including a large number of publications in medical education. The publications emphasize that distance learning programs, regardless of the technology used in teaching curriculum content, are equally effective and often more effective than traditional training programs (Knebel, 2001; Mattheos, Schittek, Attström, & Lyon, 2001; Abdelhai et al., 2012; Półjanowicz, Roszak, Kołodziejczak, & Bręborowicz, 2014; Nsiah & Oti-Boadi, 2015; Berndt, Murray, Kennedy, Stanley, & Gilbert-Hunt, 2017). However, despite the studies that point to the effectiveness of distance learning and provide the best quality standards, the quality of education in literature is a topical issue, which seeks more precise and clearer responses.

The purpose of the work. Review of the scientific literature on the quality criteria of the distance learning course in the professional development of medical practitioners.

The scientific literature review uses such scientific databases as Ebsco, ScienceDirect, Scopus, and Google Scholar. The search applied the publications during the period from 2000 to 2017. The main search keywords: medicine, distance education, quality, efficiency.

Characteristics of the concept of quality in distance education

The concept of quality in online learning is complex due to the actual course of the studies itself. A wide range of literature sources on quality in tertiary education is available, and this literature is full of terms and concepts. Such diversity identifies tensions between two aspects of quality assurance: (1) responsibility; (2) the way to quality improvement. (Uvalic-Trumbic & Daniel, 2015). The concept of quality is more closely linked to the accreditation of study programs, educational efficiency, student satisfaction, organization's competitiveness and management. Quality standards for the management, provision, and assessment of distance learning are based on a variety of methodologies, with substantially different dimensions and contributing to the quality of a fully integrated service (European Distance & e-Learning Network (EDEN), 2003). International Organization for Standardization (International Organization for Standardization (ISO)), (2005) has published a quality standard specifically for e-learning. The new ISO/IEC 19796-1 standard is intended to provide quality assurance measures for e-learning courses in order to better meet the needs of students. More recently, ISO (2017) has published the ISO / IEC 40180 quality standard, which provides a framework for quality assurance and describes the wide range of information, concepts, specifications, terms and definitions relating to the quality of e-learning, education and training.

In today's quality, special attention is paid directly to open learning and distance learning, taking into account the virtual nature and physical distance between the learners and the teaching staff (Vlachopoulos, 2016). Quality is often measured in terms of content, teaching methods and learning outcomes (Bremer, 2012). According to Tham and Werner (2005), there is no specific model that includes "*one size fits all*", especially in terms of quality of education, since each model is unique. All quality factors are regulated according to each case and the needs and objectives of the education process in question. There is often a misconception about quality standards, especially in the education community, due to the belief that quality standards restrict flexibility, creativity and the need to invest a lot of time that requires a lot of effort. However, newly created quality standards provide a set of basic principles that can help organizations develop quality systems according to their specific requirements (Pawlowski, 2007).

Speaking about the quality of distance learning, the author D. Vlachopoulos (2016) concludes that in the past, quality has been measured in terms of the content, pedagogy and learning outcomes, while developing distance education, the literature focuses on the process of developing a course that promotes educational experience and learning. The model of such distance learning process in his publication is represented by the author J. M. Pawlovski (2007), this process model reflects the seven parts for each sub-process: needs analysis – identification

of stakeholders, definition of objectives, demand analysis; system analysis – external context analysis, personnel resource analysis, target group analysis, institutional and organizational context analysis, time and budget planning, environmental analysis; concept/design – study targets, didactic methods, roles and activities, organizational, technical, media and interactions, communication, assessment and maintenance concepts; product development – design, media reality, technical implementation and support; implementation – testing of teaching resources (adaptation, activation, use, technical infrastructure); learning process – realization and use of the study process (administration, activities, review of competence level); evaluation/optimization – description of evaluation methods, principles and procedures (planning, implementation, analysis, improvement).

By analysing and summarizing scientific publications and literature on distance learning, their effectiveness and quality criteria, five qualities that characterize distance education can be distinguished.

Material content quality. A wide range of interactive multimedia presentations, including texts, images, audio and video, are available today. Using multimedia it is possible to increase students' engagement and motivation as they are suited to different studying styles (Swedish National Agency for Higher Education, 2008). The main quality problems are the creation, selection and sequencing of materials. Because of the wide variety of options, it is no longer self-evident that the course material is prepared by the teaching staff on their own; in many cases, when it comes to complex media, a whole team of experts is involved (Bates, 2016; Clark & Frith, 2013). Consequently, institutional co-operation and technology provision are important criteria in terms of the quality of materials.

Pedagogical quality. The distance learning dominant student-oriented pedagogy is to a large extent based on educational theories such as constructivist theories, adult learning theories and cognitive theories (Al-Hosni, 2016). The essence of the theory is that students can associate new ideas with the previously acquired knowledge, experience or emotions, and when learning is authentic or based on real situations. One of the most effective ways of learning to provide a sense of excellence and reduce separation between the clinical learning environment and the virtual learning environment is pedagogy based on a clinical case study on patient care (Clark & Frith, 2013).

In a number of literary sources, the planning and management of distance learning courses are mentioned as important pedagogical quality criteria (Swedish National Agency for Higher Education, 2008; Middle States Commission on Higher Education, 2011; Holsombach-Ebner, 2013; Al-Hunaiyyan, Al-Hajri, Alzayed, & Alraqqas, 2016). E-learning planning recommends the nine principles of curriculum design by the author R. Gagné: attracting attention, informing the

learner about the purpose, recalling the previously learned substance in memory, stimulating before continuing learning, providing stimulus, teaching counselling, inducing performance, feedback, performance evaluation (Al-Hosni, 2016). Planning should take place before the instructors choose the technology and the course management system that will be used for the course. The first step in planning a course is to set learning goals. Learning objectives should be defined in writing, taking into account the expected results and informing the students about it. Objectives must use clear and targeted verbs. All the learning objectives should be student-oriented and explain what is expected of students in terms of their behaviour, achievement and understanding. Learning objectives must be specific and relevant to one specific aspect of understanding. Target conditions include tools, reference sources, and aids that will be provided to the student. Each learning objective must be measurable and include criteria for the student assessment (Hanover Research Council, 2009).

An appropriate methodology (lecture, video, learning games, case study, book work), which is applied to the pursuit of distance learning goals, is another essential element of planning (Al-Hunaiyyan et al., 2016). Distance learning materials that are not aimed at achieving the learning outcomes for which they were developed or those study materials that are not designed to meet the required levels of their users, even if the quality of these materials is good for use in other environments, which does not have the quality required for the purpose (Al-Shorbaji, Atun, Car, Majeed, &Wheeler, 2015).

An important aspect to take into account is that medicine is an area in which, in addition to theoretical knowledge, the knowledge that focuses on clinical rationale and different thinking patterns that involve critical thinking is required (Benner, Hughes, & Sutphen, 2008), consequently, teaching methodological materials need to be prepared in such way that these knowledge, skills and competences are also acquired in the form of distance learning studies. All of these skills can be integrated into distance learning through interactive exercises, multimedia, thought cards and written or oral stories (Peixoto, Dos Santos, & André, 2017). Critical thinking, problem-oriented approach to care is the reason why distance learning studies are often combined with on-the-job studies in the study process (Smith, Passmore, & Faught, 2009).

An equally important pedagogical aspect is the assessment of students, which is essentially the same as evaluation in traditional studies and assessment in distance learning studies. Today, e-learning provides the opportunity to diversify assessment opportunities, including simulations, virtual seminars and asynchronous working groups. However, evaluating online results poses some challenges for the reasons of security, availability, and identification. Validation needs to be legitimate, safe and affordable, based on sound and reliable technical infrastructure and rapid response from the administrator and the faculty, which in

turn comes from the organization of technology provision (Swedish National Agency for Higher Education, 2008).

Technology quality. In the literature, technology quality indicators are platforms through which distance learning courses are implemented; digital programs with the help of which distance learning materials are prepared; internet access; equipment for the acquisition of a distance learning course, as well as student and teaching staff support (Frydenberg, 2002; Dondi & Morreti, 2006; Rubin, 2009; Holsombach-Ebner, 2013; Al-Shorbaji et al., 2015; Quality Matters, 2015; Al-Hunaiyyan et al., 2016).

Distance learning courses are delivered using various course management systems and platforms, one of the most well-known, also used by the Latvian universities, is the Moodle platform, which can be accessed through the Internet. These tools are pedagogically advanced platforms that provide a wide range of synchronous and asynchronous tools, and incorporate mechanisms for evaluating students and tracking student progress. The technical infrastructure must be strong and easy to use (Swedish National Agency for Higher Education, 2008).

Effective distance learning requires the course developer to have not only certain qualifications that include the relevant field, but also the ability of the teacher to work with a digital program to create an interactive multimedia tool. In turn, for a student to acquire distance learning course material, basic technological competencies are required: to add, manage files, manage e-communications, and be able to use the web browser (Clark & Frith, 2013). Therefore, the support and institutional co-operation of students and teaching staff is an important aspect for the development and the quality of the distance learning course, since any e-learning materials must be functional, non-defective, it should apply to all operating systems and browsers in the environment in which the resource is being run. No less important is copyright, so it is useful to point out the author of the development in the distance learning material, while the provider of the e-learning materials should provide the students with necessary equipment for the acquisition of the course (Nsiah & Oti-Boadi, 2015).

Student quality indicators. The quality indicators of the students are related to the student-centered approach in the educational process, the satisfaction of the students, personal growth and the results achieved. Active involvement of students in the learning process is the main task of distance learning. B. Pelz (2004) argues that the more students will spend quality time engaging in content, the more they will learn from this content. In order to realize the involvement of such students in the content it is necessary to create the tasks that require self-assessment of tasks or involve other students in the evaluation. Another aspect that B. Pelz (2004) claims is to promote a student-teacher and student-student interaction, which extends beyond the simple discussion. Such an approach is realized in the formation of joint groups by updating and solving some of the

health care problems. The third aspect that B. Pelz (2004) claims is the need for the presence of a representative of the teaching staff, which follows in 3 directions: (1) social presence, when the student needs approval of common goals, expression of emotions from other students; (2) the presence of a cognitive knowledge that can take the form of a discussion, bringing in actual, conceptual and theoretical knowledge; (3) the presence of learning aimed at the implementation of meaningful and meaningful outcomes of learning that is valuable from the educational level, which in turn results in a consensus, encouraging students and evaluating the effectiveness of the process.

Organization quality indicators. The success of the teaching staff and the distance learning course to a large extent depends on the support provided by the institution. Financial, human and infrastructure resources are needed to effectively develop and support distance learning education training programs (Nsiah & Oti-Boadi, 2015). By switching from the traditional learning and e-learning, the time spent by the teaching staff on the development of new teaching materials, developing new programs significantly increases. Therefore, in the implementation phase, organizations may need to increase the amount of funding to address the problem of maladministration and may need to reorganize the administrative and the technical infrastructure (Swedish National Agency for Higher Education, 2008).

Conclusions

The quality criteria of education in distance education reflect the link between learning, which includes educational goals, requirements, standards defined by the organization, companies, individuals, actors and the state as a whole.

The quality criteria of the distance learning course in literature are divided and described from different aspects, by summarizing the literature, five qualitative basic dimensions can be distinguished: pedagogical quality, technology quality and support mechanisms, student quality assessment, material content quality, organization quality and support mechanisms. The basic quality dimensions are closely related to each other and each of them needs to be involved in the quality assessment at the early stage of development of the course.

In order to meet the needs of the medical practitioners and the necessary knowledge, skills and competences, the distance learning course requires the use of e-learning methods that support critical thinking and problem-oriented approaches to patient care. Consequently, an important aspect of distance learning is the development of thoughtful teaching methods and the use of appropriate e-tools for achieving educational goals.

References

Abdelhai, R., Yassin, S., Ahmad Mohamad, Fors, F., & Uno, G. H. (2012). An e-learning reproductive health module to support improved student learning and interaction: a prospective interventional study at a medical school in Egypt. *BMC Medical Education* 2012, 12:11.

Al-Hosni, F. A. (2016). *Evaluating on-line distance learning from learners' and teachers' perceptions: A case study at Sultan Qaboos University.* EdD thesis, University of Sheffield. Retrieved from http://etheses.whiterose.ac.uk/13472/

Al-Hunaiyyan, A., Al-Hajri, E., Alzayed, A., & Alraqqas, B. (2016). Towards an Effective Distance Learning Model: Implementation Framework for Arab Universities. *International Journal of Computer Application. Volume 6, No. 5*, 2250-1797.

Al-Shorbaji, N., Atun, R., Car, J., Majeed, A., & Wheeler, E. (2015). eLearning for undergraduate health professional education: a systematic review informing a radical transformation of health workforce development. *World Health Organization*. Retrieved from http://whoeducationguidelines.org/content/elearning-report

Bates, A. (2016). *Teaching in a Digital Age. Guidelines for designing teaching and learning*. Creative Commons Attribution-NonCommercial 4.0.

Benner, P., Hughes, R. G., & Sutphen, M. (2008). *Patient safety and quality: An evidence-based handbook for nurses. (Prepared with support from the Robert Wood Johnson Foundation). AHRQ Publication No. 08-0043. Rockville, MD: Agency for Healthcare Research and Quality; March 2008*. Retrieved from: https://archive.ahrq.gov/professionals/clinicians-providers/resources/nursing/resources/nurseshdbk/nurseshdbk.pdf

Berndt, A., Murray, C. M., Kennedy, K., Stanley, M. J., & Gilbert-Hunt, S. (2017). Effectiveness of distance learning strategies for continuing professional development (CPD) for rural allied health practitioners: a systematic review. *BMC Medical Education.* 17:117.

Bremer, C. (2012). Enhancing e-learning quality through the application of the AKUE procedure model. *Journal of Computer Assisted Learning, Vol. 28 Issue 1*, 15-26.

Butcher, N., Wilson-Strydom, M., Uvalic-Trumbic, S., & Daniel, J. (2013). A Guide to Quality in Online Learning. Academic Partnerships. Retrieved from http://eadtu.eu/home/policy-areas/quality-assurance/publications

Clark, D., & Frith, K. (2013). *Distance Education in Nursing*: Third Edition. New York: Springer Publishing Company (EBSCOhost).

Delaney, J., Johnson, A., Johnson, T., & Treslan, T. (2010). Student's perceptions of effective teaching in Higher education. *26th Annual Conference on Distance Teaching & Learning.* Board of Regents of the University of Wisconsin System.

Dondi, C., & Morreti, M. (2006). E-learning Quality in Eutopean Universities: Different Approaches for Different Purposes. *European University Quality in eLearning (UNIQUe)*.

European Distance & e-Learning Network-EDEN. (2003). The quality dialogue – Integrating quality cultures in flexible, distance and elearning workshop. *Proceedings of the 2003 EDEN Annual conference,* 15-18.

Frydenberg, J. (2002). Quality standards in e-learning: A matrix of analysis. *International Review of Research in Open and Distance Learning, 3 (2)*. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/109/189

Hanover Research Council. (2009). *Best Practices in Online Teaching Strategies*. Retrieved from http://www.uwec.edu/AcadAff/resources/edtech/upload/Best-Practices-in-Online-Teaching-Strategies-Membership.pdf

Holsombach-Ebner, C. (2013). Quality Assurance in Large Scale Online Course Production. Retrieved from Embry-Riddle Aeronautical University. Retrieved from http://www.westga.edu/~distance/ojdla/fall163/holsombach-ebner164.html

International Organization for Standardization (ISO) (2005). *ISO/IEC 19796-1:2005. Information technology Learning, education and training Quality management, assurance and metrics Part 1: General approach.* Retrieved from https://www.iso.org/standard/33934.html

International Organization for Standardization (ISO). (2017). *ISO/IEC 40180:2017. Information technology -- Quality for learning, education and training -- Fundamentals and reference framework*. Retrieved from https://www.iso.org/standard/62825.html

Knebel, E. (2001). *The Use and Effect of Distance Education in Healthcare: What Do We Know? Operations Research Issue Paper 2 (2)*. Bethesda, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.

Mattheos, N., Schittek, M., Attström, R., & Lyon, H. C. (2001). Distance learning in academic health education. A literature review. *European Journal Dental Education*; 5: 67–76

Middle States Commission on Higher Education. (2011). *Distance education programs: Interregional guidelines for then evaluation of distance education (online learning).* Retrieved from https://www.msche.org/publications/Guidelines-for-the-Evaluation-of-Distance-Education-Programs.pdf

Nsiah, G. K. B., & Oti-Boadi, M. (2015). Assessing the Effectiveness of Distance Education within the Context of Traditional Classroom. *Creative Education,* 707-710.

Ossiannilsso, E., Williams, K., Camiller, A., & Brow, M. (2015). Quality models in online and open education around the globe. State of the art and recommendations. Oslo: *International Council for Open and Distance Education.*

Özgür, A. Z., & Koçak, N. G. (2016). Global Tendencies in Open and Distance Learning. *Journal of Education and Human Development.* 2334-2978.

Pawlowski, J. M. (2007). *The New Quality Standard for E-Learning: Enabling Global Quality Development.* Retrieved from http://www.initiatives.refer.org/Initiatives-2005/document.php?id=337

Peixoto, Dos Santos M., & André, T. (2017). Critical thinking of nursing students in clinical teaching: an integrative review. *Revista de Enfermagem Referência. apr-jun 2017. Vol. 4 Issue 13*, 125-138.

Pelz, B. (2004). (My) Three Principles Of Effective Online Pedagogy, *Journal of Asynchronous Learning Networks, Volume 8, Issue 3*.

Pennsylvania State University. (2008). *Penn State quality assurance e-learning design standards.* Pennsylvania: Pennsylvania State University.

Półjanowicz, W., Roszak, M., Kołodziejczak, B., & Bręborowicz, A. (2014). *An analysis of the effectiveness and quality of e-learning in Medical education.* Retrieved from https://depot.ceon.pl/handle/123456789/11789

Quality Matters. (2014). *Quality matters program: A national benchmark for online course design.* Retrieved from http://www.qualitymatters.org

Rubin, J. (2009). Quality Assurance of E-learning. Chapter 3: Modern E-learning: Qualitative education accessibility concept. *European Association for Quality Assurance in Higher Education 2009*, Helsinki. Retrived from: http://www.enqa.eu/indirme/papers-and-reports/workshop-and-seminar/ENQA_wr_14.pdf

Smith, G., Passmore, D., & Faught, T. (2009). The challenges of online nursing education. *The Internet and Higher Education, 1 (2),* 98-103. Retrieved from https://www.researchgate.net/publication/222218083_The_challenges_of_online_nursing_educatin

Stracke, C. M. (2009). Quality Development and Standards in e-Learning: Benefits. *Proceedings of the ASEM Lifelong Learning. Bangkok (Thailand).* Retrieved from https://duepublico.uni-duisburg-essen.de/servlets/DerivateServlet/Derivate-33369/Quality_Development_Standards_Stracke_Bangkok_2009.pdf

Swedish National Agency for Higher Education. (2008). E-*learning quality aspects and criteria for evaluation of e-learning in higher education (Report 2008: 11 R*). Stockholm: Högskoleverkets.

Tham, C. M., & Werner, J. M. (2005). Designing and evaluating E-learning in higher education: A review and recommendations. *Journal of Leadership & Organizational Studies, 11 (11),* 15.

UNESCO (United Nations Educational, Scientific and Cultural Organization). (2002). *Open and Distance learning. Division of Higher Education. UNESCO*. Retrieved from http://unesdoc.unesco.org/images/0012/001284/128463e.pdf

Uvalic-Trumbic, S., & Daniel, J. (2015). *A Guide to Quality in Online Learning*. Retrieved from https://odlaa.org/quality-in-online-learning/

Vlachopoulos, D. (2016). Assuring Quality in E-Learning Course Design: The Roadmap. *International Review of Research in Open and Distributed Learning, Volume 17, Number 6.*

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 25-40

LEARNING THROUGH THE EVERYDAY EXPERIENCES OF BIOLOGICAL / FOSTER PARENTING

Ramunė Bagdonaitė-Stelmokienė

Vilma Žydžiūnaitė
Vytautas Magnus University, Lithuania

Abstract. *Learning through everyday experiences is understood as a complex process during which the learner undergoes various social interactions; it is an emotional, cognitive and behavioural process of learning. The aim of the study was to describe the process of learning of parents and foster parents through the everyday experiences of biological/foster parenting by revealing the similarities and differences of their experiences. The article presents the findings of the qualitative research. Applying the narrative interview, 4 parents and 8 foster parents were interviewed in the study. The data were analysed by using an inductive qualitative content analysis method. The findings revealed that the personal change of parents and foster parents and their growth in parenthood takes place in the process of learning from everyday experiences. The birth of a child into a family as well as the acceptance of a non-relative child into a foster family pose a number of challenges and cause confusion, but it is the experience of giving, joy and community too. The most striking difference between biological and foster parenting is revealed through the experience of 'emotional triangle' which is the only characteristic of foster parents. Communication with the foster child's biological family is one of the most complex aspects of foster parenting.*
Keywords: *fostering, learning through experience, parenting, qualitative content analysis.*

Introduction

Learning from everyday life is a complex process during which the person experiences various social situations, and the perceived content of experience is transformed cognitively, emotively and practically. The experience is integrated into the person's biography resulting in a continually changing person (Jarvis, 2012).

Everyday life is a surprisingly unresearched topic from the perspective of learning, but once we delve deeper and start analysing, we recognise the significance of everyday life in the person's learning (Jarvis, 2012). It is acknowledged that learning contexts are everywhere (Edwards, 2009). However, the phenomenon of learning from everyday experiences is sufficiently difficult

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3250

to research, as it may be unrecognizable and unnoticed by the learners themselves (Eraut, 2010).

The learning of parents and foster parents through the everyday experiences of biological/foster parenting is perceived as the phenomenon socially constructed in the reality of everyday life (Burr, 2000), which takes place through diverse everyday interactions, encounters and experiences by reflecting on the new situation in the family. The everyday family life is an intersubjective world where we share and act in each other's being (Berger & Luckmann, 1999). Persons interact, share their experiences and learn from them. Parents raising their children and foster parents raising their biological children and fostering non-relative children learn from the everyday experiences of biological/foster parenting. According to Di Silvio (2012), parenting in an emotional, cognitive and behavioral process of learning; it is "natural" learning in the everyday environment. Various studies (Bagdonaitė-Stelmokienė & Snieškienė, 2011; Sutton & Stack, 2013; Noble-Carr et al., 2014; Bagdonaitė-Stelmokienė, 2015) revealed that the experiences of non-relative foster care[1] also provides an opportunity to learn from various everyday situations. Hence, learning from everyday experiences also takes place in case of non-relative foster care. Foster parents "find fostering to be a life-enhancing experience" (Diaz, 2017: p. 4). Wehler (2014) argues that foster parents learn to be foster parents on a everyday basis. However, it is not clear how learning through everyday experiences takes place. How are experiences of learning of parents raising their children and foster parents caring for their biological children and fostering non-relative children similar and in what aspects does it differ?

This article construes the learning of parents and non-relative foster parents through everyday experiences as a unique social-educational phenomenon which may be approached through the subjective concepts of experiences of parents and foster parents. Consequently, the *research questions* are raised: How does the learning of parents and foster parents through the everyday experiences of biological/foster parenting take place? How are these experiences similar and how they differ?

The aim of the study was to describe the process of learning of parents and foster parents through the everyday experiences of biological/foster parenting by revealing the similarities and differences.

[1] The term applies to families to which a non-related child (children) is placed for permanent (longer than 6 months) care which by the decision of the court of Lithuania "shall be established for children deprived of parental care who, under the existing conditions, are unable to return into their natural family, and their care, upbringing, representation and protection of their rights and legitimate interests are entrusted to another family" (Civil Code of the Republic of Lithuania, 2000, Book III, Article 3. 256).

Methodology

Sampling and Data Collection

The study used purposive sampling by involving those participants who share similar characteristics and may provide rich and relevant data pertaining to the research question (Tong, Sainsbury, & Craig, 2007).

The research included 4 parents (2 women and 2 men) raising their biological children and 8 foster parents (4 women and 4 men) who raise their biological children and foster non-relative children for a period longer than 6 months.

To collect data, a narrative interview, with the participant's narrative in the focus of attention, was applied. The narrative enables participants to create and express their meanings and knowledge. It focuses on the stories told by participants, their plots and structures of stories (Kvale & Brinkmann, 2009). The research participants were asked to tell about their everyday experiences of biological/foster parenting and learning from it.

Data Analysis

The data were analysed on the basis of an inductive qualitative content analysis method (Elo & Kyngäs, 2008; Elo et al., 2014). The transcribed interviews were first carefully read for several times. Then a unit for analysis was selected, which by the decision of the researchers was at least one sentence. The whole text was coded by dividing it into subcategories, which were later compared and linked into categories. Subcategories and categories were made of empirical qualitative data only.

Ethics

The research complied with the following principles of research ethics (Orb, Eisenhauer, & Wynaden, 2001): *autonomy* – the research participants could freely decide on their participation in the research; conditions were created for them to freely share their experiences during the interview; *beneficence* – the research participants were presented the research aim and purpose; they were explained that the data provided would inflict no harm on them; *confidentiality* – to protect the identity of the research participants, their names and the names of the people mentioned during the interviews were changed; no other personal information on the research participants disclosing their identity is made public; *justice* – the research participants could receive comprehensive information on the research; the research sought no personal benefit for the researchers; it relied on the principle of justice; the information provided by the research participants was analysed in full. Personal situation of the research participants was monitored (stress, changes in self-perception)

(Kvale & Brinkmann, 2009). Not to intrude on the family's privacy and not to violate the rhythm of its everyday life (Humphries, 2008), the place and time of the interview was agreed upon with the research participants individually.

Findings

The process of learning of parents and foster parents through the everyday experiences of biological/foster parenting is revealed through the main categories: confusion, personal change, growth in parenthood, addressing challenges, sharing experiences, support from others, 'emotional triangle,' pain of separation. When comparing the everyday experiences of learning of parents and foster parents, we can see the overlapping experience of the two groups of participants as well as certain differences within the subcategories (see Table 1).

Table 1 **Learning of parents and foster parents through the everyday experiences of biological/ foster parenting**

CATEGORY	**SUBCATEGORY (foster parents)**	**SUBCATEGORY (parents)**	
CONFUSION	Internal fight	Shock determined by life changes	
	Doubts driven by the choice made	"Everything is about the child"	
	Overcoming oneself	Change of priorities	
		Reconciliation of family and work	
		Creation of a new family model	
		Losing oneself (*woman*)	
PERSONAL CHANGE	Expanding the limits of tolerance	Becoming aware of personally important values	
	Learning to accept life challenges	Becoming aware of personal limits	
	Re-discovering oneself		
	"Reducing oneself" for the sake of another person		
	Learning to enjoy life		
GROWTH IN PARENTHOOD	Learning tolerance	Learning forgiveness to others (*woman*)	Dissociation from one's biological family (*man*)
	Learning to accept responsibility for others	Becoming aware of one's self-esteem (*woman*)	Change of the image associated with the father's role (*man*)
	Becoming aware of the differences of biological and foster parenting		

	Learning self-control	
	Increasing one's patience	
	Becoming aware of the meaning of biological/foster parenting	
ADDRESSING CHALLENGES	Reading scientific literature	
	Search for information on the Internet	
	Analysis of personal mistakes and those of others	
	Cooperation	
SHARING EXPERIENCE	Helpfulness	
	Better knowledge of one another	
	Solidarity	
	Support	
	Confidence in another person	
SUPPORT FROM OTHERS	Help from family members	
	Support from friends	
	Assistance from the community	
'EMOTIONAL TRIANGLE'	Loss of stability	
	Loss of patience	
	Fear for one's security	
	Becoming 'hostages of the situation'	
PAIN OF SEPARATION	Balancing between 'to possess' and 'to let go'	
	Mourning	
	Withdrawal	

Confusion

Both the birth of a biological child or the acceptance of a non-relative child into the family causes confusion and makes the family go through various feelings. As stated by the participants in the study, these experiences differ.

The birth of children changes the family's life beyond recognition. Parents undergo the shock determined by the changes in life: *"it was such a shock for me that everything changed completely and for good. Life will never be as it used to be before"* (Mother M). The life of the family starts revolving around the child: *"you no longer live for yourself"* (Father G). When caring for their children, parents have to limit their personal needs and refuse certain interests and goals: *"I used to do what I like, and it is no longer like that now"* (Mother M). Priorities of parents change as well. They used to have more time for their hobbies. When the child was born, the new experience made them rethink their priorities: *"our priorities changed completely; there is suddenly a new life, and naturally you have to choose what you really need in life"* (Father V). Parents learn to reconcile family and work: *"trying to fit in your work is a difficult challenge"* (Father G). They learn to create new rules and to combine their and the child's needs. Spouses accept all that as learning, which is

emotionally challenging: *"this learning is not easy, we create everything again"* (Mother R).

The analysis revealed the unique experience of women/mothers. Female participants told that after the child was born, they felt as if they were losing themselves: *"I had a feeling of disappearing – where am I? And suddenly I realised that I was not taking care of myself at all"* (Mother M). Mothers feel that they as if disappear; they get immersed in the child's world, caring and upbringing, thus forgetting and gradually losing themselves. Nevertheless, gradually, by reflecting on their experiences and receiving the support from their spouse and family, women rediscover themselves and recognise themselves as a different person: not only as a woman and wife but also as a mother. They discover how meaningful their new role actually is.

Meanwhile, the foster parents who care for their biological children and accept a non-relative child into their family already lived through the experience of birth and parenting of their biological child; after a non-relative child comes to their family, they as well undergo confusion in the family, but it manifests itself through different experiences compared to biological children. Before accepting a non-relative child into their family, foster parents experience an internal fight: *"my greatest fear was – what will I do with that unfamiliar child in my family?"* (Foster Father A). Even when the family decides to accept the child and the child is placed to the foster family, foster parents may experience doubts about their choice: *"I was sitting all pale for the first few months thinking: 'What have I done? Should I try to return those children or should I try to live somehow?"* (Foster Mother B). Foster parents feel no natural connection to the foster child which they share with their biological children: *"I still feel that this is not my child"* (Foster Mother A). They learn to overcome themselves to accept a 'different child.' At first, foster parents try to apply the experience of parenting their biological children to foster care; they try to change the foster child. However, they gradually realise that there is no need to change the foster child; they have to accept the child as he/she is: *"I had to overcome myself again and again to accept her differences"* (Foster Father T).

Personal change

Personal change of parents and foster parents driven by variety of everyday experiences and different social interactions takes place in both biological and foster parenting.

After a child is born, parents become aware of the values which they find personally important:

> *"the family leads to true values. The environment tends to knock you out of the way, and you start thinking that power, honour, good earnings and twice-a-year travels are your values; they are the good that you wish for*

yourself. But in reality being with children and playing with them in the yard are much more than all that honour taken together" (Father G).

When parenting their biological children, parents start seeing and accepting their limitations: *"I accept that I will still make a lot of mistakes, because no one is perfect. You have to do as much as you can"* (Father V).

Meanwhile, foster parents expand the limits of their tolerance by learning from the experience of non-relative foster care: *"patience is what she taught me most of all. The patience learnt now helps me with my son as well"* (Foster Father T). Non-relative foster care is a new experience for foster parents in which they face various challenges. Thus, this experience creates conditions for them to learn to accept other life challenges: *"perhaps it prepares me for other challenges"* (Foster Mother A).

Both parents and foster parents rediscover themselves: *"first of all, I saw such qualities within me which I have never thought I could have. Both positive and negative. Some of them would not have even come up with my own children."* (Foster Mother A). *"Children are like a mirror. They teach us, and this gives rise to plenty of good things. I am rediscovering myself"* (Father G). The personal change of parents and foster parents takes place through their learning to overcome their egoism and their "reduction" for the sake of another: *"fatherhood gradually forces you to put your pride and egoism aside*" (Father V). *"She allowed me 'to die'. I mean my egoism"* (Foster Mother A). Parents and foster parents view this decrease in egoism as their personal maturity and development. They learn from their biological children and foster children to enjoy life and to appreciate what they have got: *"all children teach you to be happy about elementary things, they teach you simplicity"* (Father G). "*I saw that all kinds of small things can bring you so much happiness"* (Foster Mother B).

Growth in parenthood

When children are born, parents learn the roles of a mother and a father. Even though experienced in parenting their biological children, foster parents who accept a non-relative child into their family also claim that they experience their further growth in parenthood.

Female participants stated that they learn forgiveness to others: *"I used to be a perfectionist, I am now more forgiving"* (Mother M). Motherhood also made them aware of their worth: *"I am now aware of my worth. This experience gave me the understanding that I am important"* (Mother M). Meanwhile, men/fathers see their growth in fatherhood as the dissociation from their biological family and the change in their understanding of the father's role. Fathers realised *"what it means to be a father"* (Father V).

Meanwhile, foster parents learn to be tolerant towards another person and to take responsibility for others: *"you have to learn to take responsibility for another child"* (Foster Mother S). They see and realise the differences in biological and foster parenting: *"what works on your children may not necessarily work on foster children"* (Foster Mother S). According to foster parents, they would not have learned all those things (tolerance, taking of responsibility for another person, awareness of the differences in biological and foster parenting) if they were only parenting their biological children.

Both parents and foster parents learn to control their emotions continuously: *"I mean emotional self-control in trying to convey something to children, to educate them"* (Father V). *"It helped me cope with my emotions; I really see that I now have a more detached view of the situation"* (Foster Mother S). They learn to be patient: *"at least the limits of my patience definitely expanded"* (Mother A). Gradually, both parents and foster parents discover the meaning of parenthood/foster care. They find perfect moments in their everyday routine and enjoy them:

> *"without children, everything in the world stops. You realise that there is much work to do, and it is hard, but those efforts pay off when you see those children. When you see those moments of joy, when the child comes and says, 'mom, dad,' when the child smiles"* (Father V).
>
> *"We see how those children are unfolding everyday, how they become more free and calm, how it becomes possible and simple for them to accept those everyday things. It makes me happy"* (Foster Father A).

Therefore, the growth in parenthood, which begins when biological children are born and raised, continues when non-relative children are taken into the family.

Addressing challenges

Parents and foster parents face the everyday challenges of biological/foster parenting. They search for solutions by reading scientific literature: *"I was looking through various scholarly articles; I used to read about how to create a bond between myself and a non-biological child"* (Foster Mother S). They search for information on the Internet or in various forums: *"I used to spend time in forums to see what those situations are, I used to look for answers"* (Foster Mother B). The learning of parents and foster parents in addressing the everyday challenges of biological/foster parenting also takes place through the analysis of personal mistakes or those of others: *"these are the lessons of life – you go through your own experience and make conclusions. You make a mistake, analyse it and try not to repeat it in a different situation"* (Father T). Parents and foster parents search for solutions collectively, through cooperation

and occasional involvement of their biological or foster children: *"children themselves help; you sit with the child and you talk"* (Mother R).

Sharing experience

It is important for spouses to share their experience both in parenting their biological children and in non-relative foster care.

Helpfulness of spouses is very important in biological and foster parenting: *"it is necessary to support each other to make things easier"* (Father V). *"We used to share the time that we had to endure equally"* (Foster Father T). Spouses see each other's differences, try to accept them and thus get to know each other better: *"you simply feel the openness of the other person and you get to know that person better"* (Father V). *"We saw each other's reactions that we have never seen before"* (Foster Father T). Spouses get the feeling of solidarity: *"what the situation gave us was our solidarity"* (Father T). *"It really strengthens us, because you see that there are two of us, we will handle everything, we can do it"* (Foster Mother S). Spouses support each other, stand behind each other's back and learn to accept challenges together through continuous sharing and discussion of their experiences: *"we try to row together, we learn to take decisions together"* (Father V). *"Everyday I and my husband used to sit next to each other and discuss how we felt; we shared how we were doing, what was difficult"* (Foster Mother A). This is how confidence in each other grows: *"I realised that I had to leave some space for my husband where he could build a connection with the foster child"* (Foster Mother B). *"I trusted him, I knew he was going to be a good father"* (Mother R).

Support from others

The learning of foster parents and parents from the everyday experiences takes place through the relationship with other people as well. Spouses usually receive help from their immediate family: *"moms are excellent helpers; they can look after children, spend some time with them"* (Father V). Spouses take it as a gift, a great support and also a moment to have a rest in the everyday routine of biological/foster parenting. Thanks to the assistance provided by close relatives in taking care for biological and foster children, foster parents can appreciate those moments as the time to take a breath: *"children would go to my parents on holidays. They would spend time cycling in the yard. We used those moments to take a breath"* (Foster Mother B). Families also receive support, especially emotional, from their friends: *"if we had no friends to ventilate our feelings continuously, I don't know how it all would have ended"* (Foster Mother S). Close contacts and communication with other families living through similar experiences is important for parents and foster parents. It allows them to learn from the examples of other families: *"it is indeed a great backup – those*

meetings with other young families or families with many years of experience" (Father V). Foster parents pointed out that they received plenty of emotional support from self-help groups where other foster families gathered and shared their experiences: *"the stories heard in the group were a good backup for us"* (Foster Mother B). Participation in a self-help group and talking to other foster parents strengthen foster parents; they acquire more self-confidence in everyday challenges.

'Emotional triangle'

When comparing the learning experience of parents and foster-parents in biological/foster parenting, several differences determined by a unique experience of non-relative family foster care creating additional conditions for foster carers to learn emerged. By full accepting a non-relative child into their family, foster parents also have to accept the child's biological family, history and origins. Foster parents face the so called 'emotional triangle' in this experience of acceptance, i.e. the experience of relationship between a foster family, a foster child and a child's biological family. Foster parents are well aware that it is important for a foster child to keep in contact with his/her biological family, even though a problematic one. However, it is an emotionally painful and often dramatic point for all the actors in the fostering process. Both foster parents and a foster child lose their stability: *"our foster daughter would become severely unbalanced; she would suffer anxiety attacks over and over again for the following month"* (Foster Mother A). The rules applied in the foster child's biological family would make the child's successful adaption to the foster family more troublesome: *"she did not adapt to our family due to continuous communication with her sister, who is a complete failure, with no education, with TV and chips all day long and no limits"* (Foster Mother S). Foster parents would often lose their patience: *"all that communication with no rules gradually made us lose our patience"* (Foster Mother A). In some cases, foster parents were even threatened by the child's biological family. They considered the child's removal from the family to be the fault of the foster family. In such situations foster parents would fear for their security: *"I didn't feel safe in the company of those people. They know my address and I don't know what to expect from them"* (Foster Mother G). Foster parents become 'hostages of the situation' when they have to communicate with the foster child's biological family. They have to give back the foster children to their biological family if such a decision is made; however, when they meet with the foster child, the child shows his/her attachment and wishes to come back to the foster carers:

> *"we had already brought her back to her mother, and when we met a week later, she spent the whole time sitting on our laps, and when we were about*

to say goodbye, she grabbed my hair saying, 'Mom, please don't give me to that woman.' Can you imagine? What we have to do is to take the child, detach her from us and say, 'I'm sorry but perhaps we will meet some time again'." (Foster Mother A).

Pain of separation

After the process of non-relative foster care discontinues, foster parents undergo a deep pain of separation. After getting attached to the foster child, the foster family would feel that they started possessing the child; hence, when giving the foster child back to the biological family, foster parents used to balance between the wish 'to possess' and 'to let go': *"when we ourselves decided to let go our foster daughter, I then realised that we simply have to learn to live somehow"* (Foster Mother S). After separation with the foster child, the foster family often starts mourning if the relationship is not maintained afterwards: *"I would feel as if half alive and half dead, as if after the funeral but still without a grave. Because our foster daughter was all around the house, there were photographs, everything"* (Foster Mother A). After the relationship with the foster child is discontinued, the whole foster family as if withdraws into themselves: *"she left by also leaving such negative effects on our daughter, her withdrawal into herself"* (Foster Father T). All these experiences are emotionally painful, but they are only a part of the whole experience which does not reduce the meaning of non-relative foster care seen by foster parents.

Discussion

The birth of a child or the foster care of a non-relative child causes ***confusion***. However, these experiences differ. After a child is born, parents experience confusion due to an absolutely new situation: the arrival of a new family member (Bornstein, 2002). It is a new shocking experience forcing to rethink priorities, learn to reconcile family and work, create a new family model. Meanwhile, in case of foster care, confusion is more a result of the encounter with an unknown, unfamiliar child (Di Silvio, 2012) without understanding the child's reactions and behaviour triggered by the early experience (Tryc, 2013); foster parents learn to accept a "different" child. After a child is born, the family's situation fundamentally changes, whereas the foster family faces changes in their everyday life, but there are no radical changes in the family. Foster parents already have their family model and try to accept an unfamiliar child into it by trying to maintain a balance in the family.

Learning of parents and foster parents through the everyday experiences of biological/ foster parenting takes place through ***personal change***. By parenting their children, parents learn to accept their new roles (Deave & Johnson, 2008;

Rosenberg, 2009; Reid, 2010; Cameron et al., 2012). Foster parents also consider the experience of non-relative foster care to be the process of their personal growth and change (Diaz, 2017; Gvaldaitė, 2017). The research revealed that the personal change taking place in the two groups of participants has something in common. Through the experience of biological/foster parenting parents and foster parents get to know themselves better, learn to reduce their egoism and enjoy life. The research participants refer to this experience as that which enabled them "to discover a new self," i.e. the learner rethinks his or her attitudes, worldviews, models of behaviour; they learn to accept situations as they are. However, foster parents pointed out that the experience of non-relative foster care taught them to accept the children which differ from their biological children, thus learning to expand their limits of tolerance.

When raising biological children or fostering non-relative child, ***growth in parenthood*** takes place. Parents and foster parents go through personal development, learn to control their emotions, develop their patience and gradually become aware of the meaning of biological/foster parenting. However, the two groups of participants undergo a different growth. When a child is born, parents live through a new experience; they learn to be parents. Meanwhile, foster parents already perceive themselves as parents, and the foster care of a non-relative child as if expands their perception of parenthood. They see the differences in biological and foster parenting and also learn to take responsibility for other, disadvantaged, children; they learn to be foster parents (Diaz, 2017). Non-relative foster care is viewed as a new and different experience of parenthood in such a way that it helps to nurture an unconditional love for the child and through that child to another person (Gvaldaitė, 2017).

Biological and foster parenting poses a number of ***challenges***. These challenges differ, e.g. foster parents often face a traumatising experience of foster care and the improper, aggressive and hysterical conduct of the child determined by it (Haugaard & Hazan, 2002; Fisher et al., 2011; Stacy et al., 2014; Diaz, 2017;), the lack of professionals and social services (Canali et al., 2016). Meanwhile, parents face the challenges determined by the lack of information on the child's development and the skills of parenthood (Bornstein, 2002). The present research expands the aforementioned studies by revealing what strategies are used by parents and foster parents in addressing challenges. It was observed that both groups of participants share identical strategies of addressing challenges. To solve the emerging difficulties, parents and foster parents search for information in scientific literature, on the Internet, in forums; they discuss the arising difficulties and search for common solutions together with the spouse or other family members. Parents and foster parents reflect on

their personal mistakes and those of other people and learn from them. This is how experiential learning takes place (Kolb & Kolb, 2008).

When parenting biological and foster children, ***spouses share their experience***. They support each other (Bornstein, 2002). Foster parents sense mutual solidarity (Gvaldaitė, 2017). The study revealed that parenthood and the experience of foster care allow parents and foster parents to know each other better. They see their spouses in a new light when the latter communicate with their biological or foster children.

Support from others is essential in the process of biological or foster parenting (Diaz, 2017). Support of the community and professionals, which is still lacking, is very important for foster parents; social services are especially lacking (Canali et al., 2016). It is important to be open to assistance and to use all available and possible resources from the environment in foster care (Gvaldaitė, 2017). The study showed that not only the assistance from their relatives but also the emotional support of their friends is of paramount importance in both biological and foster parenting.

'Emotional triangle' is an experience faced by foster parents. 'Emotional triangle' involves a foster family, a foster child and a child's biological family. Foster parents have to ensure that a foster child will have a chance to maintain contact with his or her biological family; however, it poses considerable challenges for them (Diaz, 2017; Gvaldaitė, 2017). Foster children have a double role to play: they have their biological parents and foster parents which they gradually start considering their parents as well (Maaskant et al., 2016). These meetings have an unbalancing effect on both foster children and a foster family. The study revealed that foster parents consider themselves to be hostages of the situation.

Foster parents experience the ***pain of separation*** when the relationship with their foster child discontinues. Both foster parents and foster children get attached to each other (Goodrich, 2010), leading to a heartbreaking separation. The feelings of loss, sadness and mourning are also experienced by the foster parents' biological children when their bond with the foster child discontinues (Bagdonaitė-Stelmokienė & Snieškienė, 2011; Bagdonaitė-Stelmokienė, 2015; Williams, 2017). As foster care begins, foster parents already sense the fear of attachment to the child; they fear that if they get attached to the child too much, it will be more difficult for everyone to get apart later. The longer the child lives in a foster family, the greater the attachment and the more difficult the separation is (Diaz, 2017). The study revealed that if the relationship with the foster child discontinues completely, the pain of separation increases. It was also observed that foster parents get too little attention from professionals when they live through separation.

Conclusions

The learning of parents and foster parents through the everyday experiences of biological/ foster parenting is understood as a complex process during which the learner faces various social interactions; it is an emotional, cognitive and behavioural process of learning. Different research participants view and characterise this learning in a similar way; certain aspects overlap and supplement one another, though differences are observed as well.

Personal change of parents and foster parents and their growth in parenthood take place in the process of learning. The birth of a child into a family and the acceptance of a non-relative child into a foster family pose a number of challenges; parents and foster parents experience confusion, but it is also the experience of joy and community. By learning through their everyday experiences, parents and foster parents live through the experience of unconditional acceptance and giving, which change and enrich them.

The most prominent difference between biological and foster parenting is viewed through the experience of 'emotional triangle,' which is only characteristic of foster parents. Communication with the foster child's parents is one of the most difficult aspects in foster care. To accept the child into the family fully, foster parents have to accept the child's family and previous history. Hence, a positive approach, empathy and understanding of foster parents enable the foster child to perceive his/her history as an inseparable part. However, it is observed that professional assistance required by foster carers in maintaining the relationship with the foster child's parents is particularly lacking.

References

Bagdonaitė-Stelmokienė, R. (2015). Globėjų biologinių vaikų vaidmuo globos procese: "Mes visi tapom jų globėjais, mokytojais, motinomis ir tėvais". *STEPP: Socialinė teorija, empirija, politika ir praktika, 10,* 21-34. doi: https://doi.org/10.15388/STEPP. 2015.10.4857

Bagdonaitė-Stelmokienė, R., & Snieškienė, D. (2011). Biologinių vaikų patirtis šeimoje, globojančioje ne giminaičius vaikus. *Socialinis darbas. Patirtis ir metodai, 7 (1),* 31-50.

Bornstein, M. H. (2002). Parenting Infants. In M. H. Bornstein (Ed.), *Handbook of Parenting: Children and Parenting, Volume 1,* (pp. 3-42). Mahwah, NJ: Lawrence Erlbaum Associates.

Cameron, G., Coady, N., & Hoy, S. (2012). Perspectives on being a father from men involved with child welfare services. *Child & Family Social Work, 19,* 14-23.

Canali, C., Maurizio, R., & Vecchiato, T. (2016). Foster care: motivations and challenges for foster families. *Social Work and Society. International Online Journal, 14 (2),* 1-15.

Deave, T., & Johnson, D. (2008). The transition to parenthood: what does it means for fathers? *Journal of Advanced Nursing, 63,* 626-633.

Di Silvio, R. (2012). Learning to 'Parenting': Peer-to-Peer Educational Actions in the Italian

Associations of Adoptive Families. *Proceedings of the 2nd International Conference on Human and Social Sciences, 8,* 18-25.

Diaz, R. (2017). *The experience of foster parents: what keeps foster parents motivated to foster long term? Doctoral dissertation*, USA: Antioch University Santa Barbara.

Edwards, R. (2009). Introduction: Life as a learning context? In Edwards, R., Biesta, G., & Thorpe, M. (Eds.). *Rethinking Contexts for Learning and Teaching: Communities, Activities and Networks,* Abingdon, Oxon, U.K.: Rutledge, p. 1-13.

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing, 62*, 107-115.

Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative Concent Analysis: A focus on trustworthiness. *SAGE Open, 4 (1)*, 1-10. doi: 10.1177/2158244014522633

Eraut, M. (2004). Informal learning in the workplace. *Studies in Continuing Education, 26* (2), 247-273.

Fisher, P. A., Stoolmiller, M., Mannering, A. M., Takahashi, A., & Chamberlain, P. (2011). Foster placement disruptions associated with problem behavior: Mitigating a threshold effect. *Journal of Consulting and Clinical Psychology, 79 (4),* 481-487. doi: 10.1037/a0024313

Goodrich, S. A. (2010). *Connecting Children and Families: Expectations and Experiences of Professional Foster Parents. Master Theses*. USA: University of Connecticut.

Gvaldaitė, L. (2017). Priėmimas globojant vaiką: patirtis, kurianti naują kultūrą. *STEPP: Socialinė teorija, empirija, politika ir praktika*, *14*, 48-63. doi: https://doi.org/ 10.15388/STEPP.2017.14.10415

Haugaard, J., & Hazan, C. (2002). Foster parenting. In M. H. Bornstein (Ed.), *Handbook of Parenting: Children and Parenting, Volume 1,* (pp. 313-327). Mahwah, NJ: Lawrence Erlbaum Associates.

Humphries, B. (2008). *Social Work Research for Social Justice*. New York: Palgrave Macmillan.

Jarvis, P. (2012). Learning from Everyday Life. *HSSRP. Human & Social Studies. Research and Practice, 1 (1),* 1–20.

Kolb, A. Y., & Kolb, D. A. (2008). Experiential Learning Theory: A Dynamic, Holistic Approach to Management Learning, Education and Development. In S. J. Armstrong & C. Fukami (Eds.) *Handbook of Management Learning, Education and Development.* London: Sage Publications.

Kvale, S., & Brinkmann, S. (2009). *Interviews. Learning the Craft of Qualitative Research Interviewing* (2nd ed.). Los Angeles: SAGE Publications.

Maaskant, A. M., Van Rooij, F. B., Bos, H. M. W., & Hermanns, J. M. A (2016). The wellbeing of foster children and their relationship with foster parents and biological parents: a child's perspective. *Journal of Social Work Practice, 30 (4)*, 379-395. doi: https://doi.org/10.1080/02650533.2015.1092952

Orb, A., Eisenhauer, L., & Wynaden, D. (2001). Ethics in Qualitative Research. *Journal of Nursing Scholarship, 33 (1),* 93–96.

Reid, C. D. (2010). *Becoming a mother without losing myself*. Alberta: Athabasca University.

Rosenberg, C. (2009). Mothers negotiating their identity: a creative narrative inquiry. *Enquire, 2 (1),* 108-132.

Stacy, L., Blythe, S. L., Wilkes, L., & Halcomb, E. J. (2014). The foster carer's experience: An integrative review. *Collegian, 21,* 21—32. doi:10.1016/j.colegn.2012.12.001

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care, 19 (6)*, 349-357. doi:10.1093/intqhc/mzm042

Tryc, L. M. (2013). *The Experience of Being a Foster Parent in Non-Kinship Placements: Emotional and Psychological Impacts. Master Theses*. USA: Grand Valley State University.

Wehler, B. A. (2014). *Until all the pieces fit: a hermeneutic phenomenology of the informal learning of selected foster parents in North-eastern Pennsylvania*. *Doctoral dissertation*. USA: The Pennsylvania State University.

Williams, D. (2017). Grief, loss, and separation: Experiences of birth children of foster carers. *Child & Family Social Work, 22*, 1448–1455. doi: 10.1111/cfs.12366

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 41-59

СОВЕРШЕНСТВОВАНИЕ КОМПЕТЕНЦИЙ УЧИТЕЛЕЙ ТЕХНОЛОГИИ, ПРИМЕНЯЯ В ВОСПИТАТЕЛЬНОМ ПРОЦЕССЕ МЕТОД ИССЛЕДОВАНИЯ СОВЕРШЕНСТВОВАНИЯ ПЕДАГОГИЧЕСКОЙ ДЕЯТЕЛЬНОСТИ (*ACTION RESEARCH)*

Development of the Competencies of Technology Teachers in the Education Process by Applying Action Research

Nijolė Bankauskienė
Kaunas College, Lithuania

Ramunė Masaitytė
LSMU/Kaunas College, Lithuania

Abstract. *Technology teaching programme has changed over the last decade. It took the path of modernisation. Intensive implementation of information technologies in the technology lessons is underway, the preparation of students for active practical life is being emphasised and the awareness of modern, but healthy daily life is being raised. In this way, new requirements are emerging for the quality of technology teacher activities with regard to their traditional and modern roles in the education process. They need to follow order No. ISAK-54 of 15 January 2007 "On the Approval of the Descriptor of Teacher Professional Competencies". In their practical work, they must possess, reveal and improve cultural competencies, professional-pedagogical competencies and general competencies. They are in line with the cognitive, functional, personal and ethical competencies of a technology teacher as provided for in the European Qualifications Framework.*

The article consists of three chapters. The first chapter discusses the activities, functions and roles of technology teachers in contemporary general education school; the content of teacher competencies and its compliance with the competencies of technology teachers provided for in the European Qualifications Framework. The second chapter describes the qualitative method of action research, its content and steps of its implementation. The third chapter summarises the results of a qualitative research carried out in the Lithuanian higher education institution X. The study reviewed the final project reports of current and future technology teachers who were enrolled in a one-year professional study programme from 2007 to 2017. The competencies acquired and developed by the technology teachers through the action research method were indicated. They mostly developed general competencies and professional-pedagogical competencies. Less emphasis was placed on the development of cultural competencies.

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3202

Keywords: *activities and functions of technology teachers; traditional and modern roles; cultural, professional-pedagogical and general competencies of a teacher; action research method.*

Введение
Introduction

В начале XXI в. общественность вступает в IV этап Промышленной революции. Klausas Schwabas (2017), основатель и руководитель Всемирного экономического форума, отмечает, что каждая крупная промышленная революция по сути меняет лицо не только промышленности, но и общественности, отмечая, что данный – IV этап, «создаст новые возможности в экономическом, в социальном и в личном воспитании». Поэтому становится понятно, что сегодня молодому человеку нужны не только специальные знания, которые он приобретает в учебных заведениях, а также навыки хорошо развитой компьютерной грамотности, таких компетенций как: знание языков, обладание навыками сотрудничества, умения гибко работать по отношению времени и места. На IV этапе промышленной революции должна поощряться качественная производственная практика и система обучения на протяжении всей жизни.

В общеобразовательных школах эти навыки развиваются на различных уроках, но самые благоприятные условия для этого создаются на уроках технологии.

На протяжении последнего десятилетия изменились программы технологического обучения. Они свернули на тропу модернизации. Всё чаще на уроках технологии применяются информационные технологии, акцентируется подготовка учеников к активной практической жизни, согласованность теории и практики. Выдвигаются новые требования для учителей, обучающих предмету технологии, для их готовности работать новаторски, выполнять традиционные и современные роли в деятельности учителя технологии, приобретать новые и развивать уже имеющиеся компетенции, на уроках поощрять учеников на обучение, рефлектировать получаемые знания и приобретенные навыки практической деятельности.

Учёные и практики эдукологии разных стран мира всё чаще предлагают учителям в своей деятельности применять метод исследования совершенствования педагогической деятельности *(action research*). Этот метод начали применять в США ещё в пятом десятилетии прошлого века, а с 2000 года его применяют и в различных высших школах Литвы в ежедневной практической деятельности. Об этом писал Lewin(1948), Corey (1953), Grundy (1988), Callhoun (1994), Mills (2003), Lankshear & Knobel (2004), Kosha (2005), Creswell (2008), Dick (2006), Stinger (2007), Gay & Mills;

Airasion (2009), McNiff & Whitdead (2009), Baranauskienė (2003), Bankauskienė & Bankauskaitė - Sereikienė (2006, 2007, 2010, 2015, 2017), Masaitytė – Apuokienė & Bankauskienė (2012), Ruškė (2012), Staskevičienė & Bankaukienė (2011), Janiūnaitė, Bankauskienė, Augustinienė, & Čiučiulkienė (2013). В этой статье мы хотели бы обсудить возможности применения данного метода в деятельности учителя технологии и проанализировать влияние метода action research на совершенствование компетенций учителя.

Поэтому в данной статье поднимается проблема: Можно ли утверждать, что метод исследования совершенствования педагогической деятельности *(action research)* помогает учителям технологии раскрыть уже имеющиеся и заново приобретаемые компетенции.

Цель статьи: проанализировать выражение компетенций учителей технологии в процессе обучения применяя иследование действий (action research).

В статье решаются следующие задачи:

- Обсудить деятельность учителей технологии, роли и приобретаемые компетенции в совокупности с компетенциями учителей технологии Европейского строения квалификаций;
- Раскрыть шаги исследования совершенствования педагогической деятельности при обучении технологиям;
- Установить, какие компетенции учителям технологии помогают совершенствовать метод исследования совершенствования педагогической деятельности.

При подготовке статьи применялись методы изучения научной литературы, документов и анализ случая.

Роли деятельности, компетенций учителей технологии и их соответствие компетенциям Европейского строения
The role of technology teachers, their competences, and the conformity of their competences with those of the European Framework

Сегодняшний учитель в современной школе выполняет множество функциий. Ему недостаточно быть только хорошим специалистом своей области, источником понимания и правды. В XXI в. учитель должен хорошо ориентироваться в постоянно изменяющемся обществе, осознать вызовы IV промышленной революции, осознать политические, экономические и социальные изменения, уметь их перечислять и комментировать их ученикам и их родителям. На стыке XX и XXI вв. мы говорим не только о работе учителя, а об его разносторонней деятельности (Lepaitė, 2003). Учитель, действуя и, согласно Tumėnienė, Janiūnaitė (2004), выполняя свои роли, существенно меняет границы своей деятельности.

Согласно Bell (1999), педагог в своей деятельности выполняет четыре основные роли: роль композитора (планирует и отбирает материал для обучения, готовит рекомендации, примеры использования такого материала), учителя – дирижёра (помогает обучающимся выдержать необходимый уровень обучения), учителя – исполнителя (передаёт информацию своего предмета, передаёт саму систему), учителя – критика (выполняет процедуры диагностирования и оценивания, поощряет самооценивание обучающегося) (Bankauskienė, & Bankauskaitė - Sereikienė, 2015).

При исследовании работ L. Stoll & D. Fink (1998), M. Fulan (1998), K. Sirotnik (1990), V. Tumėnienė (2002), V. Tumėnienė & B. Janiūnaitė (2004), R. Masaitytė – Apuokienė & N. Bankauskienė (2012), проясняется, что разнообразным функциям деятельности учителя соответствуют традиционные – роли учителя, поставщика знаний и воспитателя. На данный момент они изменяют свой род, появляются новые роли учителя. Это - новатор, консультант, побудитель процесса обучения, катализатор (клиницист, философ), исследователь, посредник изменений, социальный педагог, сотрудничающий коллега.

При анализе общих воспитательных программ, в том числе и технологий, выделяется, что учителя технологии должны хорошо ознакомиться с общим и развёрнутым курсом обучения технологий. Учителя технологии должны предоставить ученикам знания, формировать их понимание, учить решению проблем и предприимчивости, создать условия для развития технологических решений и практических навыков. Ученики на уроках технологии должны демонстрировать постановления, уметь учиться, коммуницировать.

Учителя предмета технологии должны интегрироваться с родным языком, иностранными языками, математикой, искусством, природными науками, социальной наукой и информационными технологиями.

Цель технологического воспитания – создание предпосылок для воспитания у учеников основ технологической грамотности, ценностных установок и общих технологических навыков. Создать условия для всех учеников (не систематизируя их по половой принадлежности) для обучения различным технологиям, укрепить творческие и практические навыки, воспитать позитивные установки для постоянного изменения продвинутых технологий.

Итак, в воспитательном процессе учитель технологии в своей деятельности, выполняя различные функции, демонстрирует такие роли: поставщик информации, учитель предмета, организатор, посредник изменений, консультант, руководитель и побудитель процессов обучения, новатор, исследователь, ценитель, методист, клиницист, сотрудничающий

коллега, опытный старший друг, социальный педагог, воспитатель, философ, организатор и руководитель внеклассной деятельности. (Masaitytė – Apuokienė & Bankauskienė, 2012).

При анализе приказа министра образования и науки Литовской Республики № ISAK -54 от 15 января 2007 г. «Про подтверждение описи компетенции профессии учителя», прояснилось, что учителя технологии, как и учителя других предметов, должны уметь в своей практической деятельности, выполняя различные роли учителя, демонстрировать Общекультурную, Профессиональные педагогические и Общие компетенции.

Общекультурная компетенция определяется как знания, навыки, способности, ценностные установки и другие личные качества учителя, влияющие на успешную деятельность человека в конкретной(-ых) культуре(-ах). Эта компетенция определяет открытость учителя образовательному наследию и опыту Европы и других стран.

Существуют следующие профессиональные педагогические компетенции: 1. Использование информационных технологий; 2. Создание среды воспитания; 3. Планирование и совершенствование содержания предмета; 4. Управление процессом обучения; 5. Оценивание достижений и прогресса учеников; 6. Мотивация учеников и их поддержка; 7. Признание познания учеников и его прогресса; 8. Профессиональное совершенствование.

Существуют следующие общие компетенции: 1. Коммуникация и управление информацией; 2. Общение и сотрудничество; 3. Исследуемая деятельность; 4. Рефлексия и умение учиться; 5. Совершенствование организации и управление изменениями.

В документе «Общие европейские принципы для компетенций и квалификаций учителей» (2005) выделена установка, что учитель обязан уметь эффективно работать в трёх переплетающихся областях деятельности: 1. При работе с информацией, технологиями и знаниями; 2. При работе с людьми (учениками, коллегами и другими партнёрами); 3. При работе с общественностью и на общественном локальном, региональном, национальном, европейском и глобальном уровне (Saulėnienė, Židžiūnaitė, & Katiliūtė, 2006).

В европейских документах выделяются четыре группы компетенций учителя Европейского строения квалификаций: когнитивные, функциональные, личные и этические компетенции.

Обсуждённые выше компетенции учителей Литвы (2007) непосредственно сочетаются с этими компетенциями учителей технологии Европейского строения квалификаций (Saulėnienė, Židžiūnaitė, & Katiliūtė, 2006).

1 таблица. **Сочетание компетенций учителей Литвы с компетенциями учителей технологии Европейского строения квалификаций**
Table 1 ***The competences of Lithuanian teachers (2007) in coherence with the competences of the technology teachers within the European Qualifications Framework***

Европейское строение квалификаций	**Опись компетенций профессии учителя (2007)**
Когнитивные компетенции	– коммуникация и управление информацией; – исследуемая деятельность; – рефлексия и умение учиться.
Функциональные компетенции	– планирование и улучшении предмета; – управление процессами обучения; – создание образовательной среды; – оценивание достижений и прогресса учеников.
Личные компетенции	– познание ученика; – общекультурная компетенция; – общение и сотрудничество.
Этические компетенции	– мотивация и поддержка учеников; – признание прогресса учеников.

Итак, учителя технологии в своей деятельности должны обладать когнитивными, функциональными, личными и этическими компетенциями Европейского строения квалификации, которые соответствуют указанным в Описи компетенций профессии учителя (ISAK – Nr. 54, 2007) компетенциям.

Шаги исследование совершенствования педагогической деятельности (*action research*), при обучении технологиям
Action research in the teaching of technology

Исследования деятельности являются процессом решения проблем. Lewin (1998) и Келли (1995) процесс научных исследований (традиционный и исследование деятельности) и создание знаний считают идентичными и одинаково необходимыми для ежедневного решения проблем и обучения. Исследователи деятельности критически оценивают и обновляют свою деятельность для того, чтобы подтвердить заранее предвиденный план деятельности, или опровергнуть его, если выдвинутая научная/ практическая проблема была неверна. Таким образом, цикл исследования деятельности начинается сначала (Baranauskienė, 2003).

Для авторов статьи самым приемлемым является исследование практической деятельности, выделенный G. E. Mills (2003) (Ruškė, 2012) – он «охватывает возникающие в классе проблемы и стремление к их

решению, совершенствованию обучения учеников и профессиональной работы учителей» (Bankauskienė & Bankauskaitė-Sereikienė 2017).

Главным достоинством исследований деятельности является улучшение качества практики. Согласно Kemmis и McTaggart (1982), для того, чтобы выполнить исследования деятельности, необходимо:

- подготовить план совершенствования уже существующей деятельности;
- воплотить подготовленный план;
- наблюдать за своими выполняемыми деятельностями и эффективно обдумать эффективность выполненной деятельности;
- опираясь на это, планировать следующее действие и начать цикл сначала (Baranauskienė, 2003).

Они напоминают циклы конкретного опыта Kolb (1984), рефлекторного наблюдения, абстрактной концептуализации и активного экспериментирования (Baranauskienė, 2003).

Bankauskienė, Bankauskaitė-Sereikienė (2010, 2015, 2017) предлагают следующие 15 шагов совершенствования педагогической деятельности.

1 шаг: Идентифицирую волнующую проблему, обосновываю её, определяю почему она волнует меня, обдумываю хватит ли у меня сил выполнить исследование до конца.

2 шаг: Формулирую и уточняю вопрос исследования.

3 шаг: Выясняю контекст деятельности (школа, класс). Отбираю участников исследования. Получаю информацию об их учёбе и поведении на уроках других учителей.

4 шаг: Решаю этические проблемы с участниками исследования, их родителями и руководством школы.

5 шаг: Размышляю и планирую время исследования деятельности. Устанавливаю из каких источников и как я буду накапливать данные, что может мне помочь.

6 шаг: Конкретная деятельность. Сбор данных. Ведение журнала данных. Применение различных методов исследования. Оценивание работ участников исследования.

7 шаг: Промежуточная идентификация результатов: достаточно ли накопленных результатов, информативны ли они.

8 шаг: Если возникает потребность – корректирую исследование, дополнительно накапливаю информацию, выдвигаю дополнительные задания для дальнейшего этапа деятельности.

9 шаг: Дальнейшая деятельность по подкорректированным заданиям и, возможно, изменённым методам деятельности.

10 шаг: Я оцениваю изменения, группирую полученные данные.

11 шаг: Я анализирую научную литературу и работы участвующих в исследовании учеников, провожу интервьюирование с вопросами, касающимися их самочувствия.

12 шаг: Я анализирую данные, сравниваю их между собой и интерпретирую. Я не забываю о научной литературе и советах экспертов.

13 шаг: Рефлексирую, какие компетенции я приобрела и улучшила.

14 шаг: Я пишу отчёт исследования и с ним знакомлю участников исследования, их родителей, общественность школы.

15 шаг: Если у меня есть желание, силы и стремление, я начинаю придумывать и планировать исследование новой проблемы.

Итак, исследование совершенствования педагогической деятельности является постоянно возобновляющимся, спиральным процессом. В нём проявляется и контекст исследования, и опыт, и действия, и рефлексия – обдумывание. У метода исследования совершенствования педагогической деятельности *(action research)* нет ничего общего с лабораторным исследованием, это способ для улучшения работы учителя в конкретной среде воспитания, при участии воспитанников.

Несмотря на то, что исследование совершенствования педагогической деятельности направлено на совершенствование самого учителя, без задействования в этой деятельности учеников оно является невозможным. В процессе обучения учеников учитель совершенствуется и учится сам. Во время этого качественного исследования педагог решает актуальные для него проблемы, обучает выбранных участников исследования, наблюдает за ними, коммуницирует с ними, оценивает их работу, фиксирует изменения, ведёт журнал данных исследования, рефлектирует, учится на своих ошибках, исправляет их, совершенствует методы работы, сотрудничает с коллегами и учениками. Ситуацию в классе и на уроке учитель-исследователь начинает изменять с самого себя, совершенствуя участников исследования, включая в исследование других коллег, родителей учеников.

Результаты исследования
Research results

В процессе исследования анализа качественного случая проанализированы итоговые проекты учителей технологии, которые учились и приобрели квалификацию учителя технологии в одной из высших школ Литвы, обучаясь по профессиональной программе «Студии педагогики». Эти работы охватывают период с 2007 года, когда был провозглашён приказ Министра образования и науки школ Литвы от 15 января 2007 года № ISAK -54 «Про описание компетенций профессии учителя».

Проведя анализ итоговых проектов, можно предоставить определённые замечания. Во-первых, отметить, что метод исследования совершенствования педагогической деятельности *(action research)* помогает учителю технологии совершенствовать различные компетенции.

Более всего усовершенствованы общие компетенции (ISAK, 2007), которые проявились как когнитивные компетенции Европейского строения квалификаций.

В воспитательной деятельности особо важна компетенция коммуникации и управления информацией. Она раскрыла навыки учителей технологии правильно использовать язык в реальной и виртуальной среде, выполнять поиск актуальной для воспитания информации.

«Я научилась успешно анализировать различные источники литературы, успешно применять приобретённую новую информацию во время урока, используя компьютерную программу «Crocodile», с помощью которой мы чертили трёхмерные чертежи мебели.» (Maceikienė, 2012); «В профессиональной среде я умею правильно использовать литовский язык и выполнять поиски актуальной для воспитания информации: знать, выбрать и использовать адекватные базы данных.» (Puskunigienė, 2011); «Я поощряю учеников готовить описания работы на правильном литовском языке. Мне самой приходится повторять правила правописания и пунктуации, случаи исключения.» (Poškutė, 2011); «Я умею отбирать, систематизировать, предоставлять необходимый для воспитания материал. Я умею использовать различные средства коммуникации. Я научилась работать с интерактивной доской.» (Rudzevičiūtė, 2011).

Авторы итоговых проектов акцентировали компетенцию исследуемой деятельности, которая раскрыла навыки учителей в организации исследования профессиональной деятельности, выборе адекватной стратегии, структуры и методов исследования: «Ранее у меня не было этой компетенции, сейчас я приобрела её. Я научилась выбирать стратегию, структуры, методы исследования, проектировать ход исследования, организовывать сам процесс исследования, рефлектировать, оценивать, как участников исследования, так и саму себя.» (Puskunigienė, 2011); «Приобретённая компетенция исследуемой деятельности позволяет мне оценивать саму себя и предвидеть дальнейшие варианты деятельности. Это позволяет углубиться в индивидуальные случаи, анализировать проблемы и трудности, находить лучшие решения. Это побудило меня внимательнее присмотреться к себе и к своим ученикам. С данным методом я познакомлю общественность своей гимназии и буду предлагать внедрить его в практику.» (Gudynienė, 2011); «В процессе исследования я достигла желаемых целей, я критически взглянула на свою деятельность, я постоянно задавала себе вопрос – довольна ли я достигнутым результатом? Мои

воспитанники также учились внутренней рефлексии. Мои ученики выдержали экзамен зрелости по технологии.» (Poškutė, 2011); «До сих пор мне не приходилось организовывать качественного исследования. Ознакомившись с данным методом исследования, я применила его в своей деятельности. В процессе исследования я реализовала все этапы исследования, придерживалась этики исследования, анализировала полученные результаты, рефлектировала, научилась оценивать саму себя.» (Radzevičiūtė, 2011).

Компетенция рефлексии и умения обучаться раскрыла способности исследуемых к организации своего обучения индивидуально и в группах, постоянного целесообразного обновления своих знаний, развития навыков, оценивания достоинств и недостатков педагогической практики, предвидения перспективы дальнейшего профессионального совершенствования.

«Я сама могу учиться и рефлектировать, и я способна применять это в своей практической деятельности.» (Poškutė, 2011); «Эту компетенцию я приобрела, обновляя уже имеющиеся знания, исследуя научную и методическую литературу. Эту компетенцию я совершенствовала при прохождении педагогической практики, обучаясь у своего ментора, оценивая приобретённые во время педагогической практики знания, и принимая во внимание критические замечания: (Puskunigienė, 2011); «Я постоянно подразумевал, что являюсь гражданином обучающегося общества, поэтому мы должны работать творчески, быть открытыми для новшеств, постоянно обучаться, принимать новшества и применять их в своей работе.» (Bobrik, 2011); «Во время и после студий я рефлектировала приобретённые и усовершенствованные компетенции. Я разработала дальнейший план обучения». (Maceikienė, 2012).

Исследование показало, что были усовершенствованы педагогические компетенции учителей технологии. Это соответствует функциональным компетенциям Европейского строения квалификаций.

Компетенция планирования и усовершенствования содержания предмета требует от учителя технологии умения подготовить программу обучения, тематический план, формулирования целей и задач обучения, отбора материала обучения: «Я умею планировать свою деятельность: подготовить программу, излагать тематику технологического предмета, составить план урока, подготовить профессиограмму учителя технологии, выбрать методы воспитания – работы на уроке» (Borta, 2011); «Через выполнение метода исследования совершенствования педагогической деятельности *(action research)*, я научилась планировать содержание технологического предмета. Эту компетенцию я совершенствовала во время педагогической практики. Я училась у ментора, стремясь к тому, чтобы

выдвинутые задания урока соответствовали содержанию преподаваемого урока» (Jurkevičienė, 2012); «Я умею планировать свою деятельность, подготовить программу технологического предмета и планы уроков, по которым я умею организовывать воспитательскую деятельность. Я углубила знания в области межпредметной интеграции, подготавливая индивидуализированные и дифференциализированные задания, используя их для воспитания учеников с различными потребностями» (Rudzevičiūtė, 2011).

Педагог, развивший компетенцию управления процессом обучения, способен стремиться к равновесию между передачей знаний и консультированием, руководством и лидерством, наблюдением и присмотром, развивать критическое мышление учеников, способности решения проблем и творческое мышление: «Я могу целесообразно применять современные технологии (само)воспитания, методы (само)обучения. Я обучаю учеников работать в группах, участвовать в проектной деятельности, разрабатываю индивидуальные задания. Для участвующих в исследовании учеников я разрабатывала отдельные методики обучения. Таким способом я могу передать знания, наблюдать, индивидуально консультировать, поощряю развитие лидерских качеств: (Anužytė-Gudlekienė, 2011); «Данную компетенцию я приобрела во время педагогической практики, активно общаясь и сотрудничая с ментором и тутором, в процессе проведения пробных и зачётных уроков.» (Jurkevičienė, 2012); «Во время исследования я научилась разрабатывать сами задания, дифференцировать их и индивидуализировать, поощрять на практическую деятельность. Мотивируя учеников, я научилась прибегать и применять на уроке разные методы.» (Pocienė, 2010); «Я стремлюсь к равновесию между обучением и консультированием, чётко передаю ученикам необходимую для обучения информацию, особый акцент делая на важности этнической культуры и практичных навыков. На уроке я поощряю творческую деятельность учеников.» (Voveraitis, 2011); «На уроке я умею использовать разные методы, поощряю учеников на критическое мышление, принятие решений, выдвижение волнующих их вопросов, использование различных технологий.» (Gudynienė, 2011).

Для исследователей была важна компетенция создания окружений (само)обучения: «Я научилась создавать на уроке среду, оказывающую благоприятное влияние на сотрудничество. Для этого я использовала проектную деятельность, применяла краткосрочные и долгосрочные проекты. Ученики работают в группах, самостоятельно, сотрудничают, начинают доверять друг другу и верить в себя.» (Gudynienė, 2011); «Я умею создавать воспитательную среду, микроклимат, стремлюсь беречь и охранять здоровье учеников, поощряю учеников на сотрудничество. Цели и

задания воспитания я связываю со средой воспитания. Я безопасно и успешно использую пространство предназначенного для меня кабинета технологий. Поощряю инициативу и самостоятельность учеников. По возможности я стараюсь приблизить среду (само)обучения к ученикам с разными потребностями.» (Maceikienė, 2012); «Во время исследования много внимания я уделяла созданию среды обучения. Предоставляемую на уроках информацию я старалась передать таким образом, чтобы у ученика была возможность слушать, читать, записывать, а также лично создавать изделия, обучаться традиционным ремёслам. По возможности я изменяла саму среду обучения – мы посещали музеи, выставки, знакомились с людьми разных профессий в их мастерских.» (Pocienė, 2010).

Учитель, усовершенствовавший компетенцию оценивания достижений и прогресса учеников, умеет совмещать количественную и качественную, формальную и неформальную стратегию оценивания достижений учеников, подбирать методы оценивания достижений и прогресса учеников, оценивать их социальный прогресс.

«При выполнении исследования совершенствования педагогической деятельности, я была побуждена подготовиться к оцениванию в исследовании участвующих учеников и всего класса, в котором проводилось исследование. Я должна была ввести одинаковые критерии оценивания. Я обсудила это со своими воспитанниками. Учеников я оценивала на каждом уроке, применяя накопительное оценивание. В конце исследования выявился индивидуальный прогресс каждого воспитанника.» (Anužytė-Gudlekienė, 2011); «Во время исследования по вопросам критериев оценивания учеников я консультировалась с ментором практики и членами школьного методического кружка учителей технологии. В своей деятельности я применила и даже усовершенствовала принятые в школе критерии оценивания.» (Borta, 2011); «Во время исследования я не только накапливала информацию, проводила уроки, поощряла и активировала учеников, но также обсудила с ними систему оценивания, которую я совершенствовала в процессе исследования, принимая во внимание общие требования школы, наблюдала помогают ли данные критерии совершенствоваться ученикам и становиться активнее.» (Gudynienė, 2011).

Приходится отметить, что личные компетенции Европейского строения квалификаций соответствуют учителям технологии свойственной (ISAK- Nr. 54, 2007) общекультурной, компетенции общения и сотрудничества познания ученика.

После того как учителя технологии усовершенствовали компетенцию познания ученика, проявилась их способность распознавания взгляда учеников на обучение, предоставления дополнительной помощи, оценивания силы ученика к обучению, познанию, признания

индивидуальности ученика: «При выполнении исследования совершенствования педагогической деятельности, я должна была познакомится с учениками, принимающими участие в исследовании, распознать их различающийся взгляд на обучение и признать их индивидуальность, как ценность. Уже при первой встрече я предоставила индивидуальный опросник, позднее я готовила индивидуальные задания, для того, чтобы я могла оценивать развитие ученика.» (Anužytė-Gudlekienė, 2011); «Во время исследования я научился лучше узнавать учеников, я применял разнообразные анкетирования, работал индивидуально. Всё это я фиксировал в журнале данных исследования, рефлектировал для того, чтобы суметь распознать способности учеников к обучению. Даже небольшой позитивный результат является качественным показателем деятельности педагога, он важен как для педагога, так и для самого ученика.» (Bobrik, 2011); «Я эмпатично идентифицировала эмоциональные преимущества и трудности учеников. Рефлектируя и оценивая приобретенные знания исследуемых, стало намного легче констатировать разнообразный взгляд учеников на обучение, планировать дополнительную помощь.» (Borta, 2011).

Для исследователей очень важна компетенция взаимоотношения и сотрудничества. Она раскрыла способность учителей к взаимоотношению и сотрудничеству с коллегами, учебно-вспомогательным персоналом, поощряя учеников на общение и сотрудничество в классе, умению разрешать конфликты и способности научить этому своих воспитанников, общаться с родителями учеников и социальными партнерами.

«Посредством выполнения командных технологических заданий и обсуждения их вариантов решения проблемы, через распределение работ я обучала участников исследования общению и сотрудничеству. Для этого я использовала электронную почту. Я учила их выполнять различные роли при работе в группах и рефлектировать это: (Borta, 2011); «Через общение с родителями воспитанников, я лучше поняла характер своих учеников, их наклонности, сильные и слабые стороны. Это помогло поощрить мотивацию воспитанников, создать эмоционально положительную атмосферу в классе.» (Jankevičius, 2012); «С воспитанниками я общаюсь не только на уроках, как учитель технологии, но и как воспитатель. Я постоянно сотрудничаю с коллегами и лицами, предоставляющими помощь ученику – социальным педагогом, психологом и специалистом профессионального информирования.» (Maceikienė, 2012); «Я умею организовывать работу в группах, парах. Я поощряю учеников на активное сотрудничество, взаимопомощь при выполнении разнообразных задач. Сотрудничая с учениками во время исследования, я помогла решить не одну проблему. Они научились смелее выражать своё мнение, научились учиться

вместе, выслушивать друг друга, они включались в работу группы, научились уважать мнение и старания другого, говорить друзьям хорошие слова, уступить при возникновении конфликта, стали более чувствительны и ответственны.» (Rudzevičiūtė, 2011).

Как показал анализ теоретического материала, к личным компетенциям учителей технологии Европейского строения квалификаций относится и общекультурная компетенция личности (ISAK, Nr.-54, 2007). Исследование показало, что об этой компетенции, состоящей из 8 компонентов, учителя упоминали реже всего. Они не думали, что во время исследования им до конца удалось «охранять и развивать многогранную культуру Литвы, насыщенную опытом национальных меньшинств»; «интегрировать мировую историю, географию, культурные знания при оценивании влияния культурного разнообразия стран Европейского союза на Литву»; «участвовать в процессах изменения общества и просвещения» (ISAK, Nr.-54, 2007).

Исследователи указали, что во время исследования им лучше всего удалось «оценивать роль домашней обстановки и различия семейных ценностей, сотрудничая с учениками и их родителями»; «обучать учеников руководствоваться общечеловеческими ценностями»; «уважать социальную, культурную, языковую, этническую идентичность воспитанников»; «создавать информационное общество и общество знаний».

Анализируя то, как метод исследования совершенствования деятельности помог учителям технологии совершенствовать этические компетенции, были приняты во внимание две предусмотренные компетенции: «мотивация учеников и их поддержка» и «признание прогресса учеников» (ISAK Nr.-54, 2007).

Компетенция мотивирования и поддержки учеников разрешила проявится следующим способностям учителей: воспитывать способность учеников к самооцениванию и их самоуверенность, стимулировать радость познания, заинтересовать учеников обучаемым предметом, помочь решать проблемы обучения: «В процессе выполнения исследования совершенствования деятельности, я помогла ученикам с поиском информации о специальностях, которые они планируют выбирать, поддерживала их мнение и выбор, в качестве примера предоставила свою историю обучения, поощряла их на самооценивание и уверенность в себе» (Anužytė-Gudlekienė, 2011); «Обучая и мотивируя участников исследования, я не только заботилась об их деятельности и знаниях, я также совершенствовала свою деятельность. Оценивая их, я оценивала и саму себя. Свои замечания и рефлексии я фиксировала в журнале данных исследования деятельности.» (Puskuniginienė, 2011); «Самую большую

радость при работе на уроке я испытывала тогда, когда видела на лице ученика радость, когда он испытывал успех, когда он начинал гордиться своим хорошо выполненным заданием. Мотивации учеников способствовало формальное и неформальное оценивание.» (Adomaitis, 2011).

В процессе совершенствования своих этических компетенций (1 таблица) учителю приходится постоянно наблюдать за своими воспитанниками, сотрудничать с ними, даже в проблемных ситуациях проявлять позитивное мышление, но главное – учитель в педагогических процессах должен учиться признавать прогресс учеников.

Исследователи отметили: «В целях совершенствования данной компетенции, во время студий, я дополнительно выслушала модуль педагогики, дискутировала и советовалась с воспитателем в исследовании участвующих учеников, преподающими учителями, с целью разностороннего познания участников исследования, объективного оценивания прогресса их обучения». (Jurkevičienė, 2012); «Приобретённый во время исследования опыт позволяет оценивать случившийся прогресс каждого ученика. С этой целью я вела журнал данных исследования, наблюдала, анализировала, сравнивала, фиксировала результаты учеников, делая особый акцент на их творческих способностях во время уроков технологии». (Rudzevičiūtė, 2011); «Выполняя исследование, я начала лучше узнавать учеников, эмпатично идентифицировать индивидуальность. С помощью применения формального и неформального оценивания, я начала успешнее фиксировать их прогресс.» (Poškutė, 2011).

Во время исследования было замечено, что учителя технологии, с помощью исследования совершенствования педагогической деятельности развили общие и профессиональные педагогические компетенции. Немного уже была обсуждена общекультурная компетенция, состоящая из восьми компонентов (ISAK Nr.-57, 2007). Считается, что формулировки компонентов общекультурной компетенции являются слишком абстрактными и не предоставляющие возможность учителю внедрить конкретную компетенцию в воспитательный процесс.

Исследователями было замечено что, используя описание компетенций, можно сравнить какими компетенциями обладали учителя технологии в начале студий и какие компетенции они развили, выполняя метод исследования совершенствования педагогической деятельности *(action research)*.

Выводы
Conclusions

1. Проведя анализ научной литературы и документов, можно утверждать, что в начале XXI в. на смену работы учителя технологии приходит разносторонняя деятельность, меняются традиционные роли учителя, созвучные с изменившимися функциями его деятельности. Учителям необходимо приобрести и развить общекультурную, профессиональные педагогические и общие компетенции. Эти компетенции непосредственно совпадают с когнитивными, функциональными, личными и этическими компетенциями Европейского строения квалификаций учителей технологии.
2. При проведении исследования совершенствования педагогической деятельности учителям технологии предложено руководствоваться 15 теоретическими шагами исследования.
3. С целью установления компетенций, которые помогают учителю технологии совершенствовать метод исследования совершенствования педагогической деятельности *(action research)*, практический материал анализа случая позволил обобщить, что учитель усовершенствовал эти четыре компетенции Европейского строения квалификаций – когнитивную, функциональную, личную и этическую. Эти компетенции соответствуют общим и профессиональным педагогическим компетенциям, утвержденным Описью компетенций профессии учителя (ISAK Nr. -54, 2007). Менее рефлективной является общекультурная компетенция из восьми компонентов.

Summary

Over the last decade technology teaching programmes have become more modern. The use of information technologies has become more prominent in technology classes, with the focus on active preparation of students for an active practical life and on the coherence between theory and practice. New requirements are set for technology teachers, their preparation to work innovatively, take up on traditional and modern roles in technology teaching, gain new competences and maintain those they already have, urge students to learn in class and reflect on newly gained knowledge and practical skills.

Education scientists and practitioners from different countries increasingly recommend teachers to use the action research method in their work. This method has been used in the USA since 1940s and has been applied in the everyday practical work of Lithuanian higher education schools since 2000.

Therefore, the question raised in this article is whether it is expedient to claim that action research method helps technology teachers to demonstrate the competences they already have and those they newly gain.

The aim of the article is to analyse how technology teachers use their competences in the teaching process applying the action research method.

The following tasks have been set:

- To discuss the work, roles, and competences that technology teachers gain in coherence with the competences technology teachers within the European Qualifications Framework;
- To determine what competences of technology teachers are improved by means of the action research method.

The methods of analysis of scientific literature, documents, and case analysis were used in the preparation process of this article.

The article consists of three chapters. The first chapter discusses the activities, functions and roles of technology teachers in contemporary general education school; the content of teacher competencies and its compliance with the competencies of technology teachers provided for in the European Qualifications Framework. The second chapter describes the qualitative method of action research, its content and steps of its implementation. The third chapter summarises the results of a qualitative research carried out in the Lithuanian higher education institution X. The study reviewed the final project reports of current and future technology teachers who were enrolled in a one-year professional study programme from 2007 to 2017. The competencies acquired and developed by the technology teachers through the action research method were indicated. They mostly developed general competencies and professional-pedagogical competencies. Less emphasis was placed on the development of cultural competencies.

References

Adomaitis, A. (2011). *Kaip galėčiau skatinti X klasės mokinių motyvaciją technologijų pamokose (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Encourage the 10th Form Pupils' Motivation at lessons of Technologies (on the Basis of Action Research).* Kaunas

Anužytė – Gudlekienė, I. (2011*). Kaip galėčiau padėti mokiniams teorines žinias taikyti praktikoje (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I could Help Pupils to Apply Theoretical Knowwledge in Practice (on the Basis of Action Research)*. Kaunas

Bankauskienė, N., & Bankauskaitė – Sereikienė, G. (2017*). Pedagoginės veiklos tobulinimo tyrimo metodo taikymas lietuvių kalbos pamokose*. Straipsnių rinkinys „Gimtoji kalba". Šiauliai:Lucilijus.

Bankauskienė, N., & Bankauskaitė –Sereikienė, G. (2006), (2007), (2010*). Lietuvių kalbos mokytojo veikla: pamokos organizavimo metodai ir tyrimas.* Kaunas: Technologija.

Bankauskienė, N., & Bankauskaitė –Sereikienė, G. (2015). *Lietuvių kalbos mokytojo veiklos metodai ir tyrimas.* Kaunas: Technologija.

Baranauskienė, R. (2003). *Europinių kokybinių tyrimų realizavimas Edukacinės paradigmos virsmo kontekste.* Šiauliai: Šiaulių universitetas.

Bell, J. (1999). *Doing Jour Re-search Project: a Guide for First – time Researchers in Education and Social Science. 3rd ed.* Buckingham: Philadelphia: Open University Press.

Bendrieji Europiniai principai mokytojų kompetencijoms ir kvalifikacijoms (2005). Vilnius.

Bobrik, A. (2011). *Kaip galėčiau skatinti mokinių kūrybiškumą technologijų pamokose (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Encourage Creativity of Pupils at Lessons of Technologies (on the Basis of Action Research).* Kaunas.

Borta, V. (2011*). Kaip galėčiau motyvuoti IX klasės mokinius technologijų pamokose taikyti informacines technologijas (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Couls Motivate Pupils of 9th Form of technology to use information technologies (on the Basis of Action Research).* Kaunas.

Callhoun, E. F. (1994). *How to Use Action Research in the Self-Renewing School*. Association of Superwision and Curriculum Development.

Corey, S. M. (1953). *Action Research to Improve School Practices.* Bureau of Publications Teachers College., Columbia University, New York.

Dick, B. (2006). *Action Research Literature 2004-2006, Themes and Trends.* Action Research, 4 (4). London: Sage Publications.

Gay, L. R., Mills, G. E., & Airasion, P. (2009). *Educational Research. Competencies for Analysis and Applications*. Pearson Education International.

Giedraitis, A. (2013). *Kaip galėčiau padėti mokiniams tobulinti darbo įgūdžius praktiniuose užsiėmimuose (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Help for Pupils to Develop working skills during practice activities (on the Basis of Action Reseach).* Kaunas.

Grundy, S. (1988). *Three models of action research. The Action Research Reader (3rd ed.).* Geelong: Deahin University Press.

Gudynienė, J. (2011). *Kaip galėčiau skatinti gimnazijos I klasės mokinių mokymosi motyvaciją technologijų pamokose (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Encourage Learning Motivation of the 1st from Pupils of the Gymnasium at Lessons of Technologies (on the Basis of Action Research).* Kaunas.

Janiūnaitė, B., Bankauskienė, N., Augustinienė, A., & Čiučiulkienė, N. (2013*). Edukacinės inovacijos rengiant pedagogus.* Kaunas: Technologijos.

Jurkevičienė, J. (2012). *Kaip galėčiau padėti VIII klasės mokiniams tobulinti technologijų mokymosi įgūdžius (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Help the 8th From Pupils to Develop Skills of Technologies' teaching (on the Basis of Action Research).* Kaunas

Kelly, G. A. (1955). *The Psychology of Personal Constructs*. Volumes 1 and 2. Norton, Mew York.

Kemmis, S., & McTaggart, R. (1982). *The Action Research Planner Third Substantial revised edition, 1988.* Deakin University Press, Victoria.

Kolb, D. A. (1984). *Experiential Learning. Experience as the Source of learning and Development.* Prentice – Hall, Englewood Cliffs, New York.

Kosha, V. (2005). *Action research for improving practice. A Practical quide.* London: Paul Chapman.

Lepaitė, D. (2003). *Kompetenciją plėtojančių studijų programų lygio nustatymo metodologija*. Monografija. Kaunas: Technologija.

Lewin, K. (1948). *Resolving Social Conflicts*. Selected Papers on Group Dynamics by G. Weiss Lewin. Harper and Brothers, New York.

Lietuvos Respublikos švietimo ir mokslo ministro įsakymas Nr. ISAK-54 „Dėl mokytojo profesijos kompetencijos aprašo patvirtinimo" (2007). *Valstybės žinios Nr. 12,* 511.

Maceikienė, J. (2010). *Kaip galėčiau technologijų pamokose 10 klasės mokinius ugdyti karjerai (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Help Pupils of the 10th form to Develop Career at Tecnology lessons (on the Basis of Action Research).* Kaunas.

Masaitytė – Apuokienė, R., & Bankauskienė, N. (2012). *Pedagogų veiklos tobulinimas technologijų pamokose kintant ugdymo paradigmai.* Kaunas: technologija.

McNiff, J., & Whitdead, J. (2009). *Jour and Jour's Action Research Project*. 3thrd Edition. N.Y. Routledge.

Mills, G. (2003). *Action Research: A guide for the reacher researche (2nd ed.).* Upper Sadle River, NJ: Merril/Prentice.

Pocienė, R. (2010). *Kaip galėčiau sustiprinti V klasės mokinių mokymosi motyvaciją technologijų pamokose (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Improve the Motyvation of Pupils of 5th Form For Learning at Technology Lessons (on the Basis of Action Research).* Kaunas.

Poškutė, R. (2011). *Kaip galėčiau padėti XII klasės mokiniams pasirengti technologijų brandos egzaminui (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Help the 12th Form Pupils to Get Ready for the Graduation Examination inTecgnologies (on the Basis of Action Research).* Kaunas.

Puskunigienė, A. (2011). *Kaip galėčiau motyvuoti IX klasės mokinius technologijos pamokose geriau išmokti elektronikos pagrindus (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Motivate 9th Form Pupils Better Learn Electrinics Fundamentals in Technology Lessons (on the Basis of Action Research).* Kaunas.

Rudzevičiūtė, J. (2011). *Kaip galėčiau padėti VII klasės mokiniams pasirengti technologijų mokykliniam egzaminui (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Encourage 12th Form Pupils to Get Ready for the Graduation Examination in Technologies (on the Basis of Action Research).* Kaunas

Ruškė, J. (2012). *Veiklos tyrimas kaip edukacinė asmenų su negalia orumo konstravimo strategija//Kokybiniai edukaciniai tyrimai: teorijos, duomenų rinkimas ir analizė.* Mokslo studija. Šiauliai: Šiaulių universiteto leidykla.

Saulėnienė, S., Žydžiūnaitė, V., & Katiliūtė, E. (2006). *Pedagogo rengimo standarto gairių projekto tyrimo ataskaita.* Kaunas: "Aušra".

Schwabas, K. (2017). *Ketvirtoji pramonės revoliucija*. Vilnius: Vaga.

Sirotnik, K. E. (1990). *On the Eroding Foundations of Teacher Education.* Phi Delta Kappan.

Staskevičienė, V., & Bankauskienė, N. (2011). *Pedagogo veiklos tobulinimas: darbas su globojamu vaiku ir jo šeima*. Kaunas: Technologija.

Stinger, E. T. (2007*). Action Research. Third Edition*. London: Sage Publications.

Stoill, L., & Fink, D. (1998). *Keičiame mokyklą.* Vilnius: Margi raštai.

Tumėnienė, V. (2002). *Pedagogo novacinės veiklos ypatumai Lietuvos bendrojo lavinimo mokyklose.* Daktaro disertacija. Kaunas: kauno technologijos universitetas.

Tumėnienė, V., & Janiūnaitė, B. (2004). *Pedagogo veiklos pokyčiai pasaulio ir Europos švietimo kontekste. Pedagogų rengimas Lietuvoje.* Pertvarkos pastangos. Vilnius: Danieliaus leidykla.

Voveraitis, R. (2011). *Kaip galėčiau skatinti V klasės mokinius taikyti tautodailės elementus technologijų pamokose (pedagoginės veiklos tobulinimo tyrimo pagrindu). How I Could Encourage the 5th Form Pupils to Aplly Elements of Folk Art at Lessons of Technologies (on the Basis of Action Research).* Kaunas.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 60-67

LABOUR PROTECTION SPECIALISTS COMPETENCE MODEL

Dace Brizga
Latvia University of Agriculture, Latvia

Abstract. *The number of fatal accidents in the workplace in Latvia in 2014 was higher than the average in the European Union and continues to grow. One remedial action for preventing accidents is to improve the competence of labour protection specialists. The aim of this study was to evaluate and improve a competence development model for labour protection specialists, as well as to make an expert assessment of the model. This was carried out by experts with experience in the implementation of educational programs and other professional activities. The experts ranked highly all the parameters of the model and determined that the competence model would be useful for improving labour protection and other specialists' training, study and practice.*
Keywords: *competences development model, expert assessment, specialists.*

Introduction

The actuality of the problem is determined by the fact that in 2014 the number of fatal work-related accidents in Latvia exceeded the average in the European Union. According to European statistics, the fatality rate of workers in Bulgaria, Latvia, Lithuania and Romania is greater than 4.0 per 100,000 persons compared to other countries of European Union (Eurostat, 2016). According to the information from the State Labour Inspectorate (2017), work accidents were the cause of 34 fatalities and 149 severe injuries between January 1 and December 1, 2016. Between January and May of 2017 nine workers have been killed in work-related accidents and 51 workers have been severely injured. Among Latvians working in foreign countries, the number of job-related fatalities has increased to 10 this year. One remedial action for preventing accidents is to improve the competence of labour protection specialists.

The aim of this study was to evaluate and improve a competence development model for labour protection specialists, as well as to make an expert assessment of the model.

The methodology is based on the expert assessment examples given in several publications (Briede & Peks, 2011; Paura & Arhipova, 2002).

In the data analysis nonparametric statistics – modes, medians - were used.

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3138

This was carried out by experts with experience in the implementation of educational programs and other professional activities.

Competence development model of occupational safety specialists

Previous studies (Brizga, 2016; Brizga & Peks, 2015) have shown that improving competence in safe work techniques is one of the conditions of change in individual and public attitudes and lifestyles. Improving the competence of labour specialists through courses and occupational health and safety teachings ensures the safety of institutions and their personnel, and could reduce the number of accidents and fatalities. Bertaitis (2013) show "*A labour protection specialist alone cannot create such an environment.* The participation of both employer and employees and everyone concerned in occupational safety is very important" (p. 59).

"The first task in competence-based higher education is to define what competences and competence levels students should acquire through a study programme. This task is called *establishing a competence model*" (IQM-HE, 2016: p. 34).

The European Commission (2016) Qualifications Framework describes learning outcomes in the context of knowledge, skills and competence. Competence is described in terms of responsibility and autonomy. There is an understanding that within the context of competence, there is greater understanding of autonomy and responsibility (Keevy et al., 2010).

The author's observations during both studies and practical work found that responsibility is associated with attitude. For example, Angela Smith (2005) in her publication "Responsibility for Attitudes: Activity and Passivity in Mental Life" shows that "what makes us responsible for our attitudes... is that they are the kind of states that reflect and are in principle sensitive to our rational judgments" (p. 271).

In evaluating publications and experience, knowledge, skills, attitude and intelligibility were selected as the components of the competency model.

The significance of intelligibility is apparent when applying occupational health and safety instructions and conducting lessons in training and studies. This was also stressed by experts.

The labour protection specialists' competence development model has been created to improve the professional "Labour protection and safety" higher education program (Brizga et al., 2017).

The aim of the study is to evaluate and improve a competence development model for labour protection specialists, as well as to make an expert assessment of the model.

The methodology is based on the expert assessment examples given in several publications (Briede & Peks, 2011; Paura & Arhipova, 2002). In the data analysis nonparametric statistics – modes, medians - were used. Experts whose field of activity is the higher education system were selected with regard to the objectives of the research. The experts have participated in the implementation of labour protection study programmes, as well as worked in organizations or companies.

Table 1 **List of experts**

Experts	**Experience**		**Scientific and academic degree**
	Position	***Work experience***	
A	Associate professor, Leading researcher	17	Dr. silv.
B	Associate professor, leading researcher	10	Dr.sc.ing., Mg.paed.
C	Associate professor (Emeritus)	47	Dr. sc. ing.
D	Professor (Emeritus), Leading researcher	42	Dr. sc. ing.
E	Associate professor, Leading researcher	13	Dr.sc.ing.

The scientific status of the experts (Dr. sc.) and their experience have contributed to a comprehensive evaluation of the specialist's competence development model.

Results and Discussion

The study produced the following competencies component characteristics and graphical model (Fig. 1).

1. Unconscious incompetence - You lack the skills, and you are not aware of the skills gap, or even its possible existence. By becoming aware of the skills gap, you move to the second stage.

2. Conscious incompetence - You know that you lack a specific skill. Understanding your own incompetence on the one hand can motivate you to acquire the necessary skills, but on the other hand, can lead to uncertainty and discomfort that interferes with learning.

3. Conscious competence - You pursue deliberate skill acquisition. Often this stage is referred to as self-awareness. This or any other repetitive activity requires constant concentration, more than at the outset of training.

4. Unconscious competence - This is the final stage of training, where skills are fully integrated into your behavioural repertoire. Your subconscious mind will

deal with actions independently, but your consciousness is free to obtain new skills. This stage is characterized by mastery.

Knowledge

Understands occupational health and labour medicine, promotion of wellness, protection of the surrounding environment, management sciences, economics, business IT, record keeping, rules and regulations of labour protection, work environment risk assessment and management, choice of labour protection means, ergonomics, fire safety and civil protection, work psychology and pedagogy, organisation of learning and instructional process, and utilizing this knowledge in the development of the required methodological materials in the context of safe and sustainable work which is non-injurious to health.

Skills

Skills - the labour protection specialist is able to build and develop a safe, healthy and sustainable working environment, to create and develop a learning environment for companies and organisations, to plan, organise and conduct training and instruction, to develop and improve instructional materials and training resources, and to use information technology to improve training, and to identify and use Latvian and EU employment protection legislation.

Attitude

Attitude – a tolerant, positive, consistent and responsible attitude towards promoting labour practices which are safe, sustainable and non-harmful to health, accountability for one's words and actions; responsibility to one's partners, a critical approach towards dominant societal attitudes on the observance of labour protection rules, reducing the impact of formal attitudes to these rules; respect for differing and diverse views; objective and considerate evaluation and characterisation of accidents, and observing confidentiality.

Intelligibility

Intelligibility – the ability to demonstrate and explain safe work techniques which are sustainable and non-harmful to the employee's health, as well as to design understandable methodological materials and instructions, commensurate with the knowledge level of a certain learner or that of a learning group.

The formation of a labour protection specialist expertise and development model also provides for individual and public attitudinal and lifestyle changes, according to the UNESCO Education for Sustainable Development (ESD) framework for lifelong learning. The fifth pillar of the ESD envisages learning to transform oneself and society (UNESCO's Five Pillars..., 2012). How to transform oneself and society is particularly topical given the dominance of the prevailing attitude respecting safe working condition.

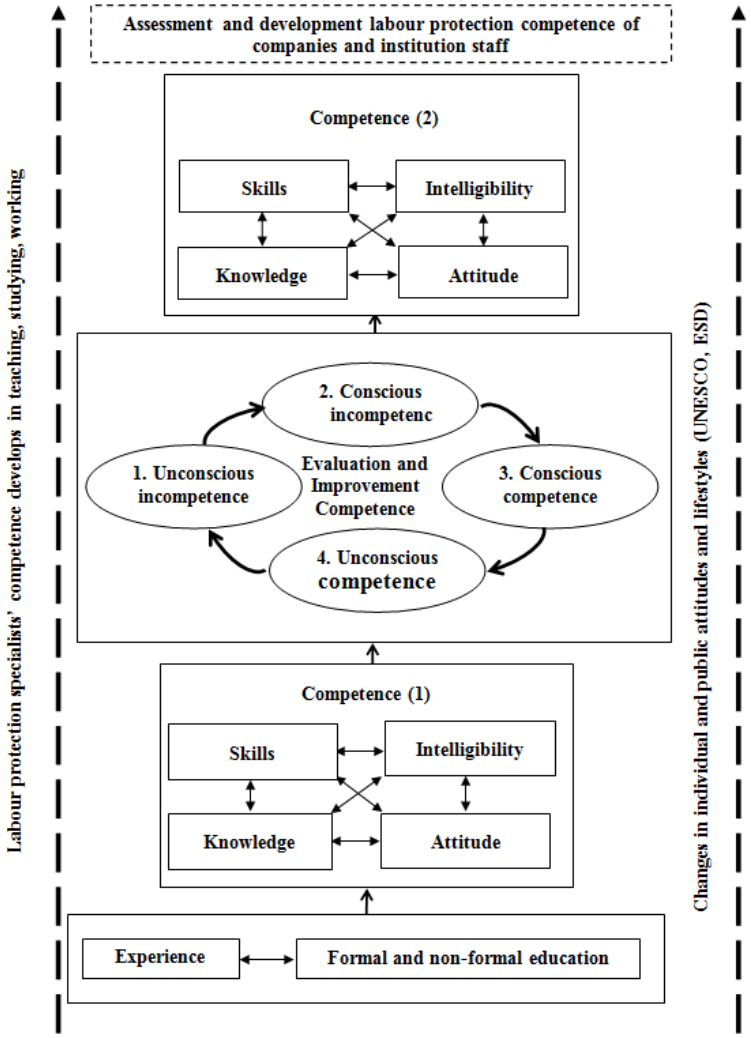


Figure 1. **Competence development graphical model for labour protection specialist**

Three stages of expert evaluation:

- Evaluation of individual components and characteristics of competence development model;
- A graphic image of the characteristics of the individual competences, characteristics of the complete, improved model, and assessment of the possible uses of the model;
- Familiarization by the experts with the assessments and their acceptance of the results.

In the first stage the experts received the key components of the model's initial characteristics.

In the second stage the experts received a graphic image model for evaluation, a list of improved components of the model and a questionnaire (Table 2):

1) Conformity of the graphical model image with the model title;

2) The model component characteristics, its succession;
3) Graphical model representation and internally consistent interpretation of the components;
4) Possible uses for the model in planning training and study modules for labour protection specialists;
5) Possible uses for the model in self-improvement for labour protection specialists (in informal learning).

Assessment uses a 5-point scale (Table 2)

Initial characteristics of knowledge and skills are formulated using the European Commission (2016) Qualifications Framework, as well as existing characteristics of the courses in the Latvia University of Agriculture study programme "Labour protection and safety".

Attitudes and intelligibility characteristics are newly formulated.

Explanation of *unconscious incompetence*, *conscious incompetence*, *conscious competence*, and *conscious competence* based on publications (Conscious Competence..., s.a.), as well as the experiences of the authors and experts.

Table 2 **Formation and development of competence model expert's evaluation summary**

Questions		**Experts**					**Total**	**Rank**
		A	***B***	***C***	***D***	***E***		
Nr.	***How do you estimate...***	***Estimate, points***						
1	Conformity of graphic image to the model title?	5	5	4	4	4	22	**2**
2	The characteristics model component, its successor?	4	3	5	4	5	21	**4**
3	Graphic image of model and interpretation of component cross-compliance?	4	4	4	3	4	19	**5**
4	Possibilities for using the model in planning training and study for labour protection specialists?	5	5	4	4	4	22	**2**
5	Possibilities for using the model in self-improvement for labour protection specialists (in informal learning)?	5	5	4	4	4	22	**2**
	Total	**23**	**22**	**21**	**19**	**21**	**106**	

Estimates of data distribution are umimodal.

All estimates median $M_e = 4$.

All the experts agree that numerical estimates adequately characterise the model quality.

The experts conclude that it would be useful to use the model for the improvement of teaching, learning and practice.

The experts also point out that the formation and development model for the labour protection specialists' competence can be used to improve on and master other professions.

The *Model of competence-based higher education* and its detail described in Handbook for Internal Quality Management in Competence-Based Higher Education (IQM-HE, 2016: p. 34). The main components of the model: intended student competences; teaching and learning process (curriculum, teaching methods and assessment methods, learning strategies); potential skills of students.

Analogous components are also included in the expert evaluation labour protection specialist's competence model. It is useful to use Handbook for Internal Quality Management in Competence-Based Higher Education recommendations.

The three-dimensional business and economic competence framework model in the WiWiKom project (Zlatkin-Troitschanskaia et al., 2017: p. 8) encourages further research into creating a similar three-dimensional competence model for labour protection specialists.

Conclusions

As a result of the study, the competence model for labour protection specialists was evaluated and improved.

Experts judged highly all the parameters of the model - median Me = 4 (using a 5-level scale).

Experts found that the competency model is useful for improving the training, study and practice of labour protection and other specialists.

The creation of a three-dimensional competence model for labour protection specialists is one of the future outcomes of this study.

References

Bertaitis, I. (2013). *Pedagogical Competence of the Labour Protection Specialists*. Summary of Doctoral Thesis. Downloaded from http://llufb.llu.lv/dissertation-summary/education/ImantsBertaitis_kopsavilkums_2013_LLU_TF_IMI.pdf

Briede, B., & Peks, L. (2011). *Ekoloģiskā pieeja izglītībā* (*Ecological approach in education*). Jelgava: LLU. (In Latvian)

Brizga, D. (2016). Competence development model for occupational safety specialists. *In conference proceedings 15th International scientific conference "Engineering for rural development"* (Vol. 15, pp. 774-780). Jelgava: Latvia University of Agriculture.

Brizga, D., Ozolina, V., Peks, L., Karlsons, U., & Sisenis, L. (2017). Labour protection specialist's competence development in adult education. 17th International multidisciplinary scientific GeoConference SGEM 2017. *In conference proceedings*

Ecology, Economics, Education and Legislation, 54 (17), 97-104. Bulgaria: Bulgarian Academy of Sciences.

Brizga, D., & Peks, L. (2015). Work environment *assessment in the aspect of work psychology processes. In conference proceedings 14th International scientific conference "Engineering for rural development"* (Vol. 14, pp. 699-704). Jelgava: Latvia University of Agriculture.

Conscious Competence..., (s.a.). Conscious competence learning model. Downloaded from http://www.businessballs.com/consciouscompetencelearningmodel.htm

European Commission. (2016). Descriptors defining levels in the European Qualifications Framework (EQF). Downloaded from http://ttk.unideb.hu/uploads/pagetranslation/file/eqf.pdf

Eurostat. (2016). Accidents at work statistics. Downloaded from http://ec.europa.eu/eurostat/statistics-explained/index.php/Accidents_at_work_statistics

IQM-HE. (2016). Handbook for Internal Quality Management in Competence-Based Higher Education. Downloaded from http://www.enqa.eu/indirme/IQM-HE%20Handbook.pdf

Keevy, J., Chakroun, B., & Deij, A. (2010). *Transnational Qualifications Frameworks*. Turin, Italy, ETF, p. 122. Downloaded from http://www.nki-latvija.lv/content/files/Transnational_Qualifications_Frameworks.pdf

Paura, L., & Arhipova, I. (2002). Neparametriskās metodes. SPSS datorprogramma. (*Non-parametric methods. SPSS computer program*.) LLKC, Jelgava: LLU. (In Latvian)

Smith, A. (2005). Responsibility for Attitudes: Activity and Passivity in Mental Life. *Ethics. Research Library Core, 115 (2)*, 236-271.

UNESCO's Five Pillars of Education. (2012). Downloaded from https://souham.wordpress.com/a-a-prologue/

State Labour Inspectorate. (2017). Accident at work statistics as of June 19, 2017. Downloaded from http://www.vdi.gov.lv/lv/jaunumi/

Zlatkin-Troitschanskaia, O., Pant, H. A., Toepper, M., Lautenbach, C., & Molerov, D. (2017). Valid Competency Assessment in Higher Education: Framework, Results, and Further Perspectives of the German Research Program KoKoHs. *AERA Open, 3 (1*), 1–12. Downloaded from http://journals.sagepub.com/doi/pdf/10.1177/2332858416686739

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 68-80

MOODLE ENVIRONMENT AND ITS USE WITHIN FORMAL AND INFORMAL EDUCATION AT A VOCATIONAL SCHOOL

Valentina Garkule
Daugavpils Trade Vocational Secondary School, Latvija

Valērijs Makarevičs
Daugavpils University, Latvia

Abstract. *The widespread development of digital technology contributes to the creation of pedagogical innovations using e-learning and m-learning technologies. The platform (e-learning environment) MOODLE, which unites these technologies, makes it possible to master the educational material both within the field of formal, as well as within informal and non-formal education. The MOODLE environment has not been yet sufficiently used in general and vocational education. The possibilities of using this learning environment at vocational schools in Latvia and Poland are considered in the article. Students who studied programs using the capabilities of the MOODLE environment, after completing the training, have evaluated the importance of such work for the acquisition of professional knowledge and skills. To do this, they were asked to answer questions of the questionnaire. The content of the questions can be found in the text of the article. The study identifies general and regional features of learning outcomes using the MOODLE environment.*
Keywords: *vocational education, e-learning, MOODLE learning environment, formal training, informal education.*

Introduction

Modern education includes three inseparable and complementary types: formal, informal and non-formal ones. The essence and significance of each one have been laconically formulated by H. Ainsworth and S. Eaton: „Whether learning take place in a formal setting such at a school, a non-formal setting such as a community or cultural center or an informal setting such as a home, all learning is good, and all learning is valuable. All learning contributes to an individual's growth, not only cognitivelly, but also emotionally and socially" (Ainsworth & Eaton, 2010: 12).

With the development of technical means of creating, storing and transmitting information, the boundaries between formal, informal and non-formal education have begining to disappear. With the introduction of e-learning, l-learning and m-learning technologies, training courses can be

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3101

simultaneously used in both formal and informal and nonformal learning. Today practically every vocational school student has a mobile phone, a home computer and / or a tablet.

The widespread use of digital technology contributes to the development of pedagogical innovations using e-learning and m-learning technologies. The platform MOODLE (e-learning environment) that unites these technologies, makes it possible to master the educational material both in the field of formal and informal and non-formal education as well. It should be noted that the MOODLE platform is used mainly by universities, and practically not used by vocational high schools. The strong points in the use of MOODLE are the following ones:

- the fact that it is an excellent repository of multiple types of contents;
- being able to access the platform at any location;
- being able to work at any time;
- it is useful to get the students' assignments;
- Moodle is useful for teaching.

MOODLE can be upgraded by various modules and plugins; it can be used to create well-structured learning scenarios; it contains many types of collaboration activities and communication modules. MOODLE collects various logging data for all student interactions.

MOODLE platform is the most flexible tool for a variety of interactive teaching methods. Properties of MOODLE help to solve one of the major challenges of modern education - formation of students' critical thinking and communicative competence.

The proposed study was carried out within the framework of the project ERASMUS+ "International Partnership for Improving the Quality of Teaching in Vocational Schools". Project participants are the following: School of Economic and General Education no 6 in Lomza, Poland; Vilnius Technology School of Business and Agriculture, Lithuania; Daugavpils Trade Vocational Secondary School, Latvia; Perfect Project LLC from Bialystok, Poland. Partners have developed the courses "Electronic Marketing", "ICT", "Communication", "Business Ethics". The course materials in English were downloaded on the MOODLE platform. These materials are also available in the mobile version.

In the research we were interested in the answers to the following issues:

- what is the point of view of scientists and practitioners on the effectiveness of using MOODLE platform (environment) in the process of teaching pupils and students?
- how do project participants (students) evaluate the effectiveness of learning using the MOODLE platform?

The concept of continuing education and modern teaching technologies

In the scientific and methodological literature one can find various interpretations of the notion of continuing education:

- continuous education as a lifelong learning;
- continuous education as adult education;
- continuing education as an increase in professional qualifications (Беляков, Вахштайн et al., 2006: 17).

It should be noted that the second and third interpretation is a special case of the first, since the concept of lifelong learning is not limited to age, modal (satisfaction of professional or personal interests) or time constraints.

Formal, informal and non-formal education are singled out in the structure of lifelong learning. The characteristics provided by us in the introduction in relation to these learning forms, we supplement with the following information.

Formal education is an institutional formation. It is carried out within the framework of public educational institutions on the basis of training programs approved by higher authorities. The main disadvantage of formal education is the lack of flexibility and focus on the “average” student.

Informal education is also constitutional, as it is implemented by various registered (licensed) courses, hobby groups, creative unions and sports associations. In the process of informal education, the individual independently studies, analyzes information and discusses it with other individuals.

In recent decades, the boundaries between these three educational forms are beginning to disappear. Formal education is actively and purposefully supplemented with elements of non-formal and informal education. This is facilitated by the development of modern means of searching, transmitting and analyzing information (Did, 1988; Pasko, 2015).

With the advent and spread of the Internet, e-leaning technologies have been appearing. One of the first e-leaning technologies was the so-called l-learning method, or distance learning via the Internet. Researchers noted that Internet translations of lectures by leading scientists allow to equalize the quality of education in the leading educational institution and its branches. Employees of different universities could unite their capabilities. However, shortcomings were revealed: not all teachers were able to communicate in this way with their students (Andrews & Daly, 2008; Schunk, 2000).

Researchers of the Michigan State University conducted a comparative analysis of traditional formal education and training using new technologies. The results are shown in Table 1.

Table 1 **Traditional and New Learning Environments**

Traditional Learning Environments	New Learning Environments
Teacher centred instruction	Student centred instruction
Single sense stimulation	Multi sensory stimulation
Single media	Multimedia
Isolated work	Collaborative work
Single path progression	Multi path progression
Information delivery	Information Exchange
Passive learning	Active/exploratory/inquiry based learning
Factual, knowledge based	Critical thinking and informed decisions
Reactive response	Proactive/planned action
Isolated, artifical context	Authentic, real- world context

Sourse: An Analysis of e-learning impact (2011).

The analysis of the two education systems, which was presented by researchers at the University of Michigan, predetermined the further development of educational technologies. The principles formulated on the right side of Table 1 form the basis of education for sustainable development. It should be noted that there is an indication in the article that this comparative analysis was carried out in 1988.

The spread of mobile telephony and the availability of mobile phone acquisitions made it possible to use these technological advances in the field of education. M-learning technologies have been appearing. Mobile communication allows you to get answers to the questions that arise not only from the teachers, but from all other subscribers with whom the individual is connected. In other words, the non-formal and informal communication network begins to serve as a basis for better mastering of the formal education program. This way of cooperative learning Russian researcher Zakharova suggests to call “we-learning” (Захарова, 2013).

The MOODLE environment and its use in education

The MOODLE (Modular Object-Oriented Dynamic Learning Environment) environment was created in the development of e-learning technologies. It allows you to place video, audio and printed materials at the rate, organize chats, which can be attended not only by teachers and students, but also by others interested in the topic proposed for discussion.

MOODLE capabilities are now widely used in higher education (Garrison, 2011; Lopes, 2011; Watanabe, 2005 and others). Along with this, the tools capabilities begin to be used not only in education, but also in the management of the educational process (Tomsons, 2010).

Researchers actively discuss the advantages and disadvantages of using the MOODLE environment within education. S. Vijaykumar notes that the student, using MOODLE, can apply his individual style of teaching. At the same time, he concretizes that he understands the learning styles in the interpretation of Kolb (Kolb, 1984). In addition, the author notes that the MOODLE environment allows you to create materials with different levels of complexity. Conventional approaches to learning make it expensive to develop three levels of didactic material. In the electronic version, this is easier to achieve. (Vijaykumar, 2013).

Canadian researcher Cristoforos Pappas notes that the development of training courses designed for use in e-learning technologies should take into account the requirements of the theory of cognitive loading (Cognitive Load Theory). According to this theory, students can effectively absorb and remember information only if it does not overload their brain. In a short-term, or working, human memory, a limited amount of data can be stored at a time. The more information the teacher gives at a time, the less likely that students will remember it and can apply it in the future (Pappas, 2014). Materials with different levels of complexity, about which S. Vijaykumar writes, meet the requirements of this theory (Vijaykumar, 2013).

An important point is the development of criteria for assessing the knowledge and skills of students. The Russian scientist G. V. Kravchenko proposes to take into account the following features of students' intellectual activity when using the MOODLE environment:

- level of activity (number of speeches);
- the ability to answer questions arguably;
- the ability to ask questions about a topic;
- information;
- knowledge of primary sources of information;
- the ability use concepts on a topic accurately;
- the ability to highlight the main idea;
- the ability to apply the knowledge gained in solving problem problems.

At the same time, the student should be allowed to study the next section only if he has acquired 70 % of the material in the previous section (determined by testing) (Кравченко, 2015). Here it should be noted that not all evaluation criteria that the author suggests can be automated. Testing in this case should be supplemented with a dialogue with the teacher. Concerns about the reliability of the results of automated testing are expressed by other researchers (Walker & Handley, 2016).

Let's turn to the opinion of teachers of higher schools who use MOODLE environment in their work. In the field of exact sciences, the opportunity for the

teacher to offer more theoretical material to the participants of the course (Skorniakova, 2012) is emphasized as an advantage of the MOODLE environment. Representatives of the humanitarian direction (teachers of English as a foreign language) note that teaching using MOODLE increases the motivation of students to improve their language skills. So, Erdal Ayan, analyzing the situation with the study of English in Turkey, notes that the student environment is heterogeneous. We can distinguish three groups of students: teachers-oriented, self-employed and problem-solving within this environment. Working in the MOODLE environment, combined with traditional lectures, increases the interest in learning English from all three student groups (Ayan, 2015).

Among the reasons that do not contribute to the active introduction of the MOODLE environment into the practice of education, the researchers mention insufficient knowledge of teachers to organize and manage the learning process through the MOODLE environment. According to the data of A. Valdemiera, among the teachers of Latvian higher education institutions in 2015 there were more than two thirds of the total number of teachers (Valdemiers, 2015). In addition, the use of the MOODLE environment can also be hampered by technical reasons. For example - low speed of the Internet (Vijaykumar, 2013) or an incorrectly selected font (Dirksen, 2012) and other problems related to the aesthetic side of developments that do not rise interest (Kong, Chan, Griffin et al., 2014).

Conditions description of the experiment and the investigation method realisation

Students from Daugavpils (Latvia) and Lomza (Poland) took part in the experiment. Among 20 students who took part in the project from Latvia, all 20 ones took part in the experiment. Among 20 students from Poland – 17 ones.

A questionnaire which contained 20 questions has been offered to testees. These questions were grouped into 5 groups. Each group contained 4 questions.

The first group. Testing. Using the questions of this group, the availability of technical capabilities for using the MOODLE network has been tested, as well as the ability of students to use these technical capabilities. This group included the following questions.

- I can use modern electronic means for information obtaining.
- My mobile phone has Internet access.
- With the help of my mobile phone I can receive necessary training information available on MOODLE.
- I have a personal computer at home.

The answer options for this group of questions were yes or no.

The next group of questions was called motivational. Its purpose was to identify the motives for using the MOODLE network in the learning process. The following questions were included in this group.

- I prefer to work with MOODLE, dealing with other people, whom we together study this or that subject witth.
- I would be happy if the information on all subjects were in MOODLE.
- MOODLE gives you the opportunity not only to receive information, but also to test your knowledge.
- I prefer to attend classes and directly contact the teacher. MOODLE provides an additional opportunity to obtain the necessary information.

By means of the third group of questions (operational-motivational unit), we have checked how the students' motivation is realized in practice. These included the following.

- I like to learn the necessary information with the help of MOODLE.
- Since I have started working with MOODLE, my interest in my profession has increased.
- I believe that the information I receive in MOODLE is not enough for mastering professional knowledge and skills.
- I highly appreciate the opportunity to work with educational information anywhere, where it is possible to enter the Internet using a mobile phone.

The fourth part was comparative. Its purpose was to find out what advantages students see in using the MOODLE environment in comparison with traditional training. This included the following questions.

- It's much more interesting for me to work in MOODLE than to read relevant educational literature.
- If there was an opportunity to choose between attending training sessions and working in a MOODLE environment, I would choose MOODLE.
- I consider MOODLE a successful addition to the work in the classroom (lecture hall).
- It is difficult to master a profession, not working with information in MOODLE.

The fifth part was productive. Here, students, answering questions, determined how work in the MOODLE environment affected their level of competence (including communicative) within their profession. Here were the following questions.

- Thanks to MOODLE, I began better to understand the features of my profession.
- Thanks to MOODLE, I found my supporters, with whom I continue to communicate on professional topics.
- Thanks to MOODLE, I started to get higher marks for examinations and examinations.
- Thanks to MOODLE, I became more confident in my profession.

Responses to the second, third, fourth and fifth parts have been differentiated. The following scale has been used: completely agree (5 points); partially agree (4 points); it's hard to say (3 points); partially disagree (2 points); completely disagree (1 point).

Results of research and discussion

First of all, let us turn to the respondents' answers which relate to the first check part. In the group of respondents from Poland, all the questions were answered: “Yes.” In the group of respondents from Latvia, two “no” answers were received. In one case, the respondent had no access to the Internet in his mobile phone; in the second case, the mobile phone did not have a connection to the MOODLE network. Nevertheless, these respondents had the opportunity to connect and work on the MOODLE network using a home computer.

Now we turn to the general results of the study. By common results we mean the average score for all the answers to the questions of the second, third, fourth and fifth parts of the questionnaire. This average score could be equal and exceed the number of 4. We named such respondents as optimists who believe that their professional training and development is impossible outside the MOODLE environment. Those who received an average score ranging from 3.0 to 3.99 will be called doubters. These respondents prefer to use the MOODLE environment as an addition to traditional activities. The third group (average score from 2.0 to 2.99) - skeptics. For them, traditional lessons are more important, but sometimes they are prone to work with the MOODLE environment. The fourth group - pessimists (average score from 1.0 to 1.99). These respondents do not recognize the MOODLE environment as a teaching tool. The distribution of respondents by these groups is shown in Table 2.

Table 2 **Distribution of respondents by categories**

Categories	Optimist	Doubting	Skeptic	Pessimist
Group from Latvia	3	12	4	1
Group from Poland	0	8	9	0

It can be seen from the table that a group of respondents from Latvia is more likely to study using the MOODLE environment than their peers from Poland. Now consider the motivational part of the questionnaire. The results are shown in Table 3.

Table 3 **Motivational part of the questionnaire. Average values of respondents' answers**

Questions	1	5	9	13	Average value by group
Group from Latvia	3,45	3,75	4,15	2,45	3,475
Group from Poland	2,94	3,0	4,765	3,47	3,54

The leading motive for both groups is the opportunity to test their knowledge when working with the MOODLE environment. At the same time, the desire to receive knowledge in direct contact with the teacher from respondents from Poland is more pronounced than among respondents from Latvia.

The next part of the questionnaire is presented by the operational-motivational block of questions.

Table 4 **Operational-motivational part of the questionnaire. Average values of respondents' answers**

Questions	2	6	10	14	Average value by goup
Group from Latvia	3,45	3,4	3,0	3,9	3,44
Group from Poland	4,06	3,4	3,7	4,8	4,0

The indicators for this part of the questionnaire for three of the four questions for the respondents from Latvia were lower than for the group of respondents from Poland. The greatest indicators for both groups are related to the position: “I highly appreciate the opportunity to work with information in any place where it is possible to enter the Internet using a mobile phone.”

The purpose of the third part of the questionnaire was to compare traditional education and education using the MOODLE environment.

Table 5 **Comparative part of the questionnaire. Average values of respondents' answers**

Questions	3	7	11	15	Average value by group
Group from Latvia	3,85	3,0	3,8	3,15	3,45
Group from poland	4,0	2,8	4,65	2,65	3,525

The average values for the indicators in this part of the questionnaire for one and the second group are close. Both groups believe that MOODLE is a

good complement to the traditional method of teaching, they would like that MOODLE could have information on all subjects, but they doubt that it is possible to master the profession using only MOODLE.

The fourth part of the questionnaire is productive. Here we found out the impact of work in the MOODLE environment on the personal and professional development of the respondents. Let's look at table 6.

Table 6 **The productive part of the questionnaire. Average values of respondents' answers**

Questions	4	8	12	16	Average value by group
Group from Latvia	3,6	2,15	3,25	4,25	3,6
Group from Poland	4,35	1,6	3,35	3,4	3,18

For respondents from Latvia, the most important aspect was the personal aspect in the process of mastering the profession (thanks to MOODLE): I became more confident. For respondents from Poland, the cognitive aspect was important: I began better to understand the characteristics of the profession. However, it seems that this has little impact on academic performance (12th question 3.25 and 3.35 respectively). According to the results of the study, it can be judged that the chat is used occasionally or not at all (the eighth question is 2.15 and 1.6, respectively).

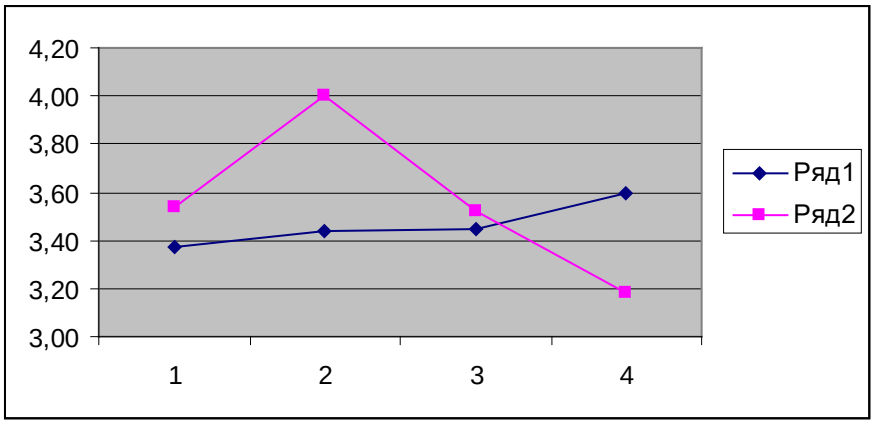


Figure 1. **Distribution of average values of indicators of thematic groups of the questionnaire in a group of students from Latvia and a group of students from Poland**

The obtained results will be displayed on the graph (Fig. 1). On the horizontal axis of the chart, the numbers indicate the thematic parts of the questionnaire:

- motivational part - 1;

- motivational and operational part - 2;
- comparative part - 3;
- productive part - 4.

The vertical axis shows the average values of the indicators for each group. The group from Latvia is designated by number 1. Number 2 - a group from Poland.

From the figure it can be seen that the first group is dominated by the productive part. In the second - motivational and operational.

The Mann Whitney U criterion, calculated for all thematic groups, showed that significant differences exist only in the third thematic group ($U = 47.5$ at $U_{kr} = 87$, $p \leq 0.01$). This means that the result can be interpreted as follows: Respondents from Poland believe that MOODLE is a supplement to the usual training sessions, willingly use it, but only as one of the training tools. In the opinion of respondents from Latvia, thanks to MOODLE, their ratings are being raised, it means, they are beginning to be more proficient and become more confident in their profession. Both groups express a wish that in the MOODLE environment one could work with all studied subjects.

Conclusions

1. Modern education needs innovative approaches. Given the wide spread of mobile communications and the Internet, the efforts of scientists and educators in the field of education modernization are now associated with the development of curricula using e-learning technologies.
2. One of such technologies is the development of training programs using the MOODLE environment. In this environment, it is possible not only to present information in various modalities (texts, videos and audio recordings), to test your knowledge using tests, but also to organize professional communication in chats, to which everyone can connect.
3. MOODLE is currently used more often in higher education. Less often - in general and vocational education. Participants in the project “International Partnership for Improving the Quality of Teaching in Vocational Schools”, teachers of vocational schools in three countries (Poland, Lithuania and Latvia) have decided to fill this gap. In the MOODLE environment, they developed several training courses.
4. The study showed that students from Latvia and Poland, who were asked to answer questions from the questionnaire, positively assess their participation in the project. At the same time, in the responses of respondents from these two countries there are general trends and regional differences in the answers.

5. All respondents believe that MOODLE is a successful addition to the traditional form of training. At the same time, respondents are not inclined to take an active part in professional chats.
6. Regional features are manifested in the fact that respondents from Latvia emphasize the personal aspect of the results of work with MOODLE (I became more confident in my profession), and respondents from Poland - on a cognitive aspect (I began to understand better features of my profession).

References

Ainsworth, H., & Eaton, S. (2010). *Formal, non-formal and informal learning in the sciences. Calgary*: Onate Press and Eaton International Consulting (EIC) Inc.

Ayan, E. (2015). Moodle as Builder of Motivation and Autonomy in English Courses. *Open Journal of Modern Linguistic. No. 5*. 6-20.

Andeews, T., & Daly, C. (2008). Using MOODLE, an open sourse learning management system, to support a national teathing and learning collaboration. *Proceeding of the 2008 AaeE Conference*. Yepoon. Barton: A.C.T. Institution of Engineers. 482-487

Did, C. Z. (1988). Formal, non-formal and informal Education: concepts/applicability. Cooperative Networks in Physics Education. *Conference Proceeding 173*. New York: American Institute of Physics. 300-315.

Dirksen, J. (2012). *Design for how people learn*. Berkeley: New Riders.

Garrison, D. R. (2011). *E-Learning in the 21st Century: A Framework for Research and Practice*. London: Routletge / Falmer.

Kolb, D. (1984). *Experiential learning: experience as the source of learning and development*. Englewood Cliffs, New Jersey: Prentice Hall.

Kong, S. C., Chan, T. W., Griffin, P., Hoppe, U., Kinshuk, R. H., Lool, C. K., Milrad, M., Norris, C., Nussbaum, M., Sharples, M., Winnie, So W. M., Soloway, E., & Shengquan, Yu. (2014). E-Learning in School Education in the Coming 10 Years for Developing 21st Century Skills: Critical Research Issues and Policy Implications. *Journal of Educational Technology & Society. Vol. 17. No 1*. 70-78.

Lopes, A. P. (2011). Teaching with moodle in higher Education. 5-th International Technology Education and Development Conference. 7-9 March, 2011. Valencia: Institute of Accounting and Administration. 970-978.

Olson, J., Codde, J., de Maagd, K., Tarkelson, E., Sinclair, J., Yook, S., & Egidio, R. (2011). *An analysis of e-Learning impacts & best practices in developing countries - with reference to secondary school education in Tanzania*. Michigan State University, College of Communication Arts & Sciences.

Pappas, C. (2014). *Cognitive Load Theory and Instructional Design*. Retrieved from https://www.slideshare.net/elearningindustry/cognitive-load-theory-and-instructional-design.

Pasko, J. R. (2015). Revolution or evolution in the twenty-first century pedagogy. *Theory for practice in tke education of contemporary society*. 83-88.

Schunk, D. H. (2000). *Learning Theories: An Educational Perspective*. Jersey: Merrill.

Skorniakova, A. Ju. (2012). Use of the Sphere of Distance Learning MOODLE in Mathematical Training of Teacher's Training University Students. *Ярославский педагогический вестник. № 2. Том 11*. 225-228.

Tomsons, D. (2010). *MOODLE datubāžu izmantošana skolvadībā*. Rīga: LU.

Valdemiers, A. (2015). Efective management of the study process using e-learning system of the RTTEMA MOODLE. *Theory for practice in tke education of contemporary society*. 163-169.

Vijayakumar, S. (2013). Developing differentiated instructional materials based on learning style using MOODLE. http://www.academia.edu/6780815/ Developin differentiated instructional_materials_based_on_learning_styles_using_ MOODLE (08.08.2017). testing. *Research in Learning Technology. Vol. 24. 1-14*. Retrieved from https://journal.alt.ac.uk/index.php/rlt/article/view/1760 (22.11.2017).

Walker, R., & Handley, Z. (2016). Designing for learner engagement with computer - based testing. *Research in Learning Technology. Vol. 24.* 1-14. Retrieved from https://journal.alt.ac.uk/index.php/rlt/article/view/1760 (22.11.2017).

Watanabe, K. (2005). A Study on needs for e learning – Through the analysis of national survey and case studies. *Progress in informatics. No 2*. 77-86.

Беляков, С. А., Вахштайн, В. С., Галичин, В. А., Иванова, А. А., Карпухина, Е. А., Клячко, Т. П., Константиновский, Д. Л., Куракин, Д. Ю., Полушкина, Е. А., & Яхин, Ю. А. (2006). Мониторинг непрерывного образования: инструмент управления и социологические аспекты/ Науч. рук. А. Е.Карпухина. Москва: МАКС Пресс. Захарова, В. А. (2013). Развитие кооперативного обучения: от «e-learning" до „we- learning". *Образовательные технологии и общество. № 2*. 529-546.

Кравченко, Г. В. (2015). Педагогические особенности организации дистанционного обучения в среде MOODLE (Pedagogical Features of Distance Learning in the MOODLE Environment). Известия Алтайского государственного университета. 3 (87). Том 1. Барнаул: АГУ. 59-63.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 81-86

EQUINE ASSISTED LEARNING: SYMBOLIC VALUE OF HORSE AS UNDERLYING PATTERN IN HUMAN THINKING

Ilona Gehtmane-Hofmane
University of Latvia, Latvia

Abstract. *Traditional pedagogy do not stressed the unique and challenging needs of the adult learner for a different kind of educational experience that was more engaging, more flexible and more appreciative of the existing knowledge base and experience of the adult learning. Equine Assisted Learning is a practice in which adults engage in systematic and sustained self–educating activities in order to gain new forms of knowledge, skills, attitudes, or values. The purpose of this research is to illustrate the meaning and symbolic value of horse as underlying pattern in human thinking.*
Keywords: *Equine Assisted Learning, horses.*

Introduction

Traditional pedagogy do not stressed the unique and challenging needs of the adult learner for a different kind of educational experience that was more engaging, more flexible and more appreciative of the existing knowledge base and experience of the adult learning. Equine Assisted Learning for adults is an innovative, informal educational approach. Equine Assisted Learning courses and programmes is based on andragogy assumptions of Adult Learners and offers Androgogical process model of human learning and development in which facilitator establish a climate for learning, together with learner identified learning needs, formulate program objectives that will satisfy those needs, design a pattern of learning experiences, conduct these learning experiences with Equine Assisted Learning techniques and strategies for facilitating learning. Equine Assisted Learning is the process of engaging adult learners in the structure of the learning experience. As informal learning approach Equine Assised Learning is less organized and less structured than either formal or non-formal learning. It involves very little reliance on pre-determined guidelines for its organization, delivery and assessment, although it must be undertaken with the specific intention to develop some skills or knowledge.

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3379

According to Manifesto for Adult learnig in the 21th Cenury (European Association for the education of adults) not only the direct learning outcomes are important for adults (European Association for the education of adults, n.d.).

Equine Assisted Learning is a practice in which adults engage in systematic and sustained self–educating activities in order to gain new forms of knowledge, skills, attitudes, or values.

The notion *Equine Assisted Learning* in literature is new and it appeared only at the beginning of the 20th century with the development of this field. *Equine Assisted Learning* practice was taking place in variety of settings. Currently, there are several hundred programs across the world that utilize Equine Assisted Interventions programmes for different learning needs for children, adolescents, and adults. Horses was taking place in prison programs, horses were involved in corporate development programs, domestic abuse programs, juvenile detention, in school settings. It seems there were no bounds to the creativity involved putting people and horses together for whatever reason. A range of practitioners from different backgrounds were involved in creating and delivering Equine Assisted Learning programmes. These learning programs function under the different theoretical framework and therefore do not deliver learning and training services using equivalent principles or techniques. Equine Assisted Learning have broad multidisciplinary content and is grounded in participants experience. The positive outcomes that can be obtained from learning activities with horses are primarily illustrated through the marketing literature, feedback from participants or practitioners, theoretical reasons why horses should be involved, and through small scale outcome based research. *Equine Assisted Learning* practice is based on empirical work and is not theoretically founded in research data.

Findings

The purpose of this research is to illustrate the meaning and symbolic value of horse as underlying pattern in human thinking. The one of the foremost anthropologists of our time Levi-Strauss (1983) suggested that mythemes are grounded in concerns that are universal for all humans across all cultures (Levi-Strauss, 1983). By understanding how horses are portrayed in human thinking, we can to understand the human horse relationship which exist outside of any physical interaction with them.

Considering the varied ways in which humans perceive, engage, compete and co-exist, learn from and with non-human animals like horses is a range of cultural contexts (Davis & Maurstad, 2016; Anthony, 2010; Johns, 2006). There has a massive outpouring of love for American-born Swiss singer Tina’s Turner

song “Simply The Best” written by Mike Chapman and Holly Knight. This is interesting for many reasons, not least because pop art is usually enjoyed. The symbol of the horse in her music video has captured something in the collective consciousness. Internationally - recognized authority on horse behavior Chris Irwin (2001) indicates some link between horses and human psyche and distinguishing feature of Jung concept of archetypes, symbols and collective unconsciousness. Irwin in his interview (2001) argues that most commonly recurring archetypes is the horse. He considers that the horse archetype has been closely linked with human instinctive, primal drives and evokes intense feelings. Irwin (2001) argues that in many different situations and in many different ways, horses were enabling humans to make contact with feelings they'd buried deep inside. Irwin wrote that horses is one of the deepest archetypes in human consciousness, and can be a direct connection into the unconscious (Irwin, 2001). Jung about collective unconscious postulated „The collective unconscious … appears to consist of mythological motifs or primordial images, for which reason the myths of all nations are its real exponents. In fact, the whole of mythology could be taken as a sort of projection of the collective unconscious...” (Jung, 1960: p. 152). Archetypes are universal patterns that derive from the collective unconscious and are psychological and physiological construction that insufficient to represent all our projections onto horse.

Beverley (2004) wrote „Speed. Strenght. Grace. Power. Beauty. Every physical horse is a living myth unto its beholder…To see, smell, touch, fear, and mount a horse in the flesh is to feel the stirrings of archetypal energies araising from at least 35 000 years of human awareness of horse” (Beverley, 2004). Midkiff (2002) says „A horse’s body and limbs are not just palpable but symbolic, not just functional but suggestive” (Midkiff, 2002: p. 1).

In nowadays most humans become familiar with horse mainly through sport, movies, folk and fairy tales. For most them, only a mythical relationship to horse exists. In Latvian folklore horses were often anthropomorphized, for example, they spoke like humans. J. Stauga (Stauga, 2011) indicates that the horse is one of the most commonly encountered animals which is associated with earth fertility deities and yield in the middle region of the balts. The horse, as the personification of heavenly deities, has been relatively widely discussed in latvian folklore. J. Stauga (Stauga, 2011) points out that in latvian folklore all stages of human life are connected with horse. The horse's color also has been given a magical meaning (Stauga, 2011). The horse has been an important object of fortune telling and prophecy. Deities - Ūsiņš or Jurģis and Mārtiņš appear as horse-guardians in Latvian songs. For ancient latvians horse has been the symbol of the Sun Cult (Stauga, 2011). In many others mythological traditions, for example, Eqyptian, Greek, Armenian, Norse, Hindu horses also pull the sun. In world mythology and folklore there is approximetly 50 well known mystical

horses, for example: Arion is a divinely-bred, swift immortal horse which was endowed with speech; Arvakr are the horse which pull the sun; Enbarr the horse, which could traverse both land and sea; Al Borak, a horse with the head of a woman and the wings of an eagle; Bucephalus, a horse mythically enhanced from historical record; Pegasus, a flying horse usually depicted as white coloured; Centaurs, a hybrid race of horse and human, are known for their barbarism. Horses have also been the bearers of essence such as Celtic horse goddess Epona, an archetype of fertility and transformation (Llywel, 1982).

Horse is the one of 12 zodiak symbols. Many myths and images portray horse as the vehicle for mythical journeys and magical powers. Horse is the object of rituals, consecration and meditation. Most folklore tales portray horse as extending the physical abilities of his rider and so becoming an accessory as a symbol of greatness.

Horse appears in forms that correspond to Jungian archetypes Anima and Animus. Animus and Anima are the two primary anthropomorphic archetypes of the unconscious mind, the archetypal figures that hold masculine and feminine qualities. Jung believed that while the Anima tended to appear as a relatively singular female personality, the Animus may consist of a conjunction of multiple male personalities (Jung, 1951). Kohanov (2001) international attention received author and founder of Epona Equestrian Services, lecturer and horse trainer claims that the horse relate to the world from primarily feminine qualities. In her book „The Tao of Equus" (2001) she wrote „As a result, the species is a living example of the success and effectiveness of feminine values, including cooperation over competition, responsiveness over strategy, emotion and intuition over logic, process over goal, and the creative approach to life that these qualities engender" (Kohanov, 2001, xxiii). In her other book „Way of the Horse: Equine Archetypes for Self-Discovery" (2007) Kohanov offer 4 types of equine archetypes that humans absorbe through working with horses: 1. Archetypes of Experience: What horse teach us about balance, timing, agility, power, and collection; 2. Archetypes of Relationship: What horse reveal about leadership, dominance, boundaries, and community; 3. Archetypes of Creativity: How horses inspire authenticity, imagination, and innovation; 4. Archetypes of Transformation (Kohanov, 2007, p. 10.).

As shown by the author's survey in the period from 2014 to 2017, in which 200 respondents participated, humans project onto horse sensations of size, strenght, grace, coordination, agility, speed, danger, freedom, love, life, wisdom, agility, trust, stability, warmth, dream, cooperation, romance. One of the more remarkable aspects of a horse in respondents' answers that he expresses both strong masculine and strong feminine qualities, as well as behavioral aspects

that seem to be is paired opposites, for example: big, strong yet fearful, hardy yet sensitive, easily domesticated and trainedand yet wild and unpredictable.

Horse has ability to inspire humans through archetypes and symbols, dreams and fantasies, reaching out to the conscious and unconscious mind. Horse is a purposeful non-verbal intervener, consciously using physical expression through body, gestures, emotional intent. For contemporary cultures no longer dependents from the horse for food, battles or transportation. Horse has ceased to be part of human daily life. However the horse, with its inherent grace, intelligence and courage, has inspired the strongest feelings of empathy an affinity reflected in more than 30,000 years of artistic representation (Pickerl T., 2009), horses have always been an important part of the movie industry, horses still have in literature and in religious writings, in legends, in Tarot cards, in mythologies (Hausman G., & Hausman L., 2012), in folklores and in fairytales, in sport, in parades and police patrols or as an partner, mediator, agent of learning content in Equine Assisted Learning practice. The role of horses in shaping world civilizations and changing lives has been recognized for a long time (Forreest, 2016), hovewer, majority educators and many other professionals still find it difficult to understand the special characteristics of the horse in Equine Assisted Learning practice and how it is capable for human learning and development. The emergence of the beneficial effects of the interaction with the horse for learning purposes needed to be intended.

Conclusion

Equine Assisted Learning for adults is an innovative, informal educational approach. Equine Assisted Learning courses and programmes is based on andragogy assumptions of Adult Learners. Equine Assisted Learning is the process of engaging adult learners in the structure of the learning experience. The purpose of this research is to illustrate the meaning and symbolic value of horse as underlying pattern in human thinking. By understanding how horses are portrayed in human thinking, we can to understand the human horse relationship which exist outside of any physical interaction with them. The symbol of the horse has captured something in the collective consciousness. In nowadays most humans become familiar with horse mainly through sport, movies, folk and fairy tales. For most them, only a mythical relationship to horse exists. Horse appears in forms that correspond to Jungian archetypes Anima and Animus. As shown by the author's survey in the period from 2014 to 2017, in which 200 respondents participated, humans project onto horse sensations of both strong masculine and strong feminine qualities, as well as behavioral aspects that seem to be is paired opposites. Horse has ability to inspire humans

through archetypes and symbols, dreams and fantasies, reaching out to the conscious and unconscious mind. Horse is a purposeful non-verbal intervener, consciously using physical expression through body, gestures, emotional intent. Hovewer, majority educators and many other professionals still find it difficult to understand the special characteristics of the horse in Equine Assisted Learning practice and how it is capable for human learning and development. The emergence of the beneficial effects of the interaction with the horse for learning purposes needed to be intended.

Referneces

Anthony, D. W. (2010). *The Horse, the Wheel, and Language: How Bronze-Age Riders from the Eurasian Steppes Shaped the Modern World*. Princeton University Press.

Beverley, K. (2004). *Day mares and night stallions: archetypes in the mythology of horses*. Part 1. Myth, archetype, and somarchetype. Retrived from: http://www.horsensei.com/publications/MythologyofHorses/index.html

Davis, D. L., & Maurstad, A. (2016). *The Meaning of Horses: Biosocial Encounters.* Routledge.

European Association for the education of adults (n.d.). Retrived from: http://www.eaea.org/en/policy-advocacy/manifesto-for-adult-learning-in-the-21st-century.html

Forrest, S. (2016). *The Age of the Horse: An Equine Journey through Human History*. Retrived from: https://books.google.lv/

Irwin, C. (2001). *Horses Help with Human Psychotherapy*. *Equisearch.* Retrived from: http://www.equisearch.com/resources/eqirwin813

Hausman, G., & Hausman, L. (2012). *The Mythology of Horses: Horse Legend and Lore Throughout the Ages.* Retrived from: https://books.google.lv/

Hintz, H. F. (1979). Horses in the movies. Published by A. S. Barnes, U.S.A.

Jung, C. G. (1951). *Aion: The Phenomenology of the Self, published in Volume 9, part 2, of the Collected Works.* Retrived from: https://archive.org/stream/collectedworksof92cgju/collectedworksof92cgju_djvu.txt

Johns, C. (2006). *Horses: History, Myth, Art.* The British Museum Press

Jung, C. G. (1960). *The Structure of the Psyche. Collected Works 8,* Paragraph 325, p. 152. Retrived from: https://books.google.lv/

Kohanov, L. (2001). *The Tao of Equus: A Woman's Journey of Healing and Transformation through the Way of the Horse.* Retrived from: https://books.google.lv/

Kohanov, L. (2007). *Way of the horse: Equine Archetypes for Self-Discovery.* New World Library, California.

Levi-Strauss, C. (1983). *Structural Anthropology*. Volume 2. Retrived from: https://books.google.lv/

Llywelin, M. (1982). *The Horse Goodness*. A Tom Donkerty Associates Book, New York.

Midkiff, M. D. (2002). *She Flies Without Wings: How Horses Touch a Woman's Soul.* Dell Publishing Random House. Inc.

Pickerl, T. (2009). *The Horse: 30,000 Years of the Horse in Art*. Merrell Publishers Limited.

Stauga, J. (2011). *Dzīvnieki latviešu folklorā: mītiski maģiskais aspekts.* Promocijas darbs filoloģijas doktora grāda iegūšanai folkloristikas zinātnes nozarē. Latvijas Universitāte

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 87-99

РЕГИОНАЛЬНЫЕ ОСОБЕННОСТИ ПОНИМАНИЯ ПРОФЕССИОНАЛЬНОГО И ЛИЧНОСТНОГО БЛАГОПОЛУЧИЯ ПЕДАГОГАМИ СЕВЕРА И АРКТИЧЕСКИХ ТЕРРИТОРИЙ РЕСПУБЛИКИ САХА (ЯКУТИЯ)

Regional Peculiarities of Understanding Professional and Personal Well-Being by Northern Teachers and Arctic Territories of the Republic of Sakha (Yakutia)

Rosalia Gerasimova

Anna Nikulina
North-Eastern Federal University in Yakutsk, Russian Federation

Abstract. *In the period of socio-economic transformation of the study of regional peculiarities of understanding personal and professional wellbeing of teachers in the North and Arctic territories of the Republic of Sakha (Yakutia) are particularly pertinent given with the increase of dissatisfaction with the social and economic situation of young teachers, a reluctance to carry out their professional activities in remote territorial units of the Republic of Sakha (Yakutia). In modern conditions the welfare of an individual depends not only on the environment, material security, and mental and physical health, but also on the subjective understanding of the professional and personal welfare of teachers.*

Analysis of domestic and foreign scientific research allows us to note that among some of the main methodological issues of research of a phenomenon well-being is the issue of the understanding of the professional and personal well-being. However, it should be noted that the problem of psychological and pedagogical support of professional and personal well-being is complex and not well understood.

Thus, the study of qualitative changes in the Outlook and attitude of teachers in the North and the Arctic gives you a holistic awareness of the impact on human reality transformation processes, and identifying qualitative changes in the personality, allowing to go deeper into issues of professional personal growth in the conditions of modernization of education, contributes effectively to determine strategic goals for professional and personal development pedagogical in terms of additional professional development.

Keywords: *additional professional education, well-being, cognitive approach, personality, professionalism, professional activity.*

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3409

Ведение
Introduction

Процессы технологизации и глобализации современного социума обусловливают трансформационные изменения дополнительного профессионального образования (далее ДПО) в соответствии с мировыми стандартами качества профессионального образования. Система ДПО, отвечая на вызовы современного общества, обеспечивает расширение компетенций специалистов, рост профессионализма, развитие личностных качеств, заключая в себе и реализуя, как и другие уровни образования, воспитательный потенциал.

Актуальность данного исследования определяется новыми требованиями к образовательному процессу и профессиональной деятельности педагога, диктуемые новой парадигмой образования, которая позволяет исследовать роль ценностных ориентаций в профессиональном и личностном самоопределении человека на протяжении формирования и развития профессиональных намерений как важнейших предпосылок успешной самореализации личности, как составляющих потенциальных и резервных возможностей региональных особенностей личности, а также нежеланием молодых специалистов вести профессиональную деятельность в отдаленных населенных пунктах региона. Этот подход позволил рассмотреть профессиональное и личностное благополучие педагогов как фактор осознания личностью ценностно-смысловых установок по отношению к профессиональной деятельности и личностному росту.

Цель: выявление ценностно-смысловых отношений педагога к профессиональному и личностному благополучию.

Задачи исследования:

1. Провести анализ научных публикаций по вопросам личностного и профессионального благополучия личности: уточнить определение, выделить критерии и факторы профессионального благополучия.
2. Разработать первичную версию методики оценки профессионального благополучия и провести проверку основных психометрических показателей на надежность и валидность.
3. Выявить и раскрыть особенности профессионального и личностного благополучия педагогов региона и динамику ценностно-смысловой сферы личности педагога в соответствии с этапами профессионального становления.
4. Установить взаимосвязь между ценностно-смысловой сферой педагога и его профессиональным и личностным благополучием.

5. Выявить комплекс условий (организационно-управленческих, технологических, ресурсных), необходимых для обеспечения профессионального и личностного благополучия педагогов;
6. Издать монография «Когнитивная педагогика: технологии электронного обучения в профессиональном развитии педагога».

Исследование базировалась на гипотезе: профессиональное и личностное благополучие будет качественным, если в содержании субъективного благополучия человека отражается содержание профессионального и личностного развития; будет создан комплекс мероприятий (организационно-управленческих, технологических, ресурсных), необходимых для обеспечения профессионального и личностного благополучия педагогов.

Научная новизна исследования:

- выявлены и раскрыты особенности профессионального и личностного благополучия педагогов в условиях трансформационных изменений непрерывной системы образования;
- установлена взаимосвязь между ценностно-смысловой сферой педагога и его профессиональным и личностным благополучием;
- выявлен комплекс условий (организационно-управленческих, технологических, ресурсных), необходимых для обеспечения профессионального и личностного благополучия педагогов;
- выявлена динамика ценностно-смысловой сферы личности педагога в соответствии с этапами профессионального становления.

Теоретическая основа
Theoretical background

Анализ отечественных и зарубежных научных публикаций позволяет говорить о том, что к числу одних из основных методологических вопросов исследования феномена благополучия относится проблема особенностей понимания профессионального и личностного благополучия педагогами. Следует отметить, что многовариантность понимания значения того или иного термина также создает трудности в обобщении результатов, представленных в современных психолого-педагогических исследованиях.

Вопросы профессионального и личностного благополучия личности отечественными и зарубежными учеными изучается уже на протяжении нескольких десятилетий. Благополучие человека понимается как характеристика проявление высокого качества его жизни. В современных

условиях благополучие личности во многом зависит не только от его окружения, материальной обеспеченности, но и от субъективного понимания профессионального и личностного благополучия, где субъектная профессиональная педагогическая деятельность понимается как система доминирующих ценностно-смысловых отношений педагога не только к социокультурному окружению, но и самому себе и к своей деятельности.

Психологическое благополучие широко исследуется в зарубежными учеными, где особое внимание уделяют на онтогенетические и культурные факторы психологического благополучия. Еще в 1958 г. Джордж Гэллап показал, что профессиональное благополучие – один из определяющих факторов, которые помогают дожить человеку до 90 лет (Рад, 2011). Кэрол Рифф, американская исследовательница, предложившая свою теорию психологического благополучия, ориентированные на исследование позитивного психологического функционирования личности, выделяет шесть основных компонентов психологического благополучия: самопринятие, позитивные отношения с окружающими, автономия, управление окружающей средой, цель в жизни, личностный рост (Рифф, 1995).

Отметим, что по сравнению с зарубежными публикациями в отечественной психологии это направление относится к числу малоизученных. Но тем не менее феномен субъективного благополучия активно изучается отечественными учеными уже на протяжении нескольких десятилетий.

Б. М. Теплов отмечает, что успешность профессиональной деятельности зависит от индивидуальных способностей человека, описывая их таким образом: “Способностями можно называть лишь такие индивидуально- психологические особенности, которые имеют отношение к успешности выполнения той или другой деятельности” (Teplov, 1961). Н. А. Лавровой выявлено, что субъект трудовой деятельности как личность характеризуется определённой специфической совокупностью устойчивости личностных образований, в которую входят: мотивы, установки, иерархическая система сложившихся субъективных отношений, направленность, способы поведения и реагирования, характерологические особенности и другие структуры, определяющие своеобразие его индивидуально- психологических проявлений в профессиональной деятельности (Kostenko & Ossovsky, 2002). Л. М. Митина, исследуя личностное и профессиональное развитие, пришла к выводу об их единстве, где фактором развития является внутренняя среда личности, ее активность и потребность в самореализации. Но при этом соотношение личностного и профессионального развития имеет «неравновесную целостность». На

начальных этапах профессионального образования источником профессионального развития является уровень личностного развития. На последующих стадиях профессиональное развитие начинает доминировать над личностным (Mitina, 2003).

Знание о себе, своих личных и профессиональных качествах, адекватная оценка своей профессиональной компетентности, а также возникающее на основе этих знаний и самооценивания эмоционально-ценностное отношение к себе предопределяют поведенческий компонент профессионального самосознания учителя. Под удовлетворенностью понимается соотношение между мотивационно-ценностной сферой личности учителя и возможностью успеха деятельности по реализации ведущих мотивов его профессионально-педагогической деятельности (Молочкова, 2005). То есть личностная удовлетворенность педагога в большой степени зависит от того, какое место занимает его профессиональная деятельность в системе его ценностей.

Проблема профессионально-личностного благополучия тесно связана с проблемой качества жизни. В связи с этим в исследованиях, проведенных среди педагогов Якутии в 2004-2005 г.г. и 2015-2016 г.г., определяющим стал комплексный подход, целями которого стали: выявление оценки педагогами качества современного образования региона в сравнении с его состоянием в прошлые годы; сформированности факторов эмоционального выгорания; влияния кризисогенных факторов на личную и профессиональную жизнь; преодоления этих факторов; сформированности базовых профессиональных компетентностей; оценки педагогами качества своей жизни; степени удовлетворенности дополнительным профессиональным образованием (Chorosova et al., 2017).

Методология исследования. Эффективным инструментом проведения исследования и получения его результатов является система научных принципов и методов. Одними из основных принципов являются принципы системного, ценностно-смыслового, комплексного, когнитивного подходов, которые взаимодополняют друг друга.

Системный подход к изучению профессионального и личностного благополучия позволяет рассматривать проблему исследования как совокупность взаимосвязанных элементов и дает возможность системного видения профессионального и личностного благополучия.

Ценностно-смысловой подход – это осознаваемая когнитивно-эмоциональная связь личности с окружающим миром, значимая для решения её жизненных задач. (Baklanov & Vedeneeva, 2016). Высокий уровень ценностно-смыслового отношения к профессии, в свою очередь, во многом обусловлен педагогическим творчеством. Именно оно способствует возникновению процессуального и результативного удовлетворения, когда

«учитель осознает, что используемые им приемы и действия дают непосредственный эффект “здесь-и-теперь”, вызывают эмоциональный отклик и большую заинтересованность учащихся» (Chudnovsky, 2006).

Комплексный подход – это направление, рассматривающее объект исследования как совокупность компонентов, подлежащих изучению с помощью соответствующей совокупности методов. Комплексный подход заключается в объединении всех методов исследования в целях качественного изучения региональных особенностей профессионального и личностного благополучия. Когнитивный подход с точки зрения нашего исследования ориентирован на формирование профессиональных знаний и направленности процесса профессиональной деятельности на решение таких проблем, как понимание человеком действительности и применение знаний на практике (Chorosova & Gerasimova, 2017).

Решение задач исследования осуществлено с использованием комплекса теоретических и эмпирических методов. Теоретические методы: анализ научных источников, синтеза, теоретическое моделирование, прогнозирование, моделирование и проектирование, обобщение независимых характеристик и др.

Эмпирические методы: анкетирование, интервью, анализ документов и результатов деятельности, экспертная оценка, мониторинг, контент-анализ, изучение и обобщение материалов исследования, методы обработки результатов (метод экспертных оценок в обработке результатов анкетирования, первичная и вторичная статистическая обработка данных, корреляционный и факторный анализ).

Следует отметить, что проблема профессионально-личностного благополучия тесно связана с проблемой качества жизни. В связи с этим в исследовании, проведенном среди педагогов Якутии в 2015-2016 г.г., определяющим стал комплексный подход, целями которого стали: выявление оценки педагогами качества современного образования региона в сравнении с его состоянием в прошлые годы; влияния кризисогенных факторов на личную и профессиональную жизнь; преодоления этих факторов; сформированности базовых профессиональных компетентностей; оценки педагогами качества своей жизни; степени удовлетворенности дополнительным профессиональным образованием (Chorosova et al., 2017).

Предпосылкой данного исследования стало проведенное в 2004-2005 г. исследование «Учитель в изменяющемся обществе», отражающее социальное положение учителей, их эмоционально-психологическое, соматическое состояние (Chorosova et al., 2006).

В проведенном в 2015-2016 г.г. среди педагогов Якутии и Республики Казахстан (Национальная академия образования им. И. Алтынсарина)

исследовании были изучены когнитивные модели в образовании взрослых, особенности применения когнитивных образовательных технологий в системе образования взрослых, научно-педагогические подходы к использованию информационно-коммуникационных технологий в профессиональном развитии педагога, роль электронного обучения в развитии когнитивных способностей педагога (Chorosova et al., 2016). А также в сравнительном аспекте (педагоги Якутии и Казахстана) рассматривались профессиональное самочувствие педагогов, влияние кризисогенных факторов на профессиональное самочувствие педагогов, сформированность профессиональных компетенций и квалификационные дефициты, субъективная оценка педагогами качества своей жизни.

Результаты исследования
Results

Социологическое исследование было проведено с охватом более 3000 человек: педагоги Казахстана (более 2000 чел.) и Якутии (более 1000 чел.). Следует отметить, что посредством опроса выявлены наиболее распространенные квалификационные дефициты педагогов. Например, у 1,3 % до 24 % педагогов обнаруживается недостаточная сформированность такой базовой компетенции, как личностно-адаптивная, которая дает человеку возможность использовать новую информацию и коммуникативные технологии; принимать новые решения; проявлять гибкость и способность мобильно адаптироваться к изменениям; не пасовать перед трудностями; совершенствоваться и профессионально саморазвиваться. Сформированность когнитивных компетенций (вопросы «Легко ли вы запоминаете специфические модели или написание незнакомых слов?», «Умеете ли Вы вести самостоятельный поиск информации, обрабатывать, анализировать и оценивать её?», «Испытываете ли Вы трудности при выделении и формулировании цели (самообразования, педагогического отчета, проекта мероприятия)?») в области самостоятельного выделения и формулирования цели, информационного поиска, применения знаково-символических действий показала средний уровень – 66 %. Легко запоминают специфические модели или написание незнакомых слов всего 43 %, соответственно, частично и полностью испытывают трудности (что говорит о редком применении респондентами действия моделирования) – 57 %. Не испытывают трудности в самостоятельном поиске информации, ее обработке, анализе и оценивании – 86 % (высокий уровень). Не затрудняются при выделении и формулировании цели – 68 %, но испытывают трудности – 27 %.

От 2,6 % до 30 % педагогов испытывают потребность в

дополнительном профессиональном образовании для формирования и/или развития таких профессиональных компетенций, которые предполагают разработку и реализацию программ учебных дисциплин в рамках основной общеобразовательной программы; осуществление профессиональной деятельности в соответствии с требованиями федеральных государственных образовательных стандартов; систематический анализ эффективности учебных занятий и подходов к обучению; организация, осуществление контроля и оценки учебных достижений, текущих и итоговых результатов освоения основной образовательной программы обучающимися; формирование универсальных учебных действий. Значительный процент педагогов испытывают затруднения в своей профессиональной деятельности в части, касающейся современных образовательных технологий (44,6 %), организации исследовательской деятельности обучающихся (36,6 %), разработке, организации и реализации проблемного обучения (52 %).

От 6,6 % до 30 % педагогов испытывают дефицит компетенций, обеспечивающих создание психологически комфортной, безопасной образовательной среды. Для этих педагогов существует необходимость дополнительного профессионального образования по направлению психологического сопровождения образовательной деятельности.

Чуть меньше 50 % педагогов испытывают затруднения во взаимодействии с субъектами образовательного процесса, коллегами и администрацией, а также подавляющее большинство педагогов признались в том, что не чувствуют себя уверенно, когда оказываются в нетипичной и / или конфликтной ситуации, или вообще не могут найти решения (14 %). Это свидетельствует о недостаточной сформированности компетенции сотрудничества, предусматривающей умения принимать решения; устанавливать и поддерживать контакты; справляться с разнообразием мнений и конфликтами; вести переговоры; сотрудничать и работать в команде.

При выявлении факторов преодоления кризисов было важно обратить внимание на те из них, значение которых является максимальным относительно других факторов. Таковыми явились два фактора: фактор обретения целей и фактор открытости миру.

Иными словами, для казахстанских педагогов факторами преодоления кризисов выступают обретение целей и открытость миру. В целом, данную ситуацию можно рассматривать также как положительную тенденцию.

Среди педагогов Якутии также из факторов, свидетельствующих о наличии влиянии кризисогенных факторов, наибольший показатель в 2005 г. у фактора потери смысла жизни, в 2015 г. – у фактора внешних обстоятельств, хотя средний балл и составляет от 0,3 до 0,6 в 2005 г. и от

0,27 до 0,45 в 2015 – 2016 гг. По этой величине отчетливо видно, что спустя 10 лет педагоги Якутии стали меньше подвержены влиянию кризисогенных факторов.

Для педагогов Севера очень характерно как стремление к новому, так и толерантное отношение к объективному, внешнему, когда необходимы самоконтроль и саморегуляция: об этом свидетельствуют ответы от 72,6 % до 95,7 % (абсолютное согласие – у 22,09 % до 73,6 %, или 205 – 683 чел.). Необходимость преодолевать влияние кризисогенных, неблагоприятных факторов среды, социума, чтобы не поддаваться негативным тенденциям (апатия, депрессия, ожесточение), наши учителя осознают важность наличия навыков целеполагания, когда постановка все новых и новых целей становится внутренней необходимостью постоянно развивающейся личности: 91,7 % - 97,3 %. И только развивающаяся личность способна быть любопытной, неравнодушной, открытой всему новому, неизведанному каждое мгновение своего бытия – открытой всему миру, что предполагает постоянную внутреннюю готовность к образованию в течение всей своей жизни: от 81,8 % до 97 %.

Очень высоко оценили качество своей жизни 10,9 % в соотношении к низкой оценке 7,6 %, при этом степень удовлетворенности ее качеством разнится на 1,1 %. Так же высок показатель оценки качества жизни как среднее: 46,7 %. В целом удовлетворены жизнью 29,3 %, в сильной степени – 15,2 %. Учитывая, что качество жизни неразрывно связано с состоянием здоровья, оценили его состояние высоко 8,7 %, относительно здоровыми считают себя 19,6 %. Среднее состояние здоровья – у более чем половины – 55,4 %.

При этом влияние мировоззрения на наполненность своей жизни смыслом ощущают большинство респондентов: соответственно, среднее – 49, или 53,3 %, относительно сильно – 18, или 19,6 %, предельно сильно – 10, или 10,9 %, однако на вопрос «В какой мере вы чувствуете, что ваша жизнь имеет смысл?» 35,9 % опрошенных ответили «Средне», 1 респондент указал, что его жизнь не имеет смысла. Соотношение оценок «относительно слабо» и «предельно сильно» выражается как 5:13.

Социологическое исследование среди педагогов представителей коренных народов Севера позволил изучить влияние дополнительного профессионального образования (в контексте образования через всю жизнь) на отношение педагогов Якутии, арктических регионов к необходимости саморазвития и непрерывного образования; психолого-педагогических особенностей обучения якутских учителей; особенностей непрерывного профессионального образования педагогов в контексте общих тенденций развития образования, а также сформированность профессиональных и экстрафункциональных (социальных) компетенций педагогов (Chorosova &

Solomonova, 2017).

Совместное исследование с научно-образовательными партнерами из Республики Казахстан (Национальная академия образования им. И. Алтынсарина, Назарбаев Университет) значимо для консолидации усилий науки, практики и общественности; расширения международного сотрудничества педагогов в области интеграции концептуального и практического опыта в сфере развития современных образовательных систем в контексте реализации непрерывного образования.

Результаты исследования:

- выявлены и раскрыты особенности и взаимосвязь компонентов профессионального и личностного благополучия педагогов региона и динамика ценностно-смысловой сферы личности педагога в соответствии с этапами профессионального становления;
- установлена взаимосвязь между ценностно-смысловой сферой педагога и его профессиональным и личностным благополучием;
- выявлен комплекс условий (организационно-управленческих, технологических, ресурсных), необходимых для обеспечения профессионального и личностного благополучия педагогов;
- издана монография «Когнитивная педагогика: технологии электронного обучения в профессиональном развитии педагога».

Выводы
Conclusions

Таким образом, психометрическая проверка профессионального благополучия показала, что разработанный психодиагностический инструмент является достаточно надежным и валидным: получены хорошие показатели оценки внутренней согласованности шкал, подтверждена содержательная, конструктная и критериальная текущая валидность.

Исследование понимания профессионального и личностного благополучия педагогов позволяет определить подходы к диагностике субъективного профессионального, личностного благополучия и включает самооценку человеком своего психологического состояния и текущего здоровья, которые тесно взаимосвязаны, а также жизненной и профессиональной успешности, материального достатка и др. и выражает степень удовлетворенности, которые не зависят от места проживания и природно-климатических условий региона, которые в свою очередь могут, в какой-то степени, выступать своеобразным ресурсом профессионального развития.

Summary

The article considers theoretical and methodological problems of studying the phenomenon of understanding of professional and personal well-being by northern teachers. In studies of foreign and domestic scientists it was shown that the professional well-being of the individual is a special case of psychological well-being in the context of professional activity. At the same time, the terms “well-being”, “psychological well-being” and “subjective well-being”, “personal well-being” are regarded as generally close in meaning and interchangeable in the context of this study.

According to the results of the study, the adaptive difficulties in the professional activity in the process of implementing the new educational paradigm were revealed, as well as the insufficient formation of such basic competence as the personality adaptive one that includes the following aspects: the ability to apply new information and communication technologies; to come up with radically new solutions and set tasks different from those set; Flexibility and mobility in a changing environment; the ability to develop one's abilities and self-education; make independent decisions.

Although among the educators of the North is characterized as a desire for a new, and tolerant attitude towards the objective, external, when self-control and self-regulation are necessary. They have a sufficiently high level of understanding of the importance of their own professional activities. In general, teachers are satisfied with the quality of their lives.

It should also be noted that a joint study with scientific and educational partners from the Republic of Kazakhstan (I. Altynsarin National Academy of Education, Nazarbayev University) is significant for expanding international cooperation in integrating conceptual and practical experience in the development of modern educational systems in the context of the implementation of continuing education

The study of the phenomenon of professional and personal well-being is presented within the framework of the search for external or internal conditions for the positive functioning of the individual in work activity in the context of such scientific and applied areas of modern psychology as management psychology, labor psychology, organizational psychology, and occupational health psychology.

Nevertheless, it is necessary:

- to study more deeply the psychological and somatic aspects, namely the emotional and behavioral aspects that affect the well-being of teachers living in the northern and arctic territories of countries;
- explore the psychological and personal well-being in the context of professional activity, which is dictated by the interest in improving the quality of personal and professional life of a person and increasing the efficiency of work in the conditions of the north.
- note that for the professional and personal well-being the following components are very important, such as the existence of personal and professional life goals, the ability to manage their professional and personal development, the impact on the environment;
- It should be assumed that the criteria for assessing professional well-being are: competence, professional growth, positive relations with colleagues, professional goals, self-acceptance as a professional, etc;
- note that the ongoing modernization processes are impossible without taking into account the nature and degree of personal and professional well-being; positive

activity and functioning of the individual in working conditions (organizational, managerial, technological, resource), meeting modern requirements, provides a sustainable sense of well-being.

Литература
References

Baklanov, I. O., & Vedeneeva, G. I. (2016). Value-semantic attitude of students to education in the conditions of a liberal arts university. *Modern science-intensive technologies, No. 4-2,* 300-304. Downloaded from http://top-technologies.ru/en/article/view?id=35822

Chorosova, O, M., Solomonova, G, S., & Gerasimova, R. E. (2017). Methodological approaches to research on professional and personal well-being of Teachers: professional competences. *The European Proceedings of Social & Behavioral Sciences. IFTE 2017: 3rd International Forum on Teacher Education,* 124-128.

Chorosova, O. M., Gerasimova, R. E., & Solomonova, G. S. (2017). Methodical approaches to the study of continuing vocational education in the Republic of Sakha (Yakutia). *International Research Journal 3*(57), 72-75. Downloaded from: https://research-journal.org/category/2017/march2017/

Chorosova, O. M., & Solomonova, G. S. (2017). Questions of methodology in the study of professional and personal well-being of teachers. *Pedagogical Education in a Changing World: Sat. sci. tr. III International Forum on Teacher Education. Part 2*. Kazan: Fatherland.

Chorosova, O. M., & Gerasimova, R. E. (2017). Monitoring as a tool for improving the quality of educational services for additional professional education. *Education Throughout Life: Continuous Education for Sustainable Development. Astana: NAO im. I. Altynsarina, I,* 479 – 486.

Chorosova, O. M., Gerasimova, R. E., Nikiforova, E. S., & Alekseeva, F. I. (2006). *The sociological study "A Teacher in a Changing Society*". Yakutsk: IPCD.

Chorosova, O. M., Sergeev, S. F., Bershadsky, M. E., Gerasimova, R. E. et al. (2016). *Cognitive pedagogy: e-learning technologies in the professional development of a teacher.* Yakutsk: Izd-vo IGI and PMN SB RAS.

Chudnovsky, V. E. (2006). *Formation of the personality and the problem of the meaning of life: selected works*. Moscow: IPSI; Voronezh: MODEK.

Gerasimova, R. E., Nikulina, A. A., & Gorokhova, N. I. (2017). Monitoring of the quality of additional vocational education. *Pedagogical Journal, № 5.*

Kostenko, N. V., & Ossovsky, V. L. (2002). *Values of professional activity*. K.

Mikhailova, E. I., & Chorosova, O. M. (2017). Development of the Republic of Sakha (Yakutia) system in the conditions of qualitative and structural change in the regional economy. *Pedagogy. Psychology. Philosophy Serija Vestnika SVFU, 4*, 96-108.

Mikhailova, E. I., Chorosova, O. M., & Gerasimova, R. E. et al. (2015). *Qualitative additional professional education for adults as a social responsibility of the federal university: monograph*. Yakutsk: Publishing House of the Faculty of Physics.

Mitina, L. M. (2003). *Psychology of development of competitive personality. 2 nd ed*., Sr. - Moscow: Izd-vo Mosk. psychol.-sots. Institute; Voronezh: Modec.

Molochkova, I. V. (2005). *Psychological support of professional development of the teacher: Textbook*. Chelyabinsk: Publishing House of SUSU.

Rat, T., & Harter, D. (2011). *Five elements of well-being*. Moscow: Alpina Publishers.

Ryff, C. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology, No. 4, Vol. 69,* 719 -727.

Teplov, B. M. (1941). *Abilities and giftedness, Science notes Gos*. науч.-исслед. Institute of Psychology M.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 100-112

ОБРАЗОВАНИЕ КАК АГЕНТ РЕСОЦИАЛИЗАЦИИ ПОЖИЛЫХ ЛЮДЕЙ

Education as an Agent of Resocialization of Elderly People

Nataliia Kalashnyk
National University "Chernihiv Collegium" named after T. G. Shevchenko, Ukraine

Yana Levchenko
H. S. Skovoroda Kharkiv National Pedagogical University, Ukraine

Olha Doronina
H. S. Skovoroda Kharkiv National Pedagogical University, Ukraine

Olha Kucherova
H. S. Skovoroda Kharkiv National Pedagogical University, Ukraine

Olga Luchenko
V. N. Karazin Kharkiv National University, Ukraine

Abstract. *Due to the aging of population there is a need for reevaluation of the importance and the necessity of elderly people's participation in the life of society and as a result reevaluation of the methods of their adjustment. Modern "third aged people" want to continue living in the habitual rhythm of life, being the full participants of the society even after their retirement. The social portrait of a modern elderly differs significantly from the one 15–20 years ago. The level of medicine in the developed countries provides them with good state of health and therefore they can retain high level of social and emotional activity. Using several countries (Japan, Australia, Canada,) as an example the article aims to present different ways of inclusion of elderly people in socially useful activities in order to solve the problems of the modern society, in other words, to suggest how third aged people may be helpful. The article sums up that giving the opportunity of social and professional activity to the elderly people helps them to prevent social maladjustment and arising feeling of needlessness after the termination of active employment.*
Keywords: *Australia; education; elderly people; Canada; Japan; resocialization; social activity.*

Вступление
Introduction

В настоящее время доля пожилого населения в мире по отношению к общему населению выше, чем когда бы то ни было, и продолжает неуклонно расти. Динамика старения населения различается в разных странах в

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3190

зависимости от экономического и социального развития стран и от осуществляемой ими политики.

Генеральная Ассамблея ООН в резолюции от 16 декабря 1991 года призвала правительства стран включить в свои национальные программы положения, касающиеся пожилых людей. Среди них основными являются «независимость», «участие» и «развитие внутреннего потенциала». Принцип независимости подразумевает предоставление пожилым людям возможности работать, участвовать в определении сроков и форм прекращения трудовой деятельности, а также возможности участия в соответствующих программах образования и профессиональной подготовки. Одной из основных идей принципа участия является вовлечение пожилых людей в жизнь общества, предоставление возможности делиться своими знания и опытом с представителями молодого поколения. Принцип реализации внутреннего потенциала гласит, что пожилые люди должны иметь доступ к возможностям общества в области образования (Генеральная Ассамблея ООН, 1991).

К категории «пожилых людей», или «людей третьего возраста», как их принято называть в мире, относят людей возрастом от 60 до 74 лет. С приходом пожилого возраста увеличивается вероятность различного рода нарушений в образе жизни: появляются неудовлетворённость, неуверенность в себе, апатия, замкнутость, чувство потери социальной значимости. Решение этих проблем путём включения пожилого населения в образовательную деятельность является *актуальной задачей* современного общества. Данный вопрос рассматривал ряд учёных: С. Арашин, Н. Ермак, Е. Ильин, Т. Кононыгина, О. Мацукевич, М. Фидлер и другие.

Целью данной статьи является на примере некоторых передовых стран (Япония, Канада, Австралия), проанализировать имеющийся положительный опыт ресоциализации пожилых людей и выявить эффективные способы включения их в социально полезную деятельность. В ходе исследования были использованы *методы* генерализации, анализа, а также иллюстративный метод.

Текст статьи
The text of the paper

Ресоциализацией можно назвать процесс усвоения новых ролей, ценностей, знаний на каждом этапе жизни, таким образом, данное явление обусловливает усвоение новых ценностей, ролей, навыков взамен прежних,

неправильно усвоенных, устаревших или же в связи с переходом в принципиально иные социальные условия (Гидденс, 2005).

Процесс ресоциализации – это не разовое или кратковременное явление. По мере того, как человек становится старше, он сталкивается с различными переходными моментами, такими, как например, выход на пенсию людей третьего возраста. Этот факт подразумевает необходимость постоянного роста, развития и изменения социальных навыков пожилых людей за счет обучения и общения (в том числе со сверстниками), приобретения новых навыков, соответствующих требованиям времени.

Зарубежными психологами выявлена связь между уровнем образованности, степенью вовлеченности в образовательный процесс и продолжительностью жизни. Показано, что обновление знаний в пожилом возрасте способствует положительным изменениям в образе жизни, отношении к заболеваниям и утрате некоторых функций. В процессе обучения вырабатывается новая система ценностей – более прагматическая и ориентированная на взаимодействие с другими поколениями. В связи с этим, за рубежом все большее распространение получает участие пожилых людей в различных специально созданных для них образовательных программах в рамках относительно нового направления в педагогике – герагогике (Ильин, 2012).

Социально–демографические тенденции в современном мире характеризуются расширением участия пожилых людей в жизни современного общества. Поддерживаем мнение, что образование во многом определяет активность человека, которая сохраняется и в старости (Мацукевич, 2012). На наш взгляд, если в практике ресоциализации пожилых людей будут применяться образовательные модели на основе использования социально–культурных технологий (Красильников, 2003), это будет способствовать оптимизации адаптационных процессов в пожилом возрасте.

Опыт Японии
Japanese experience

Япония уже сейчас сталкивается с проблемами, которые, по прогнозам специалистов, могут ожидать другие страны в ближайшие 10–20 лет. Снижение рождаемости и увеличение продолжительности жизни привело к резкому демографическому старению. С 2005 года процент пожилых людей в Японии стал самым высоким в мире (Cabinet Office, 2015: с. 8) и по данным на 2013 год составляет 25 % населения (OECD, 2017).

Япония накопила большой положительный опыт в социальной адаптации людей третьего возраста. Прежде всего, в стране поддерживается

достойный уровень жизни людей пенсионного возраста, что ведет к успешной социально–психологической адаптации. Согласно национальному опросу, проведенному Кабинетом министров Японии в 2011 году относительно экономической ситуации пожилых людей (60 лет и старше), 71 % опрошенных считают, что им не нужно беспокоиться о своем финансовом положении (Cabinet Office, 2015: с. 11).

Задача ресоциализации пожилых людей решается также благодаря обеспечению их полноценного участия в жизни общества в силу их возможностей и желания. По данным на 2013 год 61,0 % пожилых людей в возрасте 60 лет и старше добровольно участвовали в некоторых видах групповых мероприятий (Cabinet Office, 2015: с. 24).

В связи с увеличением доли пожилых людей в общей численности населения правительство Японии решило поэтапно повысить официальный возраст выхода на пенсию до 65 лет. До 2012 года он составлял 60 лет, а в 2013 и в 2016 годах возрос до 61 и 62 лет соответственно (Trading Economics, 2017). Большинство компаний, рассматривают это как позитивные изменения, поскольку это решает проблему нехватки рабочей силы и помогает передать навыки молодым работникам. По состоянию на 1 июня 2014 года 81,4 % из тех, кто достиг пенсионного возраста в прошлом году, все еще работали (Cabinet Office, 2015: с. 21).

Японское геронтологическое общество выступило с предложением изменить определение пожилого гражданина и относить к таковым лиц в возрасте 75 лет и старше. Однако доктор Я. Оути, бывший председатель Японского общества гериатрии, считает, что 60–летним следует предоставить выбор – продолжать работать или заниматься добровольными видами деятельности, если они этого пожелают (Ouchi, 2017). Такое предложение основано на медицинских исследованиях. По данным на 2013 год, ожидаемая средняя продолжительность здоровой жизни, когда симптомы болезней не влияют на повседневную жизнь, возросла до 73 лет (Cabinet Office, 2015: с. 17).

После выхода на пенсию многие специалисты, имея большой опыт работы и не имея существенных проблем со здоровьем, хотят оставаться профессионально активными и приносить пользу обществу. Причиной социальной дезадаптации у людей пенсионного возраста может быть резкое прекращение длительного периода плодотворной трудовой деятельности и невозможность дальнейшей профессиональной самореализации.

По словам Е. Ильина: «у многих старых людей выход на пенсию связан со стремлением передать профессиональный опыт ученикам. Они испытывают тягу к воспитанию нового поколения, наставничеству» (Ильин, 2012).

Древняя практика наставничества, когда опытный профессионал предоставляет поддержку и руководство молодому и неопытному новичку, существует как в западных, так и в азиатских странах. В Японии традиция подготовки «мастер–ученик» имеет древние корни в разных сферах.

Одной из основных мер, принимаемых правительством Японии в отношении стареющего общества, является поддержка и поощрение повторного трудоустройства пожилых людей. С 2001 года была введена система повторного трудоустройства учителей, вышедших на пенсию. Пример эффективного неполного трудоустройства специалистов пенсионного возраста можно увидеть в проведении программы вхождения начинающих учителей в профессию, которая с 1989 года была введена Министерством образования, культуры, спорта, науки и технологий Японии (далее – MEXT). Все преподаватели в течение первого года после назначения проходят 90–дневный курс подготовки, разделенный на обучение в школе и внешкольное обучение. В рамках учебных планов, в школе начинающему учителю назначают наставника, как правило, из числа опытных учителей персонала школы. Он закрепляется за каждым молодым учителем и является наиболее значимым, ключевым лицом во время проведения программы. Кроме того, начинающим учителям могут быть назначены предметные специалисты в случае, если учитель–наставник и молодой учитель младшей или старшей средней школы преподают различные дисциплины. Для уменьшения учебной нагрузки начинающих учителей и их наставников привлекают учителей–сменщиков, которые частично берут на себя их административные и преподавательские обязанности.

В рамках этой программы, учителей, вышедших на пенсию, могут трудоустраивать на неполный рабочий день, при этом дополнительно выделяют денежные средства для оплаты их работы. Прежде всего, учителей–пенсионеров регулярно приглашают на роль *наставников*. Одним из преимуществ подобной практики, по наблюдению Э. Хоу (2007), является то, что «они обладают значительным свободным временем и энергией, которую могут посвятить своему наставничеству». Однако, как отмечает Т. Титибу (2016), «не всех берут на эту роль, а только специалистов с существенным опытом в проведении исследования урока по определенной дисциплине». Кроме того, по наблюдениям Г. Столз и Ю. Оно (2016), распространена практика, когда опытных учителей пенсионного возраста приглашают в качестве *внешнего эксперта* присоединиться к группам по исследованию уроков (lesson study – форма подготовки начинающих учителей).

Поскольку MEXT рекомендует, чтобы большинство *учителей–сменщиков* были опытными педагогами, то нередко на эту роль берут

недавно вышедших на пенсию учителей. Они заменяют начинающих учителей в своих классах, когда те участвуют в учебных занятиях в школе, либо в других учебных заведениях.

Специалистов пенсионного возраста также приглашают в качестве *лекторов* для проведения обучения во время внешкольной программы подготовки молодых учителей, которая проходит под руководством префектурных образовательных центров.

Таким образом, одним из *главных направлений работы* по предотвращению социальной дезадаптации людей третьего возраста в Японии является тенденция неполного трудоустройства для тех, кто желает оставаться профессионально активным. Психологи считают, что желание передавать профессиональный опыт начинающим, стремление к наставничеству часто встречается среди пожилых людей. Именно данный аспект, помноженный на традицию почитания и обучения у старших, активно используется в системе профессионального образования и профессионально–ориентированной воспитательной и образовательной деятельности в Японии.

Опыт Канады
Canadian experience

Можно с уверенностью утверждать, что Канада также стремительно состаривается. Доля пожилых людей в составе населения страны будет увеличиваться, так как поколение бэби–бумеров, родившихся в период 1946–1965 годов, достигнет пенсионного возраста в течение следующих 20 лет. Вследствие этого, вырастет число пожилых людей в популяции до 23,6 % к 2030 году. К 2063, число канадцев в возрасте 80 лет и старше достигнет почти 5 млн человек по сравнению с 1,4 млн в 2013 (Statistics Canada, 2013). Тенденция такого рода будет выдвигать огромные требования к ресурсам страны с целью долгосрочного вовлечения лиц пожилого возраста в *образовательное пространство* современного общества, и будет актуализироваться ближайшие 30 лет.

Такая диспропорция вынуждает правительство Канады принимать сложные социальные и образовательные решения, которые могут помочь местным пожилым людям оставаться активными и принимать участие в жизни сообщества, идти в ногу со временем. А. Лебель, демограф из Статистического управления Канады, заявляет, что если уровень трудовой активности и производительность труда повысятся, это может противодействовать некоторым последствиям старения населения. Все чаще пожилые канадцы остаются работоспособными (Лебель, 2017).

Правительство Канады повсеместно оказывает помощь пожилым людям, организовывая различные по форме и структуре образовательные учреждения, которые в свою очередь предлагают уникальные познавательные, обучающие возможности, а также развлекательные и *социальные программы*: Центры для людей старшего поколения, Центры для пожилых людей или престарелых людей. Следует отметить, что отдельные регионы Канады в различной степени уделяют внимание пожилой группе населения и ее развитию. Так, к примеру, информационная сеть о работе в провинции Онтарио предоставляет сведения о текущих возможностях построения карьеры и шансах поработать волонтером, а также данные о рынке труда, непрерывном и дистанционном образовании.

Многие школьные советы, колледжи и университеты Онтарио предлагают возможности непрерывного и дистанционного обучения. Такого рода обучение состоит из самоуправляемых групп пожилых людей, которые делятся своим опытом в изучении широкого спектра предметов. Некоторые местные школьные советы предлагают курсы английского или французского как второго языка, где специально для людей старшего возраста представлен широкий спектр подготовки на разных уровнях – от начального до продвинутого. Одним из популярных направлений также являются *образовательные программы*, которые могут включать в себя обучение искусству, музыке, работе на компьютере.

Таким образом, во всех провинциях Канады есть, по крайней мере, одна магистерская программа по образованию взрослых (или связанная с ней область, такая как высшее образование, развитие человеческих ресурсов, дистанционное образование, образование на рабочих местах, развитие общин или непрерывное образование). Существует также несколько направлений обучения в Канаде с более крупными программами, сосредоточенными в университетах Торонто, Калгари и Британской Колумбии. Выпускные программы такого рода готовят инструкторов, консультантов, общественных работников, администраторов, оценщиков, тренеров, теоретиков и координаторов профессионального развития.

Более 45 лет одним из популярных направлений в образовании лиц пожилого возраста Канады в рамках обучения на протяжении всей жизни является программа Саймона Фрейзера (SFU, 2017). Эта программа насчитывает тысячи учеников в Ванкувере, Британской Колумбии и во всем мире, предлагая курсы по вечерам, в выходные или посредством интернета. Учитывая растущие потребности пожилых учеников, в рамках *обучения на протяжении всей жизни* (SFU Lifelong Learning), курсы стремятся удовлетворить потребности такого рода с помощью различных образовательных программ, общественных мероприятий, индивидуального обучения и проектов, тесно взаимодействующих с обществом. Посредством

некредитных сертификатов, дипломов или других программ, университет помогает повысить профессиональную квалификацию лиц пожилого возраста, помочь им войти в новую для них область и утолить их страсть к обучению.

Более того, несколько университетов в Торонто предоставляют возможность получения высшего образования пожилым людям и откажутся от всей или части оплаты за обучение, если возраст абитуриента старше 60 лет. Университет Райерсона также предлагает бесплатное обучение лиц этой возрастной категории для четырехлетних программ, а в университете Макмастера в Гамильтоне есть аналогичная программа для магистров старше 65 лет. Кроме того, он снижает плату на 50 % для пожилых людей, зарегистрированных на *курсах непрерывного образования*. Тем не менее, если программа находится в университете Торонто, то для учеников пожилого возраста будут отменены только номинальные вспомогательные взносы. В свою очередь, большинство курсов, предлагаемых общественными библиотеками Канады, вообще являются бесплатными для пожилых людей.

Таким образом, правительством Канады организованы различные по форме и структуре образовательные учреждения, социальные институты, которые повсеместно предоставляют различные способы социализациии и вовлечения в общество пожилых людей. Университеты третьего возраста созданы для организации свободного времени старшего поколения с пользой для их интеллектуального развития, помогая при этом оставаться социально полезными и активными.

Опыт Австралии
Australian experience

Процесс старения населения – глобальное явление, затрагивающее все развитые страны в мире, и Австралия не является исключением. По данным Австралийского института здравоохранения и социальной защиты, старшее поколение австралийцев (65 лет и выше) продолжает расти и, как ожидается, удвоится к 2057 году (AIHW, 2017). Количество австралийцев возрастом 65 лет и старше превысит количество детей до 14 лет уже к 2025 году (Australian Bureau of Statistics, 2011). К позитивным фактам можно отнести тот, что австралийцы отличаются высокими показателями продол-жительности жизни: в среднем мужчины живут 80 лет, женщины – 84 года. Физическое здоровье пожилых австралийцев улучшается и большинство (82 %) относятся позитивно к качеству своей жизни (AIHW, 2012).

На сегодняшний день наблюдается повышенное внимание к повторной социализации пожилых людей в Австралии, что обусловлено

прогрессирующим старением нации. На пенсию мужчины и женщины в Австралии выходят в одинаковом возрасте – в 65 лет (без учёта различных обстоятельств), и возраст выхода на пенсию изменится в предстоящие годы. Правительства штатов поддерживают людей в решении отсрочить пенсию и оставаться работающими дольше, что поможет экономике страны справиться с последствиями стареющего населения. *Актуальными заданиями* для австралийского правительства, различных организаций и университетов являются попытки привлечь как можно больше пожилого населения к учебе, переподготовке, повышению своего интеллектуального уровня с целью приспособления к меняющемуся миру и их повторной адаптации в нём не только при *продолжении трудовой деятельности*, а и после выхода на пенсию. По данным Австралийского института здравоохранения и социальной защиты, только 1 пожилой австралиец из 10 трудоустроен (AIHW, 2017). Также отмечается, что 1 из 5 австралийцев старше 55 лет утверждает, что возраст является главным барьером для получения работы, а 1 из 3 австралийцев возрастом от 55 до 64 лет отмечает, что подвергался дискриминации по возрастному признаку (Australian Bureau of Statistics, 2008).

Для пожилых австралийцев, имеющих опыт работы, обучение является дополнительной возможностью продлить срок трудовой службы. При этом негативным фактором является то, что большая часть пожилого населения чувствует себя некомфортно, возвращаясь к учебе. В основном это люди, которые имели негативный опыт в школьные или студенческие годы, люди с заниженной самооценкой, неуверенностью в себе, те, кто долго оставался безработным или социально неактивным. Однако, многие австралийские учёные полагают, что опыт учащихся – основной фактор, благоприятствующий обучению.

В 1960 году в г. Хобарт, штат Тасмания, была основана ассоциация Австралийская ассоциация образования взрослых, а в 1998 году реорганизована, чтобы осветить меняющуюся среду образования взрослых. На сегодняшний день она является ключевой организацией, содействующей «непрерывному» и «постоянному» обучению в Австралии, главным национальным органом сектора образования взрослых в Австралии (Adult and Community Education in Australia, далее – ACE). Основными направлениями политики организации являются развитие грамотности, неформальное обучение, образование взрослых групп коренного населения, образование стареющего населения (Adult Learning Australia, 2018).

Сектор образования взрослых в Австралии представлен в каждом штате и территории Австралии в различных формах. Существует 531 коммерческая организация, непосредственно признанная и спонсируемая правительствами штатов Виктория, Новый Южный Уэльс и Южная

Австралия. Также поддерживается база данных, состоящая из 950 поставщиков услуг, которые идентифицируют себя организациями ACE. Ключевой характеристикой ACE является предоставление различных форм образования, направленных на индивидуальные или групповые цели. Наряду с привлечением молодёжи, взрослого контингента, людей с ограниченными возможностями в процесс обучения, сектор играет важную роль в поддержке пожилых австралийцев для продолжения их обучения в благоприятной среде. ACE помогает пожилым учащимся продлить трудовую деятельность посредством способствования в приобретении навыков и поддержки в последующем трудоустройстве (Adult Learning Australia, 2018).

Являясь образовательным феноменом XX столетия, *университеты третьего возраста* позволяют не только более эффективно использовать имеющиеся знания пожилых людей, опираясь на уже имеющийся опыт, и приобрести новые навыки, а также решить ряд социальных проблем. Международная волонтёрская организация Университет третьего возраста (U3A) начала свою деятельность в г. Мельбурн в 1984 году с целью образования людей, активных после выхода на пенсию, «в третьем возрасте» жизни. Организация предлагает краткосрочные и годичные курсы (A University of the Third Age, 2018).

В 1998 году правительством Австралии был создан первый в мире онлайн Университет третьего возраста (U3A) как однолетний проект для оглашенного ООН Международного года пожилых людей в 1999 году. Целью создания такой формы университета являлось предоставления виртуального обучения (курсов) через интернет пожилым людям, в частности тем, кто был географически, физически или социально изолирован. Добившись позитивный результатов, онлайн университет продолжил работу. Сейчас он открыт для всех людей пожилого возраста и молодых людей с ограниченными возможностями (U3A Online, 2018).

Для решения проблемы дезадаптации пожилых людей после выхода на пенсию, а также стимулирования профессионально активных людей третьего возраста, правительством Австралии предоставлено много возможностей для *продления социальной активности* путём обучения. Сектор образования взрослых в Австралии, университеты третьего возраста, различные курсы предлагают широкий выбор программ для пожилых людей разных форм и содержания.

Выводы
Conclusions

Опыт передовых стран показывает, что реализация принципов «независимости», «участия» и «развития внутреннего потенциала» людей третьего возраста (Генеральная Ассамблея ООН, 1991) ведет к эффективной социальной адаптации в новых для них условиях. Предоставление пожилым людям возможности продолжать работать, участвовать в определении сроков и форм прекращения трудовой деятельности не ограничивает их в выборе форм социальной активности и дает возможность в дальнейшем приносить пользу обществу. В условиях резкого снижения доли работающего населения по отношению к неработающему, как никогда важно сохранить вовлеченность пенсионеров в жизнь общества и использовать их профессиональный опыт и мастерство.

Summary

The United Nations General Assembly in its resolution 46/91 encouraged governments of different countries to incorporate the principles concerning elderly population into their national programs. The main aspects are as following: independence, participation, and self–fulfillment. The principle of independence stands for providing the elderly with the opportunity to work and determine when and at what place withdrawal from the labor force takes place. Moreover, they should have access to appropriate educational and training programs. The principle of participation implies integration in society and sharing the knowledge and skills with younger generations. The principle of self–fulfillment states that older persons should have access to the cultural resources of society for the full development of their potential.

Currently, the share of the elderly population in the world in relation to the total population is higher than ever and continues to grow steadily. Dynamics of population ageing varies in different countries depending on the economic and social development of countries and their ongoing policy. Using several countries (Japan, Canada, and Australia) as an example, the article presented different ways of elderly people's resocialization.

The experience of Japan is significant in this regard. One of the recent trends is offering the pensioners the opportunity of part–work. Ancient practice of mentoring when an experienced elder provides support and guidance to a younger, inexperienced person has been widely adopted in the system of professional pedagogical education. Professionals with rich experience of work are invited as mentors for novice teachers, external specialists, substitute teachers, and lecturers in terms of mandatory Teacher induction program.

Canada provides widespread educational opportunities for people of third age. These include both state and public educational institutions. To attract the elderly, the government offers free or subsidized learning. One of the most popular educational centers of Canada, which provides services to the elderly people, is the Simon Fraser University.

A rapid increase of the proportion of the elderly people in Australia has encouraged the government to reevaluate the importance of their involvement and participation in socially useful activities. Presently, the Australian Government provides many educational opportunities in order to extend social activity of the elderly (Adult and Community Education

sector, University of Third Age, online courses). Elderly people who keep learning throughout their lives are considered to improve the quality of life and remain competitive in the labor market which is seen as prolongation of employment.

The experience of advanced countries shows that the implementation of the principles of "independence", "participation" and "self–fulfillment" people of third age leads to effective social adaptation to their new social age.

Литература
References

A University of the Third Age. (2018). *U3A Movement*. Retrieved from http://www.u3a.org.au/u3a_movement

Adult Learning Australia. (2018). *About ALA*. Retrieved from https://ala.asn.au/about–us/

Australian Bureau of Statistics. (2008). *3222.0–Population Projections, Australia, 2006 to 2101*

Australian Bureau of Statistics. (2011). *3101.0–Australian Demographic Statistics, June 2011*

Australian Institute of Health and Welfare. (2012). *Australia's health 2012.*

Australian Institute of Health and Welfare. (2017). *Older Australia at a glance*. Retrieved from https://www.aihw.gov.au/reports–statistics/population–groups/older–people/overview

Cabinet Office, Government of Japan. (2015). *Annual Report on the Ageing Society* [summary]. Retrieved from http://www8.cao.go.jp/kourei/english/annualreport/2015/2015pdf_e.html

Chichibu, T. (2016). Impact on Lesson Study for Initial Teacher Training in Japan: Focus on Mentor Roles and Kyouzai–Kenkyuu. *International Journal for Lesson and Learning Studies, 5* (2), 155–168. Retrieved from https://doi.org/10.1108/IJLLS–01–2016–0001

Howe, E. R. (2007). *Japan's teacher acculturation: critical analysis through comparative ethnographic narrative.*

Lebel, A. (2017). *Government Statistical Service*. Retrieved from https://gss.civilservice.gov.uk

OECD. (2017). *Elderly population* [indicator]. doi: 10.1787/8d805ea1–en (Accessed on 12 December 2017). Retrieved from https://data.oecd.org/pop/elderly–population.htm#indicator–chart

Ouchi, Y., Rakugi, H., Arai, H., Akishita, M., Ito, H., Toba, K., Kai, I. and on behalf of the Joint Committee of Japan Gerontological Society (JGLS) and Japan Geriatrics Society (JGS) on the definition and classification of the elderly. (2017). Redefining the elderly as aged 75 years and older: Proposal from the Joint Committee of Japan Gerontological Society and the Japan Geriatrics Society. *Geriatr. Gerontol.Int., 17*: 1045–1047. doi:10.1111/ggi.13118.

Simon Fraser University. (2017). *Lifelong Learning.* Retrieved from https://www.sfu.ca/lifelong–learning.html

Statistics Canada. (2013). Retrieved from http://www.statcan.gc.ca/pub/11f0019m/11f0019m2013352–eng.htm

Stols, G., & Ono, Y. (2016). *Lesson Study: An Implementation Manual.* Retrieved from https://school–maths.com/documents/Lesson%20Study%20Manual_Eng_Stols_Ono_25Dec2016.pdf

Trading Economics. (2017). *Japan Retirement Age* [indicator]. Retrieved from https://tradingeconomics.com/japan/retirement–age–men

U3A Online (A Virtual University of a Third Age). (2018). Retrieved from https://www.u3aonline.org.au

Unesco. (1999). The General Conference Adopts a Recommendation on Adult Education. *Adult Education Information Notes*, 1–2.

Арашин, С. Н., & Арашина, А. С. (2015). *Проблема образования пожилых людей, 36*, 101–105. Retrieved from: http://e–koncept.ru/2015/95612.htmn

Генеральная Ассамблея ООН. (1991). *Принципы Организации Объединенных Наций в отношении пожилых людей. Резолюция 46/91*. Retrieved from http://www.un.org/ru/documents/decl_conv/conventions/oldprinc.shtml

Гидденс, Э. (2005). *Социология*. М.: Едиториал УРСС.

Красильников, Ю. Д., Моздокова, Ю. С., & Мацукевич, О. Ю. (2003). Социально–культурные технологии в процессе гериатрической реабилитации. *Вестник МГУКИ*, *1*, 95–108.

Ильин, Е. П. (2012). *Психология взрослости*. СПб.: Питер.

Мацукевич, О. Ю. (2012). Социально–культурная ресоциализация пожилых людей. *Вестник Кемеровского государственного университета культуры и искусств, 2* (19), 203–207. Retrieved from http://oaji.net/articles/2014/774–1415854827.pdf

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 113-121

THE PROCESS OF STRENGTHENING THE POTENTIAL OF A POST-INDUSTRIAL SOCIETY INDIVIDUAL - ABOUT THE ROLE AND IMPORTANCE OF THE CAREER COUNSELLING PROCESS

Daniel Kukla

Marta Nowacka
Akademia im. Jana Długosza w Częstochowie, Poland

Abstract. *The study is an analysis of the literature on the subject in the area of society's expectations towards the process of career counselling. At present, it seems very important to make adequate educational and vocational choices in the era when knowledge and information becomes more and more important and quickly becomes outdated. It is important to prepare a unit in the counselling process to deal with a permanently and dynamically changing world.*
The effect of the analyses is to indicate the challenges and needs of the professional counselling process towards the modern society in the current socio-economic realities.
Keywords: *career counselling, professional career, post-industrial society.*

Introduction

The times are changing, the reality that surrounds us is changing, but most of all people are changing. It is the man who shapes the place where he lives, his choices, his values, and determine the reality. There is no doubt that man feels more and more lost in the world around him. The family ties are loosening, which is caused by the increasing globalization and human mobility. We expect more and more from life, we want to satisfy our needs and we set newer and newer goals.

Above all, however, nowadays people must constantly make choices. It is not easy, because often we do not see opportunities and threats that bring further decisions. Man is no longer able to choose, he is afraid of consequences, he needs security. Therefore, broadly understood counselling has become an indispensable part of our lives. People are no longer satisfied with the help of family, friends, reading guidebooks. They expect the intervention of a professional, an adviser who will show them the right way, help them overcome

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3327

obstacles. There is an increasing demand for life counselling, for experts who ease the stigmatizing difficulties.

More and more attention is given not only to the fact of having a job, but to its character, to the opportunities it gives, to the satisfaction that can be derived from it. Man wants to develop professionally, achieve new goals, gain experience in various positions and still needs support in the implementation of individual challenges. Professional counsellors have more work and clients are less likely to experience disappointments.

Post-industrial society

The attempt to characterize clients that career counsellors currently work is a very complex thing. Let us not hide the fact that post-industrial societies differ greatly depending on the geographical region. This is due to economic, material and probably cultural conditions. We see, however, many similarities, both in the hierarchy of values and in the consumption way of life.

The current image of society brings to mind one word - a journey to find knowledge and information. It can be seen both in a literal and figurative sense. Man now has the opportunity to choose a place where he wants to stay for some time. Nothing limits him, in fact, all geographical and demographic boundaries are slowly becoming blurred. Searching for own piece of space in the world is something completely normal and accepted. Mobility in life, professional mobility - these are the concepts that perfectly characterize the society of our time. Man needs constant changes, new stimuli provided by other people as well as new surroundings. The number of divorces is increasing, we change our life partners more and more often, we change our job several times, and even profession. Long-term life plans are becoming rare, they are dangerous and not very rational.

No one, after all, is able to guarantee professional and life stability. Durability and solidity are the departing structures, because, as Zygmunt Bauman says: *"The spirit of uncertainty of a new kind is rising above the world today: resulting not so much from lack of confidence in your ingenuity and cunning, how much about the future shape of the world, tomorrow's imaginations about a sensible life, the future measures of the rightness of life decisions"* (Bauman, 2000).

The reality provides the individual with numerous crises, breakdowns not only of the business cycle, problems concerning itself and the whole community. Man is even forced to change his system of values, moral norms and adapt to progress, the future of which he cannot foresee.

The reality is fearful, it is unstable and ambiguous (Gerlach, 2008), it can give a lot to a man and at the same time can take it away from him. The

individual feels lost, tries to find his own identity. The increased activity certainly helps in many spheres of life. The acquisition of new qualifications, competences and experience allows to meet the requirements of modern times. More and more life goals, non-closure in a specific spatial framework gives the opportunity to choose. It is the choice that is most important for a man, and its lack only means apparent stability.

The participants are aware of instability and constant changes (Panasewicz, 2008). Every person's life consists of individual events, and the life course diagram constituting a component of culture and being a social institution undergoes - along with social, political and economic changes - constant changes. It is inevitable, and the basic task of the individual becomes adaptation to reality. Temporality does not allow us to “grow roots” in one place, which in time causes loss and frustration. Despite the man's striving to pursue more and more goals, he needs support and help to be able to find his place in an unoccupied world. An important feature of post-modernity, strongly affecting the individual, is the fact that staying in a place for a long time does not guarantee rooting in it.

An individual increasingly does not see the logic that should govern reality. Divisions, social hierarchy, certain permanent values that created social order, are now arranged into an incomprehensible whole, in which the ability to control own destiny becomes almost impossible. More and more often we are forced to make other difficult choices and often the individual is unable to decide for himself. The need to safeguard one's own decision is born. We need someone who will give us support, advice and sometimes simply approve our decision positively.

Individual, personal problems require objective solutions that only specialists can provide. Any physical or spiritual discomfort is usually a state of repair. Man is in a way obliged to look for a way out of unclear and difficult situations (Halawa & Wróbel, 2008), and more and more often he is looking for help from advisers.

Post-modern society gets accustomed to the idea that every problem is another task for an expert. More often, we need psychologists, therapists, career counsellors, discussions about our dilemmas. The uncertainty of times, ambivalence are transferred to the behaviour of a modern man who is not sure of anything anymore, not even his own decisions.

A characteristic feature of modern man is the pursuit of individuality and uniqueness. We do not like to be like others, both in what we do and in what we have. People want to feel their “otherness”, and being only one of the elements of society is not enough for us. However, new needs and preferences are quickly met by products and services. So a new idea is born for uniqueness, because what was something individual yesterday, today belongs to the broadly

understood mass culture. Being different, outstanding is more and more difficult, because sooner or later a person is assigned to a certain group and becomes again a member of the community, not an outstanding individual.

The post-industrial era man wants to be responsible for the lifestyle he adopts. He makes choices, determines his identity and more rarely asks for help from family and friends. At the same time, he is aware of the availability of not only cultural goods, mass media, but above all specialists professionally advising in many aspects of life. Searching for identity, giving direction to life, more and more often people use the help of professionals to reduce uncertainty, to feel safe. It should be noted that despite the progressive isolation of the individual, the loosening of family ties, changes in the system of values, the need for security is even indispensable to normal existence. Marriage, the other man who will protect us, are no longer medications for fear. It is a good job, material and housing conditions that are satisfying.

The era in which we live allows us to make choices, to freedom, but the price we have to pay for it is, above all, the frustration and constant search. The possibility of deciding on the shape of own life path does not bring satisfaction to contemporary people. In addition to the sense of freedom which a person has in imparting an individual face to at least some dimensions of his human existence, he also experiences anger when he gets the impression that in the past he has not used his options or the conviction that he made wrong decisions.

Social expectations towards career counselling

Rapid changes in almost all spheres of human life are deeply felt also in the sphere of consulting services. The clients of career counsellors are not only unemployed people and youth expecting advice on the choice of profession or path of education. Man must adapt quickly to changes and make difficult decisions more and more often. He needs help, professional advice that a specialist is able to give him.

One of the fastest growing areas is career counselling. It is no longer associated only with services provided by jobcenters. A vocational counsellor becomes a human companion in planning a professional career. He is present not only at the beginning, when the client makes the first decisions regarding his career, but also helps him adapt to the changes that are constantly occurring on the labour market. The central role in the life of an individual is more often occupied by persons providing advice, both in professional and personal life. Modern man is aware that only professional help is able to protect him from wrong decisions. Nobody is ashamed to go to family therapists or psychologists, far less to a career counsellor. Conversations with friends, family members, are no longer sufficient for the individual, because the unpredictability of the next

day paralyzes the man, and the advice of a professional is more credible to him. It is the reality that surrounds us in part forces the search for more and more new solutions with the help of specialists, because even wrong decisions are then not just mistakes of a given individual. It is easier in such a situation to justify and look for a new way.

More often we are talking about lifelong guidance, about supporting people at all stages of development, (Bańka, 2003) about taking care of the client while making professional decisions, but also monitoring its progress and possible help during the crisis. Only a few years ago, the vocational counsellor's profession was unnecessary for the average person. Few people expected advice when choosing a profession, an education path, and a reorientation.

Poland's entry into the structures of the European Union is associated with specific responsibilities, including the field of career guidance. This is an area that has only recently begun to develop in our country and which has received special attention. Society cannot be left alone in the labour market. Individuals should be helped not only to find suitable employment, but above all to prepare for the real possibility of frequent changes in their careers. Career counselling cannot be just a one-time advice, it must be organised in a continuous and consistent manner. The most important challenge, and at the same time the main expectation of society, is that citizens, regardless of their place of residence or social situation, should be guaranteed equal access to consultancy services of the same quality. The age of the client, his education, professional experience is not important, each of us can meet with dismissal from work, and the current reality does not facilitate a quick return to professional life. From the advisers and the entire system of vocational counselling in Poland, citizens expect first of all help to take on new civilization challenges. Challenges posed by work, family life, the other person. Overcoming fear, uncertainty, bold and accurate decisions lead people to find their own identity, not only the professional one. The examples of other countries show that a well-informed society, aware of its own limitations and capabilities, is able to better control the reality and above all to create it according to own needs. Career counselling plays an important role in satisfying various human needs, and its importance in the near future will increase even more.

The advisory system, in order to meet social needs should be based on the following assumptions:

- the society is informed about services and how to use them,
- the possibilities of using the services are defined and understood,
- clients receive support in discovering opportunities and making choices,
- consulting services are planned and well organised,

– the competences of the personnel providing the services are sufficient.

There is no doubt that modern society needs support from career counsellors. However, the main problem, especially in small towns and villages, is the availability of consultancy services. Not all people are accurately informed about the form and the fee for this type of advice. They expect it, they need it, but they do not always know where to find it.

The social expectations regarding the quality of consultancy services, especially for career advisors are growing. In addition to the vast knowledge of many scientific fields, numerous competences, such as communication, interpersonal skills, involvement, relationship skills, creativity, a vocational counsellor must support and mobilize his client, be close to him during these difficult moments, accompany almost all his life.

Obtaining simple professional or educational information is now possible thanks to the broad accessibility of the Internet and the media. When going to a career counsellor, an individual must feel subjective (Kukla, 2008), as a partner in conversation who has a lot to say, self-determines about himself and his future.

The world sets people more new tasks, which start much earlier than a few years ago. On the day of birth, the parents are already planning where their child will go to kindergarten and which high school is the best. More and more opportunities also give us the feeling that we have to constantly choose and we are not always convinced and the rightness of the path we follow.

With regard to the dynamics of socio-economic processes shaping the image of the present day, the challenges – which face career counseling - can be characterized taking into account the criterion of goals and tasks, as A. Kławsiuć-Zduńczyk writes. These are, among others:

- supporting clients in acquiring the skills necessary to function effectively in a society of risk – among others, we talk about the ability to anticipate dangers and to shape adaptive abilities, to deal with threats,
- awareness of the risk situation – by pointing out to people who cope with certain threats resulting from social changes,
- informing clients about the latest tendencies – which include, for example, the need to constantly upgrade the qualifications and competences, lifelong learning, the ability to demonstrate flexibility, openness to changes,
- providing practical consulting advice – that is, providing clients with specific information on what opportunities they have to acquire the desired qualifications and competences, especially those that meet the needs of the modern labour market, without forgetting about those that

satisfy the client's needs. The adviser should have full knowledge about the educational and professional opportunities of individual clients,

– indicating and shaping the client's competences necessary to manage their own professional and educational careers – by providing information on ways to acquire relevant knowledge. The task of a vocational counsellor is also to encourage clients to self-development, indicating what kind of meaning it plays and what benefits it can bring (Kławsiuć-Zduńczyk, 2010).

The tasks of career counselling arise from contemporary social and educational transformations, and are to help to understand and objectively assess the situation in which the counsellor is found, and to motivate to take actions contributing to development.

The contemporary world and the labour market place many challenges and requirements towards a career counsellor. But the task can be easier if the adviser's work is taken into account as a man accompanying people in finding their own way, making their dreams come true. It happens through: raising awareness of one's own abilities, learning about own passions and dreams, constructing a plan for their implementation, creating a plan of life and finding ways to put it into action, as well as supporting that implementation by freeing oneself from limitations and drawing a vision (Szumigraj, 2003). If a future adviser goes through this path, then it can be assumed that he will meet the challenges of reality and he will realize his life plan.

A man lives in eternal fear, that *by some unintentional move he will close the path to better moves in the future and will not be able to grasp the new, unimaginable possibilities that the future brings* (Halawa & Wróbel, 2008). Today, thorough education and qualifications are not enough. The job market requires skilful management of own professional career. The Polish society is just beginning to learn this and begins to appreciate the role of specialists in assisting in the planning of a professional career path. Difficulties in locating own place have not only people subject to the process of professional reorientation, but also young individuals entering the professional world, who does not like making mistakes.

“How to live?”, “Where to go?”, “What do I want and what is expected of me?” – these are further questions posed by man. The search for appropriate solutions is much easier when someone accompanies us, supports us and sometimes indicates mistakes. Coping with an unstable reality is much more difficult than planning a career path. The individual more and more often feels that life runs own path, and one cannot stray from it. It is vocational counsellors who should make people aware of the possibilities, which number constantly increase but a man simply do not see them. Man has to get used to instability,

like it and stop being tormented by the lack of stabilization for the next dozen or so years. Every moment of our life gives something new, sometimes something beautiful, sometimes disappointing, but the changes are good because they show what is really important.

Contemporary society needs counsellors, but it still needs faith in another person and in ourselves. The system of values, the labour market, the whole reality are changing. It is worth to have something permanent, some point of reference, maybe love or faith, because without it the human life loses human dimension.

Conclusion

The social expectations towards many professions and people who perform them are growing. One of them is a vocational counsellor, who no longer serves only as a specialist in career planning. Career counselling today is above all accompanying the client throughout their lives. Instability, permanent fear and uncertainty require taking appropriate advisory and supportive actions. You cannot ignore the needs of individuals who cannot cope with making decisions. There is a social demand for consultancy services. It is worth thinking about the greater availability of career counselling for the society. The existing system intervenes when the problem already arises. Effective counselling prevents problems and not cures.

In the present world, the advisory process accompanies people “from the beginning”, the moment of choosing a school, a profession up to a “professional end”. Today, there is also talk about career counselling, which is aimed at showing the possibilities of life and development (supporting people in programming different spheres of life) in conditions of permanent change. Career as a way of life, a mosaic of episodes of life, where the goal of career counselling is to plan and adapt the individual to undertake projects in an individual biography of choice. Career counselling is evolving towards helping people diversify the portfolio of investment into a career and deal with the negative effects of changes in personality. Because in the era of globalisation, no career scenario guarantees success, the counselling task is focused on helping clients reduce the risk of functioning.

References

Bańka, A. (2003). *Psychologiczne doradztwo karier*, Poznań: Wyd. Prin-t.

Bauman, Z. (2000). *Ponowoczesność jako źródło cierpień*, Warszawa. Wyd. Sic!.

Cybal-Michalska, A. (2013). *Młodzież akademicka a kariera zawodowa*, Kraków: Wyd. IMPULS.

Gerlach, R. (2008). *Praca człowieka w XXIwieku. Konteksty – wyzwania – zagrożenia*. Bydgoszcz: Wyd. Uniwersytetu Kazimierza Wielkiego.

Kukla, D. (2008). Kompetencje komunikacyjne jako atrybut doradcy zawodowego. In: Kukla D., *Komunikacja w doradztwie zawodowym*. (pp. 49-50). Radom: Wyd. Instytut Technologii Eksploatacji-Państwowy Instytut Badawczy.

Kukla, D., & Zając, M. (2011). Skuteczne zarządzanie własnym talentem szansą na odniesienie sukcesu zawodowego. In: Kukla D., *Wielowymiarowość poradnictwa w życiu człowieka,* (pp. 307-310).Warszawa: Wyd. Difin.

Kukla, D. (2011). W *kręgu personalizmu doradcy zawodowego*. Częstochowa: Wyd. AJD.

Halawa, M., & Wróbel, P. (2008). *Bauman o popkulturze. Wypisy*. Warszawa: Wyd. Akademickie i Profesjonalne.

Panasewicz, A. (2008). *Wędrowcy – ponowocześni klienci Akademickiego Biura Karier*. In: Siarkiewicz E., Wojtasik B., Być doradcą. (pp. 225). Wrocław: Wyd. Naukowe Dolnośląska Szkoła Wyższa.

Pukelis, K. (2014). Relation of career designing theories and career counseling strategies: for creative person's career development. In: Górna J., Kukla D., *Vocational counselling changes and challenges on the labour market* (pp. 91-96). Częstochowa: Publishing House of Jan Dlugosz University in Częstochowa.

Szumigraj, M. (2003). *Poradnictwo kariery,* Warszawa: Wyd. Łośgraf.

Kławsiuć-Zduńczyk, A. (2010). Funkcje i zadania doradcy w świetle współczesnych przeobrażeń społecznych i edukacyjnych, In: Duda W., Wieczorek G., Kukla D., *Tendencje i wyzwania poradnictwa zawodowego.* (pp. 75-76). Częstochowa: Publishing House of Jan Dlugosz University in Częstochowa.

Zając, M. (2015). Zarządzanie rozwojem zawodowym oraz własną karierą wobec wyzwań rynku pracy. In: Duda W., Kukla D., *Współczesne uwarunkowania rynku pracy.* (pp. 50-52). Częstochowa: Publishing House of Jan Dlugosz University in Częstochowa.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 122-136

SKOLOTĀJU PROFESIONĀLĀS MŪŽMĀCĪŠANĀS METOŽU UN PAŅĒMIENU IZVĒLE

A Selection of Methods and Techniques Professional Teachers Can Apply to Their Own Lifelong Learning

Ilga Kušnere
Latvijas Universitāte, Latvija

Abstract. *A selection of methods and techniques professional teachers can apply to their own lifelong learning.Education is the key to converting knowledge and experience into practical actions, their analysis and application. It plays a key role in the synthesis of new knowledge into research and innovation. Such thoughts on education were expressed in the resolution of the sixth World Education Congress in 2011. Today, when world education forums are widely discussing how schools can better organise the learning process, when ambitious long-term reforms are being implemented in the Latvian education system—the transition to competency-based educational content and teaching methods—it is essential to assess current situation and to bring innovative methods and techniques to our teachers' own learning process. The new knowledge and experience teachers gain through lifelong learning, through their experience and the understanding of how to share it, can be presented and guided by such methods and techniques that enrich a teacher's emotional and intellectual function. My own research has confirmed my belief that for a teacher to be confident and capable enough to help her students discover the joy of learning and gain new knowledge through the process of education, that teacher must herself have the experience of active learning, insight, and personal growth through the learning process. The author has selected a number of methods and techniques for lifelong learning based on the methods and techniques developed by a number of education researchers (Kolb, 1984; Koķe, 1999; Stueck, 2010; Vedins, 2011; Ščurkova, 2016; Robinson, 2013; Amonašvili, 2017), and on her own experience of leading and developing a professional lifelong education programme for teachers. The model of teacher learning presented here has been used in practice since 2012 and has been well-received. Teachers can develop themselves mentally, emotionally and spiritually through the learning process and in doing so increase their professional value.*
Objective for the Study*. To create a model for teaching professional teachers in the context of their own lifelong learning, to assemble a selection of methods and techniques for professional teachers' lifelong learning, including several designed by the author, and to assess them.*
Keywords: *emotional and intellectual activity, pedagogical patterns, professional growth, teacher training.*

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3234

Ievads
Introduction

Izglītība ir galvenais līdzeklis zināšanu un pieredzes pārnesē praktiskā darbībā, analīzē un izmantošanā. Tai ir galvenā loma jaunu zināšanu sintēzē pētījumos un inovācijās. Šādas domas par izglītību tika izteiktas Pasaules Izglītības darbinieku arodbiedrības sestā kongresa rezolūcijā (EI, 2011). Kvalitatīva izglītība attīsta cilvēka talantu un radošumu, tādējādi dodot ieguldījumu indivīda personīgajā un profesionālajā izaugsmē, kā arī sabiedrības sociālajā, ekonomikas, politikas, vides un kultūras attīstībā kopumā. Šobrīd, kad Latvijas izglītības sistēmā notiek vērienīga ilgtermiņa reforma, pāreja uz kompetencēs balstītu mācību saturu un procesu, ir jāizvērtē skolotāju tālākizglītībā izmantojamās metodes un paņēmieni. Pedagogiem mūžmācības procesā jaunas zināšanas, pieredze un savas pašpieredzes atklāšana, dalīšanās tajā piedāvājama un vadāma ar tādām metodēm un paņēmieniem, kas veicina skolotāja emocionālo un intelektuālo darbību.

Kvalitatīvas izglītības nodrošināšana, kas parādās rūpējoties par skolēnu spējām un vajadzībām, ir galvenais izaicinājums mūžmācībā, sākot no pirmsskolas līdz augstākajai izglītībai. To apstiprina arī Pasaules Izglītības darbinieku arodbiedrības sestā kongresa rezolūcijā (EI, 2011). Izglītības kvalitāti definē pēc tās ieguldījuma, pēc izglītības procesa un paredzamā rezultāta. Skolas izglītības kvalitāte ir atkarīga no skolotāju radošuma un nepārtrauktas personības izaugsmes. Minētā dokumenta II sadaļā "Izglītības kvalitāte" ir norādīts, ka "kvalitatīvai izglītībai jābalstās uz ticamiem izglītības pētījumiem. Šādu pētījumu rezultātiem ir jānorāda izglītības teorijas un prakses saistība. Pētījumiem jābalstās uz skolotāju reālo profesionālo pieredzi, skolotāji jāiesaista šajā pētniecībā". Tas palīdz radīt jaunu izpratni, zināšanas, kā arī pilnveido, stiprina pedagoģiskās profesionalitātes prasmes un pārliecības.

Dr. habil. paed. Ausma Špona atzīst, ka vienībā ar cilvēka brīvības izjūtu pieaug cilvēka vajadzības bagātināt sevi. Tas ir pamats personības pašrealizācijai un pašregulācijai, kas izglītības ieguves procesā sekmē mācīšanās prasmju veidošanos (Špona & Čamane, 2009). Pieaugušo izglītības pētniece Tatjana Koķe savā disertācijas darbā "Pieaugušo izglītības attīstība: raksturīgās iezīmes" (Koķe, 1999) pierāda, ka cilvēka motivāciju turpināt izglītību visu mūžu nosaka esošās zināšanas, kas nepārtraukti rosina pēc jaunām prasmēm, ar kuru palīdzību var apgūt inovācijas, attīstīta attieksmes un vērtības. Stiprina pieaugušā cilvēka pašapziņu, kas balstās uz stipru gribu un pašrealizācijas vajadzībām. Lai pedagoģiskajā procesā skolotājs pats prastu un uzdrošinātos radīt jaunas zināšanas, mācītu saviem skolēniem piedzīvot zināšanu atklāšanas prieku, tad arī skolotājam profesionālajā mūžmācībā jāpiedzīvo aktīvs, sevi izzinošs un personības izaugsmi veicinošs mācīšanās process. Tādējādi šajā zinātniskajā

rakstā pirmo reizi tiek publicēts autores izveidotais skolotāju profesionālajā mūžmācībā izmantojamais mācīšanās modelis.

Darba mērķis. Apkopot un izveidot skolotāju profesionālajā mūžmācībā izmantojamo mācīšanās metožu un paņēmienu kopumu, kas ir pamats skolotāju profesionālās mūžmācīšanās modelim.

Metodes. Teorētiskās: psiholoģiskās, pedagoģiskās un zinātniskās literatūras analīze, pašpieredzes atspoguļošana, skolotāju aptauja.

Pieaugušo mācīšanās pedagoģiskās likumsakarības
Pedagogical Patterns of Adult Learning

Rietumu zinātnieka Kolba (Kolb, 1984), Brukfīlda (Brookfield, 1983), Kinga (King, 1990) pētījumi pieaugušo izglītībā liecina, ka pieaugušo mācīšanās process balstās uz kognitīvajām un informācijas apstrādes teorijām, kur mācīšanās process tiek saprasts kā kognitīvo, afektīvo, psihomotorisko un sociālo procesu mijsakarība. Kolba teorijas būtību izsaka jēdziens ”mācīšanās cikls”. Autors atzīst, ka mācīšanās procesā pieaugušie iziet mācīšanās cikla četras pakāpes:

- percepciju un refleksiju, kuras pamatā ir pieredze;
- novērojumu apkopojumu un “teoriju” izveide;
- hipotēzes veidošana no ideju kopas;
- hipotēzes pārbaude praksē, kas veido jaunu pieredzi;

Pēc Kolba (Kolb, 1984) izteiktajām atziņām var teikt, ka mācīšanās procesu sekmē un padara veiksmīgu, ja tajā iekļauj aktivitātes, kas paredz:

- pieredzes realizēšanu un bagātināšanu;
- novērošanu, kas balstās uz refleksiju;
- abstraktu jēdzienu veidošanu;
- aktīvu eksperimentēšanu.

Minēto domu apstiprina arī filozofijas doktors, eksperts jautājumos par mācīšanās mākslu Ivans Vedins. Cilvēks ir radīts darbībai – personības radošā enerģija ir darbības enerģija. Efektīvas darbības rezultāti balstās uz vajadzību un spēju vienību. Darbības enerģija ir vajadzību enerģija (Vedins, 2011).

Mācību psiholoģijas aspektā autors ir izvirzījis piecus būtiskus kritērijus, kuri svarīgi arī skolotāju profesionālajā mūžmācībā:

- uzmanības noturības pakāpe – svārstīga vai augsta uzmanības koncentrācija uz problēmas iekšējo loģiku;
- domāšanas īpatnības – praktiskā, teorētiskā, uzskatāmi tēlainā;
- atmiņas īpatnības – mehāniskā, loģiskā vai tēlaini asociatīvā;
- rakstura īpatnības – paaugstināta emocionalitāte vai rakstura noslēgtība;

- empātija – spēja iejusties citas personas emocionālajā stāvoklī (Vedins, 2011).

Savukārt Leipcigas Universitātē (Stueck, 2010, 2011) ir izstrādāts septiņu soļu empātiskās pedagoģijas modelis. Šī modeļa īpatnība ir tāda, ka tajā vispirms tiek izvirzīta nepieciešamība integrēt domāšanu ar ķermeņa pieredzi. Empātiskās pedagoģijas modelī (Stueck, 2010, 2011) autori mācīšanās procesu iesaka sākt ar limbiskās sistēmas aktivizāciju. Tas apstiprina arī domu par kopveseluma pieeju izglītībā, ko savos darbos ir izteikuši gan filozofi, gan pedagogi, gan zinātnieki (Pestalocijs, 1996; Щуркова, 2016; Robinson, 2013; Dispenza, 2015; Chinmoy, 2017; Амонашвили, 2017). Vācijā Markus, Štuks šo modeli ir prezentējis 2010. gadā kā Meistarplānu, kas izmainītu izglītību, ja to ieviestu (Stueck, 2010). Kā uzskata autori (Štuks, Svence, Villegas) pirmie 3 soļi skolotāju mācīšanās procesā ir ļoti būtiski, jo tie nodrošina:

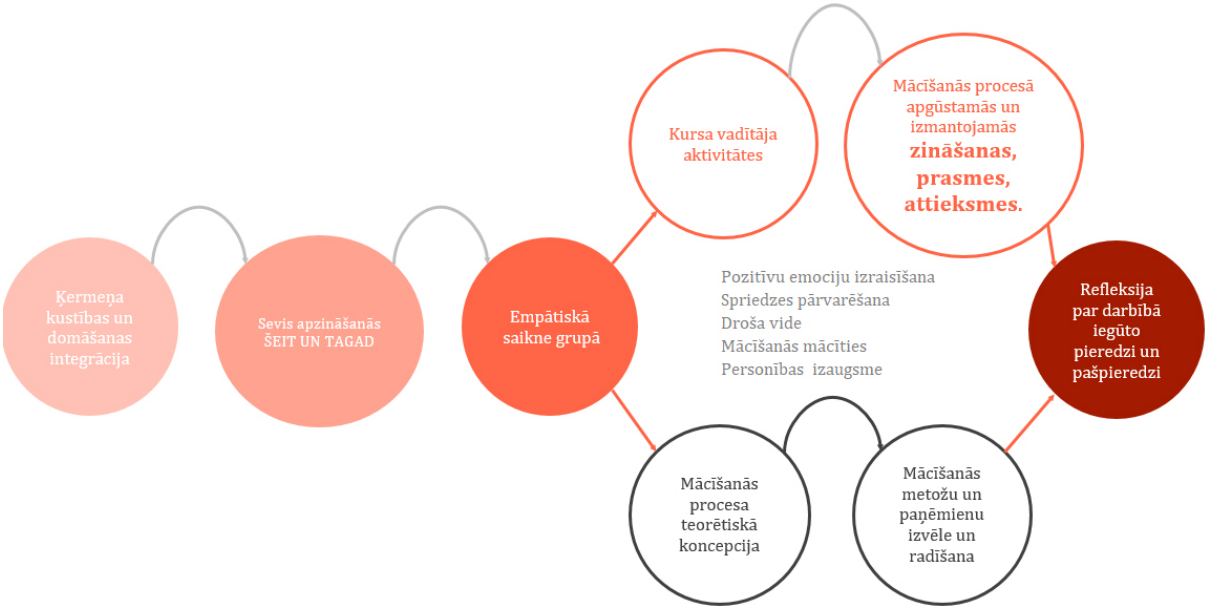
- ķermeņa un domāšanas integrāciju pirms racionālās uztveres;
- relaksāciju pirms vielas apguves (vingrinājumi, kas nomierina);
- atbalstoša kontakta veidošanos starp grupas biedriem.

Minētie soļi sagatavo uztveri jaunas informācijas apgūšanai. Uzsvars tiek likts uz pozitīvo bioķīmisko norišu aktivizēšanu. To panāk ar atslābināšanos, sevis apzināšanos, drošas vides radīšanu. Veidojas psihiska gatavība shematiskai un verbālai mācību materiāla uztverei.

Martins Būbers (Buber), izcils 20. gadsimta domātājs, dialoģiskās filosofijas pamatlicējs, apgalvo, ka visa īstā dzīve ir sastapšanās, jo "pamatvārdu Es – Tu var teikt ar visu būti. Savākšanās un sakušana vienā būtē nekad nevar norisināties caur mani, nekad nevar norisināties bez manis. Es topu pie Tu: tapdams Es, es saku Tu" (Būbers, 2010: 19). Tagadne – nevis punktveidīgā tagadne, kas tikai apzīmē ikreizējo domās noteikto "aiztecējošā" laika noslēgumu, aizturētā tecējuma šķitumu, bet īstā un piepildītā – pastāv tikai tad, kad pastāv tagadīgums, sastapšanās, attiecība. Tikai tādējādi, ka Tu top tagadīgs, rodas tagadne. Šīs Mārtina Būbera atklāsmes parāda, kāda loma mācīšanās procesā ir dialogam. Dialogam ar sevi un otru cilvēku. Arī filozofs Frīdrihs Jakobi jau 1785. gadā raksta, ka ".. bez tu nav iespējams Es" (Būbers, 2010: 8). Šo ideju attīsta arī Nīče (Būbers, 2010). "Es un Tu" ir par sastapšanos, kurā iespējama kļūst tapšana. Caur apzinātu Es un Tu satikšanos var radīt un rast, izgudrot un atrast. Veidošana ir atklāšana. Īstenodams savu domu darbībā, cilvēks veic atklāšanu. Tāpēc arī mācīšanās procesā ir svarīgs Es un Tu princips. "Mans Tu iedarbojas uz mani tāpat, kā es iedarbojos uz to" (Būbers, 2010: 21). Mūsu skolēni mūs māca, mūsu darbi mūs veido. Mēs dzīvojam plūstošajā savstarpējībā.

Skolotāju profesionālajā mūžmācībā izmantojamais mācīšanās modelis
Model for teaching professional teachers in the context of their own lifelong learning

Mācību metožu un paņēmienu izvēle skolotāju mūžmācībā palīdz nodrošināt veiksmīgu mācību rezultātu, rada interesantu mācību procesu, skolotāji iegūst pozitīvas emocijas, atvieglo ceļu informācijas uztverei un sekmē labvēlīgas socializācijas un vides rašanos. Mūžmācības procesā piedzīvotais skolotājiem palīdz veidot pārnesi uz savu vadīto pedagoģisko procesu skolas vidē. Jau 18. gadsimtā vācu pedagogs Johanss - Heinrihs Pestalocijs savā darbā ”Metode un sirds” uzsver, ja “..notiek cilvēka atsevišķo spēku un dotumu izglītošana un attīstīšana, rezultātā notiek arī visa viņa prāta izglītošana”. (Pestalocijs, 1996: 87). Pozitīvās psiholoģijas pārstāve Guna Svence, pamatojoties uz Eriksona atziņām, raksturojot pieaugušo izglītošanos, uzskata, ka nozīmīgs komponents mācīšanās procesā ir cilvēka pašizjūtas pazīme jeb radošā aktivitāte. Tas nozīmē, ka cilvēks nemitīgi ko meklē dzīvē un pilnveido sevi (Svence, 2006). Pieaugušie mācīšanās procesā vēlas mācīties ar jēgu un izjust, vai tas, ko es daru, atbilst manam potenciālam, vai es skaidri zinu, kā sasniegt izvirzītos mērķus (Martinsone, 2012).



1.att. **Skolotāju profesionālajā mūžmācībā izmantojamais mācīšanās modelis**
Fig.1. ***Model for teaching professional teachers in the context of their own lifelong learning (Kušnere, 2018)***

Autore, vairāk kā 10 gadus izstrādājot, vadot un pilnveidojot savas pedagogu profesionālās kompetences pilnveides A programmas, studējot transpersonālo psiholoģiju, esot humānās pedagoģijas skolotāja, pamatojoties uz vairāku

pētnieku izstrādāto mācīšanās metodiku, (Pestalocijs,1996; Kolb, 1984; Koķe, 1999; Stueck, 2010; Vedins, 2011; Ščurkova & Muhin, 2012; Robinson, 2013; Dispenza, 2013; Šri Činmojs, 2015; Amonašvili, 2017), ir izveidojusi un praksē jau no 2012. gada aprobē savu skolotāju mācīšanās modeli, kas tiek atzinīgi novērtēts skolotāju profesionālās mūžmācīšanās procesā. Izstrādātais skolotāju mācīšanās modelis shematiski tiek parādīts 1. attēlā.

Autores izstrādātais un praksē aprobētais Skolotāju profesionālajā mūžmācībā izmantojamais mācīšanās modelis (1. attēls) paredz skolotājiem mācīšanās procesā sevi pilnveidot mentālajā, emocionālajā un garīgajā līmenī. Izveidotais mācīšanās modelis piedāvā mācību procesā integrēt ķermeņa kustības kopā ar domāšanu. Tas klausītājos aktivizē limbisko sistēmu, rada pozitīvas emocijas, kliedē spriedzes un noguruma pārvarēšanu. Lai notiktu skolotāju apziņas paplašināšanās, tad šajā modelī tiek ieviesta sevis apzināšanas vingrināšana laikā, telpā un ķermenī. Skolotājam tās ir iespējas mācīties apzināties savu patību, novērot sevi, aktīvā darbībā praktizēt pateicību, lai paplašinātu dzīves enerģijas plūsmu un rastu līdzsvaru starp prātu un sirdi. Modelis vērš uzmanību arī uz skolotāju empātiskās saiknes radīšanu grupā, tā veidojot drošu, pozitīvu, aktīvu radošas mācīšanās vidi, kas veicina skolotāju personības izaugsmi. Lai skolotāju profesionālajā mūžmācībā tiktu sasniegts izvirzītais rezultāts, svarīga nozīme ir kursa vadītāja piedāvātajām aktivitātēm, kas tiek īstenotas, izvēloties atbilstošas metodes un paņēmienus. Pastāv iespēja arī mācīšanās procesā radīt jaunas metodes un turpat aprobēt, tā uzreiz gūstot pārliecību par darbības efektivitāti. Izstrādātais modelis vērš uzmanību arī uz to, ka skolotāju profesionālās mūžmācības process ir balstīts uz teorētiskām koncepcijām, ko labi pārzina un savā dzīves darbībā ievēro pats kursa vadītājs. Tādējādi sadarbības procesā notiek mijiedarbība starp kursa vadītāja un skolotāju zināšanām, prasmēm un attieksmēm. Lai sekmīgi norisinātos abpusēja personības izaugsme, tad autores izstrādātais skolotāju profesionālajā mūžmācībā izmantojamais mācīšanās modelis sevī ietver refleksiju par darbībā iegūto pieredzi un pašpieredzi, kas nepārtraukti tiek aktualizēta visa mācīšanās procesa gaitā.

Rezultāti
Results

Pētījums tika veikts ar 275 dažādu paaudžu un atšķirīgas pieredzes skolotājiem, (2017. gada augustā un oktobrī), vadot profesionālās kompetences pilnveides kursus Latgalē, Vidzemē, Kurzemē, Zemgalē. Iegūtie dati apkopoti 1. tabulā. Mācīšanās procesu atzinīgi novērtēja 273 respondenti. Tikai divi dalībnieki sniedza nepārliecinošas atbildes, kas saistīts ar apjukumu, izbrīnu. Tas veido ne vairāk kā 0,7 % no respondentu skaita. 1. tabulā apkopotie pētījuma dati

liecina, ka pētījumam nav gadījuma raksturs. Ir pietiekami liels skaits atbilžu, lai varētu izdarīt secinājumus, kā veikt skolotāju mūžmācīšanās procesu, kas veicina personības izaugsmi, slīpē profesionālo meistarību, stiprina cilvēka gara brīvību. Praksē īstenojot savas radītās skolotāju profesionālās kompetences pilnveides programmas, autore strādā pēc izveidotā Skolotāju profesionālajā mūžmācībā izmantojamā modeļa (1. attēls). Apkopojot skolotāju refleksijas par jautājumu - "Kādas izjūtas piedzīvoji mācīšanās procesā?", var teikt, ka skolotāji pamana un augstu vērtē uzticību, drošību, brīvu, nepiespiestu atmosfēru, prieku, harmoniju, mīlestību, saskarsmes kultūru. Šīs piedzīvotās izjūtas atbrīvo skolotāju sasprindzinājumu, ļauj cilvēkiem atraisīt savus iekšējos resursus. Aptaujas rezultāti liecina, ka mācīšanās procesā piedzīvotās pozitīvās izjūtas stiprina skolotāju pārliecības, ka pedagoģiskajai darbībai jābūt pieredzē balstītai, emocionālai, teorētiski pamatotai, izziņu virzošai. Balstoties uz pieredzi un pašpieredzi, tiek izdarīts secinājums, ka pedagoga darbībā galvenais ir veiksmīga cilvēka audzināšana. Veicot refleksiju par mācīšanās procesā piedzīvoto, skolotāji paši brīvprātīgi izvērtē savu darbu un saredz risinājumus uzlabojumu veikšanai, jo tiek iegūta iedvesma un sapratne, kā pilnveidot savu pedagoģisko darbību. Skolotāji pamana, cik būtiski blakus akadēmiskajām zināšanām cilvēkam ir vēlme izzināt sevi, atklāt savas spējas un talantus, kopt emocionālo inteliģenci. Darbībā skolotāji piedzīvo atklāsmi, ka profesionālajā mūžmācībā iegūtā pieredze pamodina pedagoga apziņu. Mācīšanās procesā tiek izmantots autores izveidotais metožu un paņēmienu kopums (2. attēls). Praktiskā darbībā nostiprinās pārliecība, ka, strādājot ar piedāvātajām metodēm un paņēmieniem, var piedzīvot pozitīvas emocijas, izzinošu un radošu darbību. Tāpēc, iedziļinoties iepazīto mācīšanās metožu un paņēmienu būtībā, kas attēlota 2. attēlā, skolotāji caur sevi pamana, kā šīs metodes ietekmē personības izaugsmi. Savstarpēji diskutējot par profesionāliem jautājumiem, rodas iedvesma un uzdrīkstēšanās darīt savādāk, lai nonāktu pie vēlamā rezultāta. Apstiprinājumu izteiktajam argumentam var rast tajā, ka, atkārtoti strādājot vienā un tajā pašā skolotāju auditorijā, ir novērots, ka pedagogi labprāt diskutē par iegūto pieredzi, kas rasta, pārbaudot praksē mācību procesā piedzīvotās atziņas, apgūtās zināšanas, prasmes un attieksmes.

Veiktais pētījums ļauj izdarīt secinājumu, ka mācīšanās procesā skolotājs, pilnveidojot sevi mentālajā, emocionālajā un garīgajā līmenī, paaugstina savu profesionālo meistarību.

1.tab. **Pētījuma apraksts**
Table 1 ***A description of the study***

Uzdotais jautājums	Respondentu skaits	Biežāk saņemtās atbildes
Kādas izjūtas piedzīvoji mācīšanās procesā?	275	– Jutos pārsteidzoši labi, jo saņēmu atbalstu, – bagātinājos pieredzē, piedzīvoju atvērtību, prieku, jautrību, optimismu, aizrautību, – pašpārliecību, vieglumu, labvēlību, interesi, apmierinātību, atbrīvotību – gaismas starojumu, prasmi dalīties, – gandarījumu par piedzīvoto, – enerģiju, pozitīvu lādiņu darbībai.
Pārliecības, ko sevī stiprināji?	275	– Skolotājam jābūt elastīgam, nemitīgi jāpilnveido sevi dažādās jomās, – problēmas jārisina sadarbībā ar citiem kolēģiem, – apzinājos līdzpārdzīvojuma un radīšanas nozīmi mācīšanās procesā, – jūtu apzināšanās cilvēku bagātina, – skolotājam vispirms jāstrādā pašam ar sevi, tad ar bērniem, – ļauties katras dienas stāstam kā īpašam piedzīvojumam, – problēmas var atrisināt mainot savu attieksmi, – skolotāja darbā pats galvenais - veiksmīga cilvēka audzināšana – es varu savā darbībā būt brīvs, būt es pats, – skolotājs mācību stundā bērnam māca dzīvi.
Kā profesionālajā mūžmācībā piedzīvotās metodes un paņēmieni palīdzēs pedagoģiskajā procesā?	275	– Apguvu paņēmienus, ko lietošu skolēnu radošuma veicināšanai, – spēšu iepriecināt skolēnus, guvu iedvesmu darīt – rodas motivācija veidot interesantas mācību stundas, – piedāvāšu skolēniem iespēju mācību stundā izzināt sevi, – atnāca iedvesma, kā bērna dvēselei dāvināt gaismu, kā attīstīt skolēnu spēju just, – iegūta pieredze, kā atbrīvot prātu, – iedvesma un idejas profesionālajai darbībai, – rodas pārdomas par savām vadītajām stundām, saredzu iespēja veikt uzlabojumus, – sapratu, kā sasaistīt savas zināšanas un pieredzi, lai radītu jaunas idejas, apgūto paņēmienu pielietošana palīdzēs skolēnus mobilizēt mērķtiecīgai darbībai, – izmantošu mācībās piedzīvoto praktiskā darbībā kopā ar skolēniem, – ierosme ieskatīties sevī, uzdrīkstēties veikt profesionālu sadarbību ar kolēģiem.

Izvērtējot vairāku citu pētnieku izstrādāto mācīšanās metodiku (Kolb, 1984; Koķe, 1999; Stueck, 2010; Vedins, 2011; Ščurkova, 2016; Robinson, 2013; Amonašvili, 2017), kā arī uz pašpieredzi, kas iegūta veidojot, vadot un pilnveidojot savas skolotāju profesionālās kompetences pilnveides programmas, autore ir izvērtējusi un apkopojusi, tai skaitā arī savas radītās, skolotāju mūžmācīšanā izmantojamo mācīšanās metožu un paņēmienu kopumu (2. attēls), ko pirmo reizi publicē šajā zinātniskajā rakstā. Piedāvātais skolotāju profesionālajā mūžmācībā izmantojamo metožu un paņēmienu kopums veiksmīgi tiek aprobēts un atzinīgi novērtēts skolotāju profesionālās mūžmācīšanās procesā, kā arī vietējās un starptautiskās nozīmes pedagogu konferencēs.

Mācīšanās metodes	Paņēmieni	Ieguvumi
UZSKATES METODES	Apskats	– Situācijas izzināšana
	Interaktīvā prezentācija	– Domāšanas aktivizēšana – Aktīva līdzdarbošanās
	Demonstrēšana	– Pašpieredzes stiprināšana
	Vizualizēšana	– Informācijas strukturēšana – Mācīšanās mācīties
	Esejas rakstīšana un analīze	– Individuāla domu izteikšana, ievērojot noteiktu struktūru
	Stāstījums	– Aktīvā klausīšanās

Mācīšanās metodes	Paņēmieni	Ieguvumi
PRAKTISKĀS METODES	Praktiskais darbs	– Gribas stiprināšana – Jauna pieredze – Izziņa – Jaunu zināšanu piedzīvošana darbībā
	Laboratorijas darbs	– Izvirzītās problēmas risinājumu apzināšanās – Praktiskās darbības iemaņu stiprināšana – Pētniecības metožu apguve
	Modeļu izgatavošana	– Teoriju radīšana un aprobēšana
	Mācību ekskursija	– Redzesloka paplašināšana – Pieredzes bagātināšana – Priekšstatu ieguve
	Novērošana	– Situāciju novērtēšana – Teorijas un pieredzes izvērtējums – Jaunu atziņu iegūšana

Mācīšanās metodes	Paņēmieni	Ieguvumi
PĒTNIECISKĀS METODES	Mācību eksperiments	– Atklājums – Pieredzes paplašināšanās
	Praktiskie darbi	– Izziņa – Teorijas un prakses saistības apzināšanās
	Pētījums	– Esošās informācijas izvērtējums – Datu ieguve – Hipotēzes izvirzīšana un pārbaude – Teoriju izveide
	Spēles	– Atbrīvotība, pašizpausme – Mirkļa atklājumi – Attieksmju veidošanās – Pietuvošanās sapņiem

Mācīšanās metodes	Paņēmieni	Ieguvumi
DIALOĢISKĀS METODES	Filozofiskā dienasgrāmata	– Atbilžu rašana uz sev svarīgiem jautājumiem – Ieklausīšanās sevī
	Dialogs	– Prasme runāt un ieklausīties – Sadarbība un mijiedarbība
	Diskusija	– Māksla diskutēt par profesionāliem jautājumiem – Savstarpējas pašpieredzes bagātināšana

Mācīšanās metodes	Paņēmieni	Ieguvumi
PROJEKTS	Kooperatīvā mācīšanās	– Problēmu apzināšanās un risināšana ilgtermiņā – Pieredzes bagātināšana un realizēšana – Profesionālās pieredzes apzināšanās – Inovāciju radīšana – Sadarbības un mijiedarbības prasmju izkopšana – Procesa un rezultāta pašnovērtēšana – Atbildība

Mācīšanās metodes	Paņēmieni	Ieguvumi
DARBS AR TEKSTU	Jautājumi	– Informācijas iegūšana – Informācijas lietotprasme – Domāšanas vingrināšana – Kopsakarību veidošana
	Situāciju izpēte un analīze	– Pašizziņa un pašvadība – Atziņu gūšana – Personīgā un sociālā atbildība – Lēmumu pieņemšana
	Debates	– Prasme atlasīt un izmantot argumentus – Pārliecības stiprināšana, balstoties uz faktiem
	Konspektēšana	– Būtiskākās informācijas apkopošana
	Atziņu dienasgrāmata	– Kultūras izpratne un tās vērtību pārmantošana – Sev svarīgu atziņu apkopošana, pamatošana, izmantošana

Mācīšanās metodes	Paņēmieni	Ieguvumi
DRĀMAS METODE	Situāciju izspēle	– Problēmsituāciju risināšana
	Lomu spēles	– Talantu un spēju izkopšana – Pašizpausme
	Etīdes	– Spriedzes atbrīvošana – Radošums – Saspēle – Domu apkopošana
	Pasaku un mītu inscinēšana	– Pašizziņa – Pašanalīze – Pašregulācija

Mācīšanās metodes	Paņēmieni	Ieguvumi
DARBS AR IT	Informācijas iegūšana	– Informācijas ieguve, izmantojot IT
	Informācijas sistematizēšana	– Informācijas sistematizēšana, izmantojot IT
	Informācijas prezentēšana	– Prezentāciju veidošanas prasmju izkopšana, izmantojot IT

Mācīšanās metodes	Paņēmieni	Ieguvumi
DARBS AR SIMBOLIEM	Ieraugi! Novērtē, Izdari!	– Problēmu apzināšanās, risināšana – Pozitīvu emociju aktualizēšana – Sadarbības veicināšana – Egoisma izskaušana, dalīšanās prieks – Atklāsmju piedzīvošana
	Asociāciju veidošana	– Iztēles treniņš – Radošuma veicināšana
	Iedvesmas stāsts, vēlējums	– Dzīvesspēka resursu apzināšanās – Radošās domāšanas treniņš – Uzticības, drošības radīšana – Labestības veicināšana

Mācīšanās metodes	Paņēmieni	Ieguvumi
APZINĀŠANĀS	Elpošanas vingrinājumi	– Sevis apzināšanās – Spriedzes un stresa pārvarēšana
	Emociju apzināšanās	– Empātijas stiprināšana – Emocionālās inteliģences izkopšana
	Darbības apzināšanās	– Apziņas paplašināšanās –
	Pateicības praktizēšana	– Dzīves enerģijas plūsma –
	Meditācija	– Prasme novērot savas domas, emocijas – Harmonija – Savas patības apzināšanās

2.att. ***Skolotāju profesionālajā mūžmācībā izmantojamo mācīšanās metožu un paņēmienu kopums***
Fig.2. ***A selection of lifelong learning methods and techniques for professional teachers (Kušnere, 2018)***

Lietojot skolotāju profesionālajā mūžmācībā izmantojamo metožu un paņēmienu kopumu atbilstoši piedāvātajiem mācību standartiem un mācību programmām, kā arī, izzinot katra paņēmiena būtību un ar to sasniedzamo mācīšanās rezultātu, kas parādīts 2. attēlā, skolotājiem mācīšanās procesā ir iespējams piedzīvot izvirzīto hipotēžu pārbaudi praksē, veidojot jaunu pieredzi, kā arī iegūtajā pašpieredzē dalīties ar kolēģiem. Piedāvātās metodes un paņēmieni paaugstina skolotāju empātiju, raisa tēlaini asociatīvo domāšanu, rada un stiprina apziņu "Es varu" un "Es daru". Izvēlēto metožu un paņēmienu kopums paredz arī

skolotāju pašpieredzes realizēšanu un bagātināšanu, novērošanu, kas balstās uz refleksiju, abstraktu jēdzienu veidošanu un aktīvu eksperimentēšanu. Izteikto domu apstiprina arī pētnieki (Kolbs, 1984; Koķe, 1999; Vedins, 2011; Svence, 2006; Štuks, 2010; Robinsons, 2013) savās izstrādātajās atziņās par pieaugušo mācīšanās likumsakarībām. Skolotāju mūžmācībā izvēlētā mācīšanās metode ir sadarbības forma. Kā atzīst humānās pedagoģijas skolotājs Šalva Amonašvili (Amonašvili, 2017: 24), "Metode un visa dzīvā realitāte, kas tiek veidota ar tās palīdzību, dāvā skolēnam īpašu dzīvi un panākumu prieka pārdzīvojumu. Taču, lai metode tāda kļūtu, ir vajadzīga skolotāja radošā personība, vajadzīga izpildīšanas māksla. Metode pārtop dzīvē caur skolotāju". Ja skolotājs mūžmācīšanās procesā piedzīvo ticību un to apliecina radošā darbībā, saskaras ar daili un tiecību, iemācās atšķirt patiesi jauno izglītībā no maldīgā, piedzīvo iedvesmas stundas, darbībā gūst apstiprinājumu savām pārliecībām, saņem metodisku atbalstu, nevis direktīvas "no augšas", izjūt vienlīdzības sajūtu ar skolotāju (mācīšanās procesa vadītāju) un visiem citiem pedagoģiskā procesa dalībniekiem, mācīšanās procesā izzina un garīgi bagātina sevi, tad skolotājs pats kļūst "..par jaunu ideju un pieredzes avotu" (Amonašvili, 2017: 7).

Secinājumi
Conclusions

- Lai izglītības procesā kopumā notiktu pozitīvas pārmaiņas, tad skolotājiem profesionālajā mūžmācībā jārod iespēja sevi pilnveidot mentālā, emocionālā un garīgā līmenī.
- Lai mācīšanās procesā metode kļūtu par līdzekli mērķa sasniegšanā, ir vajadzīga izpratne un pārliecība, kā katra izmantotā metode veicina skolotāja personības izaugsmi.
- Mūžmācības procesā personīgi piedzīvotais skolotājiem palīdz veidot pārnesi uz savu vadīto pedagoģisko procesu skolas vidē.
- Skolotājs mācīšanās procesā, piedzīvojot harmoniju, cilvēkmīlestību, radošumu un pašizziņu, mācās diskutēt ne tikai par profesionālām veiksmēm, bet arī kļūdām, mācoties tām rast risinājumu.
- Skolotāji profesionālās mūžmācīšanās procesā vēlas mācīties ar jēgu, izjust atbalstu savu izvirzīto mērķu sasniegšanā.
- Lai cik arī veiksmīgs būtu skolotāju profesionālajā mūžmācībā piedzīvotais mācīšanās modelis, skolotājs spēs sasniegt savas pedagoģiskās darbības pilnvērtīgāko rezultātu, ja skolā būs atbalstoša vide.

Summary

A selection of methods and techniques professional teachers can apply to their own lifelong learning.

Education is the key to converting knowledge and experience into practical actions, their analysis and application. It plays a key role in the synthesis of new knowledge into research and innovation. Such thoughts on education were expressed in the resolution of the sixth World Education Congress in 2011. Today, when world education forums are widely discussing how schools can better organise the learning process, when ambitious long-term reforms are being implemented in the Latvian education system - the transition to competency-based educational content and teaching methods - it is essential to assess current situation and to bring innovative methods and techniques to our teachers' own learning process.

The new knowledge and experience teachers gain through lifelong learning, through their experience and the understanding of how to share it, can be presented and guided by such methods and techniques that enrich a teacher's emotional and intellectual function. My own research has confirmed my belief that for a teacher to be confident and capable enough to help her students discover the joy of learning and gain new knowledge through the process of education, that teacher must herself have the experience of active learning, insight, and personal growth through the learning process.

The author has selected a number of methods and techniques for lifelong learning based on the methods and techniques developed by a number of education researchers (Kolb, 1984; Koķe, 1999; Stueck, 2010; Vedins, 2011; Ščurkova, 2016; Robinson, 2013; Amonašvili, 2017), and on her own experience of leading and developing a professional lifelong education programme for teachers. The model of teacher learning presented here has been used in practice since 2012 and has been well-received. Teachers can develop themselves mentally, emotionally and spiritually through the learning process and in doing so increase their professional value.

Objective for the Study. To create a model for teaching professional teachers in the context of their own lifelong learning, to assemble a selection of methods and techniques for professional teachers' lifelong learning, including several designed by the author, and to assess them.

Methods. Theoretical - psychological, pedagogical, and a study and evaluation of scientific literature. A presentation of the author's professional experience, a survey of teachers, and an illustration of the created model.

Results. A model for teaching professional teachers and a selection of methods and techniques professional teachers can use in their own lifelong learning, developed and tested in practice. Certain techniques and preliminary methods have been well-received when applied to teachers' lifelong learning, and when presented at local and international conferences.

Conclusions. To achieve positive transformation in the process of education the task of the teachers' professional lifelong learning is to find a possibility to improve oneself mentally, emotionally and spiritually. To make the method which is used in the process of teaching serve as means of achieving the goal it is necessary to understand how each applied method contributes to the personal growth of the teacher. Experience gained during the lifelong learning process allows the teachers to create a transfer to their pedagogical practice in the environmet of school.

Literatūra
References

Amonašvili, Š. (2017). *Nav viegli būt dvēseles dārzniekam*. Rīga: Latvijas Humānās pedagoģijas asociācija.

Brookfield, S. (1983). *Adult Leamers, Adult Education and The Community, Milton Keyness*: Open University Press.

Būbers, M. (2010). *Es un Tu*. Rīga; Zvaigne ABC.

Činmojs, Š. (2017). *Laimes pavedieni meditācijai un sevis izzināšanai*. Rīga: Apgāds "Jumava", 165 lpp.

Dispenza, Dž. (2015). *Atbrīvojies no ieraduma spēka*. Rīga: SIA "Lietusdārzs".

Kolb, D. A. (1984). *Experiental Leaming. Experience as a Source of Leaming and Development.* Prentice – Hall, Englewood Cliffs, New Jersey

Koķe, T. (1999). *Pieaugušo izglītības attīstīstība: raksturīgās iezīmes*. Rīga: SIA "Mācību apgāds NT".

Martinsone, K. (2012). *Pieaugušo izglītība*. Rīga: RaKa.

Fišers, R. (2005). *Mācīsim bērniem mācīties*. Rīga: RaKa.

Pestalocijs (1996). *Johanss – Heinrihs Pestalocijs Darbu izlase: veltīta pedagoga 250 gadu atcerei.* Rīga: Latvijas Universitāte.

Robinsons, K. (2013). *Ne tikai ar prātu*. Rīga: Zvaigzne.

Performance in Exstreme Environments, 8 (1), p. 11-20. Schibri PublishingHouse (submitted). Source. Stueck (2011) Healthy Education – Introduction to a Masterplan. Journal of Education. SignumTemporis, RPIVA (submitted).

Stueck, M. (2010). Children, researchers, educators – Early education on the Test. In: *M.Stueck (Ed.) Contributions to healthy education. Volume 14*, Strasburg: Chibri Publishing House.

Svence, G. (2006). *Pieaugušo psiholoģija*. Rīga: Raka

Špona, A., & Čamane, I. (2009). *Audzināšana Pašaudzināšana*. Rīga: RaKa.

Svence, G. (2006). *Pieaugušo psiholoģija*. Rīga: Raka.

Špona, A., & Čamane, I. (2009). *Audzināšana Pašaudzināšana*. Rīga: RaKa.

Vedins, I. (2011). *Mācīšanās māksla*. Rīga: Avots.

Щуркова, Н. Е. (2016). *Восхождение к нравсвенности Москва*: ИТРК. http://www.lizda.lv/content/files/EI_rezolucija_2011_lv.pdf (skatīts. 12.01.2018)

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 137-144

LEARNING FROM THE KNOWLEDGE AND EXPERTISE OF OTHERS

Gilberto Marzano
Rezekne Academy of Technologies, Latvia,
and Janusz Korczak University in Warsaw, Poland

Luis Ochoa Siguencia
Jerzy Kukuczka Academy of Physical Education in Katowice, Poland

Abstract. *There is a broad consensus that the digital revolution is moving towards the reshaping of traditional professions and jobs. The key idea emerging from expert opinion is that continuing education and learning are essential to help people stay employable in the labor force, and this idea is behind most of the programs and projects co-funded by the European Union over the last decade. Experts are also persuaded that education systems should be adapted to prepare individuals for the changing labor market, and that technological advances will offer new widely available ways to access education. From this perspective, new forms of learning that harness digital technology should be explored.*

Recently, we have been seeing an increasing interest from researchers in the engagement of connected people in initiatives and processes with social relevance, such as crowdfunding, crowdsourcing, and crowd sensing. Crowd learning is a new topic whose borders are not still well-defined.

This paper focuses on internet social learning and crowd learning, which appear to be closely related to two new topical fields of investigation: ubiquitous learning and smart and connected cities. It will present some preliminary results from an ongoing research on how interconnected citizen can use, share, remix, and co-construct learning and cultural resources.

Keywords: *collaborative learning, crowd learning, digital social learning, participatory learning.*

Introduction

The educative process, it has been argued, is a teaching-learning process. Although it consists of teaching on one hand and learning on the other, teaching and learning are actually interrelated activities. Learners are not passive recipients of what teachers provide and teachers are not neutral repeaters (Seufert, 2003).

The modern concept of the teaching-learning process is grounded on the principle that learners are at the center of the educational process and on the fact that individuals are not perfectly alike. Contemporary educators are persuaded that teaching is not only about giving and checking knowledge, but encompasses many other non-secondary activities, such as guiding, stimulating and motivating

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3083

learners, helping learners to be effective, supporting and reinforcing positive attitudes of learners, and so on. Moreover, teaching-learning is seen as a triangular process that comprises teachers, learners, and the subject matter being taught/learned.

However, over the last few decades, digital technology has been rapidly affecting and sometimes disrupting the teaching/learning process. Advances have been so rapid and profound, in fact, that, nowadays, the distance traveled since the first e-learning application seems enormous. The advances in Internet technology and, since the 2000s, the spread of social networking platforms have led to new forms of learning that are often in stark contrast to more traditional ones based on face-to-face and synchronous paradigms. The possibilities of social media and virtual interactions mean that the co-presence of teachers and learners in a physical classroom is no longer required and, accordingly, new modalities for synchronous and asynchronous learning have been introduced.

Recently, it has been claimed that digital technology will improve the efficacy of self-directed learning (Collins & Halverson, 2010), a learning practice that is, it is argued, strategic in adult education. Indeed, the ongoing digital revolution is moving towards the reshaping of traditional skills and jobs, and a large part of the workforce should be retrained in order to acquire new competencies and maintain their positions.

The article draws upon new forms of learning ushered in by ubiquitous connectivity and the popularity of ideas of smart cities as territories with a high capacity for learning and innovation (Albino, Berardi, & Dangelico, 2015; Huang, Zhuang, & Yang, 2017).

It focuses on crowd learning and internet social learning, highlighting how interconnected citizen can use, share, remix, and co-construct learning and cultural resources. Figure 1 illustrates the context of the teaching-learning process in a ubiquitous teaching-learning environment.

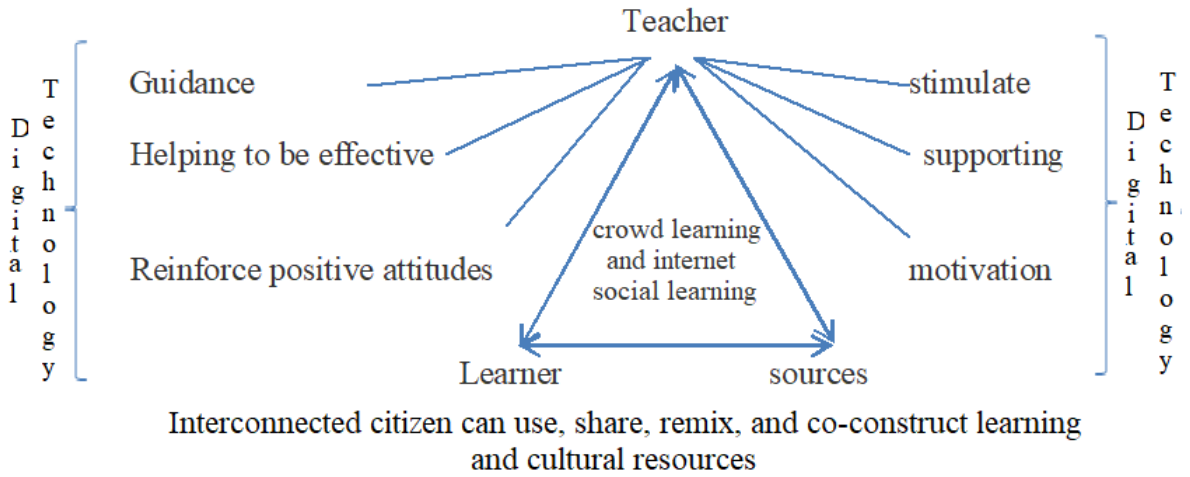


Figure 1. **The ubiquitous teaching-learning context** (Source: own research)

Research methodology

Our research into crowd learning and internet social learning was performed on the current literature by analyzing online databases and selected scientific journals, including ERIC, EBSCO, ScienceDirect, Web of Science, Springerlink, and Wiley. We also searched on Google Scholar, Academia.edu, and Researchgate.net to cover any missing studies and to evaluate the popularity of papers.

In order to capture relevant pieces of research, search criteria were based on the following combinations of keywords: “crowd learning”, “internet social learning”, “learning by social media”, and “ubiquitous learning”. We used filters to restrict the search, and concentrated our attention on publications from the last four years [2014, 2015, 2016, and 2017] concerning the subject of “education”. The following inclusion criteria were adopted:

- subject of publication was relevant to our research;
- publication was academic and peer-reviewed;
- publication presented a conceptual or theoretical background;
- publication had a well-defined research design;
- sample was wide enough.

Our analysis of the literature resulted in 46 relevant publications, since we eliminated about 95 articles which did not respect the inclusion criteria. For example, we found that many articles containing the term “crowd learning” were instead focused on crowdsourcing or crowd sensing.

It is proper to underline that this is an ongoing research, and the work done so far should be considered as an exploratory step in the study of learning from the knowledge and expertise of others.

In the following paragraphs, we introduce a few of the elements that emerged from our preliminary analysis.

Ubiquitous learning

A major benefit of digital media is their independence from physical space and, as a consequence, their ubiquity. The portability of computing and communication devices has facilitated new forms of learning, namely Electronic learning (E-learning), Mobile learning (M-learning), and, recently, Ubiquitous learning (U-learning).

Ubiquitous learning is commonly defined as learning anywhere, anytime, and is closely associated with digital mobile technologies:

> *U-learning is a learning paradigm which takes place in a ubiquitous computing environment that enables learning the right thing at the right place and time in the right way*. (Yahya, Ahmad, & Jalil, 2010: 120)

Most of the recent articles on ubiquitous learning focus on the design of ubiquitous learning environments, and address learning issues that are emerging in the face of the greater mobility and heterogeneity of computing facilities (Kalaivania & Sivakumar, 2017). A ubiquitous learning environment (*u*-learning) is supported by mobile and ubiquitous computing technologies which include mobile devices, and embedded computing devices such as GPS, RFID tags, pads, and badges, as well as wireless sensor networks and devices (Chiu, Tseng, & Hsu, 2017).

Solutions are proposed in order to exploit ubiquitous computing resources in learning processes in ways that harmonize various aspects such as flexibility, high adaptability, and intelligence. In this regard, Smart Learning Environments (SLEs) have been designed to deliver better and faster learning by enriching the environment with context-aware and adaptive digital devices. They should provide learners with multidimensional information and interventions that can stimulate a learner to learn as well as to socialize and collaborate with other learners.

Smart and connected cities

The notion of Smart and Connected Cities is a relatively new concept. In 2009, IBM launched a program called *Smarter Cities* to investigate the integration and application of new sensors, networking, and analytics to urban centers (Harrison et al., 2010). Similarly, in 2012, Cisco created a new division named *Smart and Connected Communities* to commercialize its new products and services developed through pilot projects conducted in three major world cities, namely Amsterdam, San Francisco, and Seoul (Coleman, Rajabifard & Crompvoets, 2016).

These initiatives share the vision, matured at the beginning of the 2000s, that the ICT industry is able to provide cities with new and effective tools to help their sustainable development (Albino, Berardi, & Dangelico, 2015).

The notion of Smart and Connected Communities (SCC) embraces a collection of initiatives rather than a tightly defined discipline (Green, 2011), and Cisco, which coined this term, uses it to indicate an orientation towards digital innovation in order to create new revenue and better serve citizens. The *Smart+Connected Digital Platform* promoted by Cisco is a pay-as-you-go cloud-hosted service for aggregating, analyzing, and correlating data from wired or wireless sensors.

In the context of SCC, digital crowdsourcing, as the practice of outsourcing tasks to a crowd, has been argued to be the best way to engage individuals for

providing new ideas and solutions as well as to involve users for cocreation and optimization of tasks, and reduction of costs.

Crowd learning share with crowdsourcing the idea of the engagement of crowd exploiting the opportunities offered by ubiquitous connectivity and intelligent applications.

Internet social learning and crowd learning

Social media have introduced profound changes in the way people interact and communicate (Fuchs, 2017). They provide an individual with the opportunity to play an active role in spreading opinions and connecting with a large mostly unknown audience. As a result, social media have enhanced participatory attitudes, although, paradoxically, are at the same time playing a part in increasing the segmentation of relationships, since users of social networks prefer to interact with those who share the same preferences and beliefs.

An interesting aspect that is emerging from our research is the topicality of *social learning theory* (Bandura, 1977) in internet-based learning approaches. In fact, the concept that "learning is a social activity" where individuals achieve their learning goals by interacting with each other (Stamps, 1997; Gherardi, Nicolini, & Odella, 1998; Pritchard & Woollard, 2013) is shared by many researchers engaged in internet social learning and online collaborative learning (Yu, Tian, Vogel, & Kwok, 2010; Hamid, Waycott, Kurnia, & Chang, 2015; Liao, Huang, Chen, & Huang, 2015). In the selected papers, 15 % make reference, either directly and indirectly, to social learning theory.

Furthermore, many articles on internet social leaning focus on online collaborative learning experiments (75 %), particularly concerning technological aspects (Toth, Ludvico, & Morrow, 2014; Popescu, 2014; Harasim, 2017), whilst only 25 % focus on learning processes, for example peer learning experiments (Kim, Cho, & Kim, 2015) or a qualitative metasynthesis (Mnkandla & Minnaar, 2017).

From our research, crowd learning appears to be a relatively new concept that essentially encompasses three main areas:

- Machine learning;
- Crowdsourcing and crowd sensing applications;
- Massive Open Online Courses (MOOC).

Indeed, crowd learning is designed as a process that involves "harnessing the knowledge and expertise of many people to answer questions, solve problems, or enable collaborative learning" (Sharples, Kloos, Dimitriadis, Garlatti, & Specht, 2015). It can accordingly be seen as a process of learning from the knowledge and experience of others.

On the basis of our research, we can define crowd learning as a form of collective learning in which individuals contribute their knowledge and experience to the achievement of prefixed learning objectives. This definition encompasses machine learning as well as crowdsourcing. In effect, we can gather data from crowd sources in order to implement machine learning solutions but studying the knowledge acquisition of individuals in time and space, namely in crowd contexts, can lead to the implementation of more effective crowdsourcing applications (Prpić, Shukla, Kietzmann, & McCarthy, 2015). Learning how a crowd behaves and knowing its attitudes are crucial factors, both in designing new services for a broad audience and in emulating learning capability in a machine.

Some preliminary questions

Many theoretical and practical questions have emerged from our research. A few of them are very challenging:

- How can we bring crowd paradigms to satisfy real social needs?
- What are the implications for privacy and security?
- How can we keep up, with crowd technological involvement controlling and guiding it?

These questions encompass both technical and social aspects.

Indeed, many of the articles we analyzed contain references to learner issues, as well as advice and recommendations:

- New solutions should support learners' reflection
- Content should be presented in such a way as to avoid learners' annoyance

Researchers are also cognizant of various social implications of crowd-based applications such as, for example:

- People's self-consciousness
- Different level of granularity in technology appropriation
- Control by users
- Social positive results
- Broad affordability

Conclusion

From our research, it emerges that, in crowd learning and internet social investigations, a great emphasis is put on technology, especially in regards to its integration, and a lot of effort is being directed at designing powerful and flexible environments that can support more sophisticated learners' expectations. Nevertheless, it is very likely that both crowd learning and internet social learning

research will impact on and affect current educational models as a whole. Indeed, although there are some who argue that the process of pedagogy will remain the same (Kalantzis, 2006; Kalantzis & Cope, 2008), many authors are persuaded that educational processes will change according to the new learning opportunities and modalities (Khapaeva & Genči, 2016; Sahito & Vaisanen, 2017). New learning paradigms that involve intelligent programs and smart devices will lead towards new forms of relationships and, accordingly, towards to a new generation of educational models. For example, what will peer-learning or collaborative learning mean if the learning interaction is with a robot or an intelligent virtual assistant?

From this perspective, our opinion, matured from the present research, is that crowd learning should be proposed as an autonomous scope of investigation.

The next step of our research will focus on the design of crowd learning as a distinct area of investigation with the aim of stimulating common research in order to tackle various questions, both technical and social, that ubiquitous connectivity is raising in the education field.

References

Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology*, *22* (1), pp. 3-21.

Bandura, A. (1977). *Social learning theory*, Prentice-Hall

Chiu, C. K., Tseng, J. C., & Hsu, T. Y. (2017). Blended context-aware ubiquitous learning in museums: environment, navigation support and system development. *Personal and Ubiquitous Computing*, *21* (2), pp. 355-369.

Coleman, D., Rajabifard, A., & Crompvoets, J. (2016). Spatial Enablement in a Smart World. *SMART WORLD*, 1. Available at: http://snig.dgterritorio.pt/portal/docs/noticias/Spatial_Enablement_in_a_Smart_World_2016.pdf#page=16; last accessed 22.01.2018.

Fuchs, C. (2017). *Social media: A critical introduction*. Sage.

Gherardi, S., Nicolini, D., & Odella, F. (1998). Toward a social understanding of how people learn in organizations: The notion of situated curriculum. *Management learning*, *29* (3), pp. 273-297.

Green, J. (2011). *Digital Urban Renewal-Retro-fitting Existing Cities with Smart Solutions is the Urban Challenge of the 21st Century*. Ovum. Available at: https://www.cisco.com/c/dam/en_us/solutions/industries/docs/scc/Digital_Urban_Renewal.pdf; lasr accessed 22.01.2018.

Harasim, L. (2017). *Learning theory and online technologies*. Taylor & Francis.

Hamid, S., Waycott, J., Kurnia, S., & Chang, S. (2015). Understanding students' perceptions of the benefits of online social networking use for teaching and learning. *The Internet and Higher Education*, *26*, pp. 1-9. Available at: https://umexpert.um.edu.my/file/publication/00007217_106152.pdf; last accessed on 01.14.2018.

Harrison, C., Eckman, B., Hamilton, R., Hartswick, P., Kalagnanam, J., Paraszczak, J., & Williams, P. (2010). Foundations for smarter cities. *IBM Journal of Research and Development*, *54* (4), 1-16.

Huang, R., Zhuang, R., & Yang, J. (2017, June). Promoting Citizen's Learning Experience in Smart Cities. In *International Conference on Blended Learning*, pp. 15-25. Springer, Cham.

Kalisz, D. E. (2015). Crowd learning: Innovative harnessing the knowledge. *Innovative management education pedagogies for preparing next-generation leaders*.

Kalaivania, R., & Sivakumar, R. (2017). A survey on context-aware ubiquitous learning systems. *International Journal of Control Theory and Applications, 10*, pg. 15.

Khapaeva, S. S., & Genči, J. (2016, November). Educational technologies for the effective implementation of engineering education. In *Emerging eLearning Technologies and Applications (ICETA), 2016 International Conference on*, pp. 165-170.

Lambert, L., Walker, D., Zimmerman, D., Cooper, J., Lambert, M. D., Gardner, M. E., & Ford-Slack, P. J. (1995). The constructivist leader. New York: Teachers College Press.

Liao, Y. W., Huang, Y. M., Chen, H. C., & Huang, S. H. (2015). Exploring the antecedents of collaborative learning performance over social networking sites in a ubiquitous learning context. *Computers in Human Behavior, 43*, pp. 313-323.

Popescu, E. (2014). Providing collaborative learning support with social media in an integrated environment. *World Wide Web, 17* (2), pp. 199-212.

Prpić, J., Shukla, P. P., Kietzmann, J. H., & McCarthy, I. P. (2015). How to work a crowd: Developing crowd capital through crowdsourcing. *Business Horizons, 58* (1), pp. 77-85.

Pritchard, A., & Woollard, J. (2013). *Psychology for the classroom: The social context*. Routledge.

Sahito, Z., & Vaisanen, P. (2017). Effect of ICT Skills on the Job Satisfaction of Teacher Educators: Evidence from the Universities of the Sindh Province of Pakistan. *International Journal of Higher Education, 6* (4), pp. 122-136.

Seufert, T. (2003). Supporting coherence formation in learning from multiple representations. *Learning and instruction, 13* (2), pp. 227-237.

Sharples, M., Kloos, C. D., Dimitriadis, Y., Garlatti, S., & Specht, M. (2015). Mobile and accessible learning for MOOCs. *Journal of interactive media in education, 2015* (1). Available at: https://jime.open.ac.uk/articles/10.5334/jime.ai/; last accessed on 01.16.2018.

Stamps, D. (1997). Communities of Practice. Learning Is Social, Training Is Irrelevant? *Training, 34* (2), pp. 34-42.

Toth, E. E., Ludvico, L. R., & Morrow, B. L. (2014). Blended inquiry with hands-on and virtual laboratories: the role of perceptual features during knowledge construction. Interactive Learning Environments, 22 (5), pp. 614–630.

Yahya, S., Ahmad, E. A., & Jalil, K. A. (2010). The definition and characteristics of ubiquitous learning: A discussion. *International Journal of Education and Development using Information and Communication Technology, 6* (1), 1, pp. 117-127.

Yu, A. Y., Tian, S. W., Vogel, D., & Kwok, R. C. W. (2010). Can learning be virtually boosted? An investigation of online social networking impacts. *Computers & Education, 55* (4), pp. 1494-1503.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 145-158

COMMODIFICATION OF CULTURAL IDENTITIES AND/OR EMPOWERMENT OF LOCAL COMMUNITIES: DEVELOPING A ROUTE OF NUCLEAR TOURISM

Natalija Mažeikienė
Vytautas Magnus University, Lithuania

Eglė Gerulaitienė
Vytautas Magnus University, Lithuania
Šiauliai University, Lithuania

Abstract. *Research presented in the paper focuses on commodification of cultural identities and community empowerment strategies of cultural tourism in Visaginas. One of challenges in developing tourism is orientation toward profit and commodification of culture, which becomes a problem in regard to practicing authentic identities. The article presents efforts of researchers working in the project EDUATOM to scientifically substantiate construction of new educational nuclear/ atomic tourism route in the Ignalina Nuclear Power Plant (INPP) region. The authors discuss what diverse parameters and elements of place identity could be included and represented in the tourism in Visaginas and how community empowerment and involvement of different stakeholders might contribute to practicing various commodification strategies. The article analyses commodification of cultural identities and community empowerment strategies of educational, cultural, nuclear/atomic tourism in Visaginas, using research strategy of case study, including methods of document analysis, conversations (formal and informal) with stakeholders, secondary data analysis, construction of Post-Soviet identities and empowerment of local communities.*

Keywords: *cultural identities, commodification of cultural identities, self-commodification, cultural tourism, Visaginas, Ignalina Nuclear Power Plant, nuclear tourism, atomic tourism, empowerment.*

Introduction

The article presents efforts of researchers working in the project EDUATOM[1] to scientifically substantiate construction of new educational nuclear tourism route in the Ignalina Nuclear Power Plant (hereafter, INPP) region in Lithuania by applying new approaches in STEM education and seeking to

[1] The project 'The Didactical Technology for the Development of Nuclear Educational Tourism in the Ignalina Nuclear Power Plant (INPP) Region (EDUATOM)' (No. 01.2.2-LMT-K-718-01-0084/232) is funded by the grant from the Research Council of Lithuania.

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3381

empower local communities of town Visaginas which was created and built as a satellite-settlement for the workers of the INPP. It is envisaged by the researchers, social partners and stakeholders participating in this initiative that the new route will be consistent with the idea and practice of similar nuclear/ atomic tourism museums, expositions and sites existing in other countries. Atomic tourism route under construction will embrace an exposition of Information Centre at INPP which will be adjusted to the new conception of so called 'Movement of Science Centres' (Beetlestone, 1998), when science communication expositions (science centres, science museums, and etc.) include elements of *edutainment* (entertainment + education). Referring to the new concept of Science Centre the exposition at the INPP will be based on interactivity, application of IT technologies, and will rely on visitor's sensory experience and educational needs of different groups of visitors. The future exposition will stick to the idea of science museums and tourist centres to combine the exposition with other activities, i.e. lectures, creative laboratories, camps, events, performances, traveling, temporary exhibitions. Current explosion of Information Centre at the INPP is dedicated mostly to technological and security aspects of decommissioning. The first block of the INPP was suspended in 2004, the second in 2009. Decision on decommissioning was made upon Lithuania's accession to the EU. The completion of the INPP decommissioning works is planned for the year 2038. It is worth mentioning that the current exposition presents the historical and social development of identity of the town of Visaginas quite poorly and fragmentarily.

Apart the Information Centre at the INPP, the future nuclear tourism route will include other objects and sites in Visaginas town. In this way science communication on atomic energy will be complemented by elements of cultural tourism by exposing multicultural and multilingual identity of local community, specific and unique demographic profile of Visaginas and identity of the town. The town was built in 1975 and before 1992 it had the name „Sniečkus" which was a surname of leader of the Lithuanian Communist Part. The future workers, most of whom were of Russian origin, arrived (were sent by Soviet authorities) from various places in the Soviet Union to build the town. Today most of the inhabitants of the town are Russian-speaking inhabitants (e.g., there are 15 % of Lithuanians and Belarusians equally). Initially designed by Soviet authorities as a satellite-settlement for the workers of the plant, Visaginas is still isolated from the rest of the country both culturally and geographically. According to Baločkaitė (2010), Visaginas represents a complex and specific development of post-soviet identity in a mono industrial urban site ('a migrant island'), which is very difficult to position in the post-Soviet cultural, political and economic context. From cultural and heritage tourism perspective, Visaginas becomes a site of Soviet

industrial and urban heritage, 'a showcase of socialism' (Freimane, 2014) and in this way turns into dissonant and contested heritage. All the above mentioned aspects suggest a specific collaborative and empowering approach for the development of nuclear tourism route while involving local and national stakeholders, negotiating and mediating ways and strategies of local identity building within the framework of more democratic politics of identity and memory.

The aim of the paper is to analyze commodification of cultural identities and conceptualize community empowerment strategies of educational, cultural, nuclear tourism in Visaginas. The article focuses on the following objectives:

1) Disclose the concept of commodification in representing cultural identities;
2) Identify dissonant strategies of Post-Soviet identities, discuss strategies and practices of Post-Soviet urban identities in tourism and envisage nuclear tourism conditions in the development of this type of tourism in Visaginas;
3) Reveal community empowerment strategies and the role of stakeholders in developing nuclear tourism in Visaginas.

The article analyses commodification of cultural identities and community empowerment strategies of educational, cultural, nuclear/atomic tourism in Visaginas, using research strategy of case study, including methods of document analysis, conversations (formal and informal) with stakeholders, secondary data analysis, scientific literature review, analyzing concepts of commodification, construction of Post-Soviet identities and empowerment of local communities.

Commodification of identities as commercialised hospitality in cultural tourism

One of the challenge in developing tourism is orientation toward profit and commodification of culture which becomes a problem in regard to practicing authentic identities. Scholars stress ambiguity of "sharing culture" in tourism industry when culture and identity, traditions and cultural practices are 'sold out', transformed into tourism products, and representations, commodity and alienable products for consumption and for the benefit of tourists (Bunten, 2008; Cassel & Maureira, 2017). In this case a distinction between the acted identity and the 'real' identity not presented to tourists could occur (Stronza, 2008). It is discussed by scholars whether such creation of tourist product and commodification lead to a loss of cultural authenticity or it could help to reinforce cultural identity and strengthen the culture (Bunten, 2008; Cassel & Maureira, 2017).

Cultural tourism is defined here not just as 'monumental tourism" which is aimed on visiting monuments and cultural sites (museums, monuments, archaeological and historical sites). We rely on the broader notion of cultural tourism which is mentioned by N. Galı-Espelt (2012) and refers to the definition provided by International Council of Monuments and Sites (ICOMOS): 'Cultural tourism may be defined as any activity that allows visitors the experience of discovering other people's ways of life, allowing them to experience on the one hand their customs, traditions, physical environment or ideas, and on the other, access to places of architectural, historical, archaeological or any other type of cultural value' (Ibid., p. 47).

Representatives of culture as cultural tourism workers in order to sell a tourist product perform a self-commodification which 'can be broadly defined as a set of beliefs and practices in which an individual chooses to construct a marketable identity product while striving to avoid alienating him- or herself' (Bunten, 2008: 381). The self-commodification is conceptualised as a complicated psychological and intercultural communication process which deals with convergence of emotional labour, identity construction, and the politics of representation. Creation of representations of local culture usually is performed in line and within the framework of hegemonic politics of representations: it is based on perceptions and concepts shared by dominant society and cultural majority and attached to the local culture.

Certain strategies and forms how this self-commodification is carried out are recognised and distinguished. It is carried out by presenting concrete culture and identity in uniform, standardized and simplified way and by self-exoticizing as the Other and by meeting tourists' desires tourist to have an encounter with the Other. For instance, A. C. Bunten (2008) presents a case of tribal tours in Alaska when local cultural tourist workers (Native Alaskans) presents identity of their culture in the frame how White majority perceive indigenous people. Some authors note that such encounter with the Other is unequal whereas the Western, middle-class guests see representatives of local cultures as places the different and exotic (Cassel & Maureira, 2017). The condition of being an exotic Other in cultural tourism in order to make profit and sell out the culture and identity as commodity may contradict to identities and authentic practices which are exercised by local people. There could be ‚tensions *within* these expressions of the local and what (and how) community memories are validated and legitimised and what are marginalised or erased altogether '(Murtagh et al., 2017: 508).

Another possible self-commodification strategy while presenting own culture and identity in cultural tourism industry as a product and service, besides the self-exoticization, is to put up resistance by presenting diverse forms of displays and expressions of identity and trying to strive against stereotyping

(Bunten, 2008). In quite complicated process of balancing between contradictory and contesting strategies and practices local tourist workers perform a role of "cultural brokers" by negotiating between expressions of identity of hosts (representatives of local culture) and expectations and stereotypes of dominant cultural group (guests). This cultural brokering could induce an exchange of expectations and expressions of identities in *both groups* (hosts and guests) and diminish tensions caused by unequal configuration of power within concrete politics of identity.

In the process of developing the nuclear tourist route in Visaginas and the INPP region the scholars and local stakeholders recognise inevitability of (self-) commodification which becomes a constituent element of tourism in its orientation towards generation of revenue. Additionally, other aims of the tourism in this region are identified. The tourism could be a vehicle to empower local communities and foster a new sense of belonging.

Envisaging self-commodification strategies in nuclear and postsocialist heritage tourisms in Visaginas

When designing the tourist route in the INPP region, we take into consideration the nature of self-commodification discussed above. One of the possible ways in cultural tourism is to present identity through self-exoticizing as the Other. Seeking to attract tourists and create motivation to travel several hundred kilometres from their home towns and come to remoted place (Visaginas), some distinctive and unique ('exotic') attraction should be offered. On the one hand, exotic otherness and specificity could be constructed by appealing to representation and image of the atomic city and the INPP, which used to play a significant role in national economy by producing electricity in a specific way – by deploying a nuclear energy for power which is different from other types of energy resources (oil, hydroelectric power, wind power plants). Improving the exposition at the INPP by adjusting it to the idea of the Science Centre and presenting knowledge about nuclear energy in a mode of edutainment could become such an self-exoticization element which could attract the tourists. One more attractive element here could be a reference to the place of nuclear energy in world economy. Exposition at the INPP could be presented as one of similar objects of nuclear/ atomic museums, sites and objects in the world. In this case the exposition will include not only narrative on security and safety of decommissioning. It could embrace broader issues of nuclear physics. Additionally, the exposition could encompass social, cultural and symbolic representations exposing discourses of mono-industrial atomic cities and social consequences, environmental concerns, post-industrial and post-apocalyptic

images, associations and references to other nuclear energy objects (Chernobyl, Hiroshima, Fukushima, etc). In this case certain elements of 'dark tourism' may appear.

Another unique quality of this region, which could be used in the self-exoticization strategy, is specific and distinctive post-soviet identity of Visaginas which was built in the Soviet era and is directly associated with the first 'exotic' feature – atomic energy industry and the INPP. Although Lithuania together with all neighbouring countries belongs to the post-Soviet region, the situation of Visaginas is unique. The question here arises whether and under what circumstances, the Soviet identity of the Visaginas city can become a tourist product and commodity. Under what conditions Lithuanian tourists would "buy" this Soviet and post-Soviet specificity of the city and consider it as different from what they see in their own towns and home places. At the same time, whether the community of Visaginas is ready to "sell" this commercial product.

Considering the possibility to transform identity of the town into a commercial tourist product and commodity one more aspect that should be taken into consideration is that identity is not stable, static and immutable. Culture is changing and evolving, it is a dynamic concept that varies in time and space. In cultural tourism it should be decided what diverse parameters and elements of place identity will be included and represented in the tourism. Change of place identity in Visaginas could be associated with several stages of life of the town. I. Freimane (2014) distinguishes three main stages, according to the major political transformations in the country. The first stage begins with the decision to build the INPP and Visaginas in 1974. The first stage is associated with the Soviet period when the city was built by referring to the highest standards of quality of life at that time in Soviet Union and seeking to construct the most powerful nuclear power in the world. The beginning of the second stage of development of the town is associated with new status of the INPP when in 1991 the INPP becomes an important strategical industrial object which generates energy for independent Lithuania. The third stage of the development of the town is associated with entering EU in 2004 when decommissioning of the INPP becomes a condition and prerequisite for Lithuania to become EU member. All these 3 historical stages implied transformations and redefinition of identity moving from enthusiasm, proud of living in 'soviet paradise' and feeling of privilege in Soviet times to uncertainty, fear and hope in the period of negotiations with EU during the second stage; nostalgia, narratives of decline and anxiety about the future in the third stage after closure of two blocks of the INPP.

Apart from the historical transformations of the city's identity, it should be noted that due to its Soviet identity Visaginas falls into category of dissonant and contested heritage. Variety of ways of dealing with this type of heritage and

'unwanted' past in Visaginas has been described by R. Baločkaitė (2010). The author refers to postsocialist urban identities formation strategies distinguished by C. Young and S. Kaczmarek (2008) whereas 'unwelcome past' is overcome by applying decommunization, returning to the pre socialist Golden Age, and fostering Westernization/Europeanization. These strategies are specific case of formation of place identity with enacting processes of historical memory, remembrance and forgetting. According to Baločkaitė (2010, 2012) identity formation in Visaginas as one of the planned socialist cities has poor reference to pre-socialist past, so the strategy of looking for the Golden Age outside of the Soviet era cannot be realized in the region. That is why other strategies are being used more actively. Anyway, as stated Baločkaitė, all these other strategies are quite ideologically ambivalent. One can find a strategy of the use of de-ideologized images of young and green city with beautiful nature. The third strategy of construction post-soviet urban identity is *partial* decommunization and private nostalgia for the socialist past and public denial in official institutionalised discourses. 'In Visaginas, the old identities have not been deconstructed and the – unwanted past remains present in multiple forms, including – inherited nostalgia of the first post-socialist generation (the restaurant 'Third Block'). The Soviet past is suppressed and suspended but not cancelled; it is rendered invisible in official representations but memorialized in daily life' (Baločkaitė, 2010: p. 51). One more strategy of construction of post-socialist identity distinguished by the author is commercialisation of the soviet past ('Socialism for Sale') in socialist heritage tourism as a specific niche within heritage tourism which has been successfully realised in Poland and other post-communist countries (i.e.'Grūtas Park' in Lithuania) by positioning certain places (i.e. Nowa Huta - district of Krakow) as a socialist landmark and relating to authentic experience of socialism. It is worth noting that variety of representation strategies is deployed here including grotesque, postmodern pastiche with nostalgia, irony and parody. All the strategies of constructing of place identity in Visaginas as a post-socialist town will be taken into consideration while developing atomic/ nuclear route and arranging discussions with stakeholders.

Community empowerment and role of stakeholders in developing nuclear tourist route in Visaginas

Community empowerment is deemed to encourage communities to participate in tourism planning and development. Some authors (Nyaupane et al., 2006) suggest that members of the host community should be involved in tourism planning because they: (a) have an historical understanding of how the region adapts to change; (b) will be the ones most closely affected by tourism; and (c) will be expected to become integral part of the tourism product. As it is noted in

the literature, participation can be facilitated through surveys, focus groups and charters, which can set down the rights of the community (Tukamushaba & Okech, 2011). This promotes collaboration, transparency and accountability for all destination stakeholders. When we discuss the case of Visaginas community, the stakeholders, who should be involved in the building consensus about tourism related policies are: Visaginas Municipality (Strategic planning department, Education, culture and sport department); INPP; NGOs; municipal-owned cultural, recreation and sports institutions; INPP Region Business and Tourism Information Centre; school communities; politicians (city council, political parties, mayor); artists (including artists from other cities); entrepreneurs; and scholars. Involvement of the local community creates a bond through mutual understanding and trust. It thus helps to reduce potential conflicts and all the costs associated with their resolution (Bramwell & Sharman, 1999). Jackson (2006) developed a framework to foster the process of community participation and involvement in tourism development. He showed that the process begins with identification of key stakeholders and interest groups, establishment of communication mechanisms and information flow channels among stakeholders (Tukamushaba & Okech, 2011). As the key stakeholders who would contribute to the development of Visaginas cultural tourism were identified, it is crucial to analyse different interests that these stakeholders possess in the framework of tourism development.

Visaginas Municipality and other public authorities. Economic and social development of Visaginas municipality for many years has been closely related to the operation of the INPP, and the current urban development vision is linked both to the innovative development of the industry in Visaginas and promotion of Visaginas as the centre of energy competency. Representatives of the public authorities stress the role of nature and culture in the INPP region which provides opportunities for educational and cultural tourism. The main tourist attractions in the region are named such as sports and sport leisure activities (walking, cycling, boating, kayaking and etc.) and countryside accommodation, multicultural cuisine of the region. However, it is stressed in conversations with representatives of public authorities that other towns and places of the region (Ignalina and Zarasai) have richer and more attractive nature resources and facilities.

Speaking about quality of cultural and leisure facilities and activities in the town it could be noted that Visaginas municipality has carried out a survey of inhabitants. A considerable amount of respondents (44.31 %) is not satisfied with the city's cultural life. Similar number of respondents (40 %) negatively evaluates the infrastructure of cultural institutions and cultural needs. Also, respondents indicated that there is a lack of water entertaining, tourism routes, tourism and educational settings. The research showed that Visaginas inhabitants rated the

worst tourism information and services. Analysing Visaginas municipality strategic development plan 2016-2022 it was found that the municipality seeks to create attractive and effective use of existing leisure and sports facilities. But it is still notable that municipality focuses on nature more than on the cultural needs of inhabitants and tourists. This attitude indicates a greater focus on tourism which is based on resources of local nature than on cultural assets. Referring to strategies of place identity construction mentioned above in the article we can admit that authorities emphasize de-ideologized image of Visaginas as young and green town with comfortable conditions to live and spend leisure time. Multicultural, multilingual and multi-ethnic profile of Visaginas is perceived as an important resource to represent uniqueness of the town and deliver 'commercialised hospitality' in cultural and recreational tourism. Strategy of positioning of the town as socialist city within the framework of socialist heritage tourism has not been sounded and was evaluated by representative of public authorities quite negatively in brainstorming discussions. It confirms once more the observation made by R. Baločkaitė (2010) that the official and institutional discourse tries to minimize the socialist past while constructing place identity.

Ignalina Nuclear Power Plant is the state enterprise. As one of the main stakeholders the INPP supports idea of nuclear tourism in the region. Still the interest in tourism development is specific, as its main task is to carry out the decommissioning of the INPP, which is set to be completed by 2038. The enterprise's goal is to become an expert on safe and efficient nuclear facility decommissioning. Current role of the INPP in tourism development is to spread information about safety and security in the use of nuclear power. The INPP has intention to modernise and promote activities of Information Centre which is very active in arranging tours for domestic and foreign tourists. Up to now the INPP has been visited by about 95,000 visitors, 5517 tours have been organized. On the other hand, the INPP is a stakeholder which might contribute to the development of soviet heritage tourism. Site of the INPP (reactors, other industrial infrastructure) as well as some facilities (for instance, soviet style canteen) could be used while developing soviet industrial and urban heritage tour. As it was discussed by Baločkaitė (2010, 2012), socialist past is „exotic" and remains a significant component of everyday life, therefore the site of the INPP with facilities (i.e. canteen) might become a place to encounter „exotic" soviet interior, food and atmosphere which could attract the tourists.

Visaginas community and tourists would be interested in trying more innovative touristic routes, which might be commercialized, as 3D simulations while walking in the site of the INPP, or computer games, other simulations to effect a sense of adventure and feeling of danger, even if the INPP strategic objective is to insert and spread safety and security message.

Public Establishments as the INPP region Business and Tourism Information Centre and others

Public establishments in Visaginas provide all tourist information: different kind of routes, places of interest, information on events, accommodation, catering. These organizations are non-profit bodies which are established in order to contribute to the development of the region, help small and medium-sized businesses. These centres might contribute to the development of different tourism strategies in the region by helping enterprises to develop different products for commercialization.

Entrepreneurs and SME's

This group of stakeholders should become the most interested in developing commercialised products and services for tourists in the region. Entrepreneurs will be able to set up catering, accommodation services. We see this group of stakeholders active in commodification of „socialist past" based on ambivalent ideological place identity strategies of soviet heritage tourism (it was the case of Grūtas Park in Druskininkai - an exposition of Soviet ideological relics). However, as shown by statistics, over the last 5 years the number of active business enterprises in the Visaginas municipality almost has not changed and is about 470, there is a tendency to slight decreases in their number of SME's, from 301 companies in 2013 to 293 companies in 2016. The newly registered number of small and medium-sized enterprises fell to 15 in 2016. This shows that business as a sector is quite weak in the region. People are reluctant to set up their own business on the financial risk or ignorance from where to start and what to pursue.

Artists

Visaginas community representatives display different attitudes on commodification of the past through heritage tourism. Quite a new trend emerges - Visaginas becomes 'a centre of gravity' for artists and their creative projects (for example, singer from Visaginas Alina Orlova, project "Babocka" by British photo artists Laurie Griffiths and Jonty Tacon, photo journalist Artūras Morozovas, documentary theatre performance 'Žalia pievelė'/ 'Green Meadow'). These artists and performances present Visaginas town and people with their identities and destinies related to closure of the INPP. As R. Baločkaitė (2010) states, contradiction of two contesting discourses has been revealed – on the one hand, public denial and forgetting of the Soviet past in official and institutional discourse; on the other hand, private remembrance and nostalgia in everyday life. Meanwhile the artists is a group which expresses an emancipation from the dominant discourses by various forms of artistic and symbolic expression, as their massage is constructed through symbols, metaphors and visual forms. Artists using a variety of artistic forms and genres (photography, painting, theatre performances, etc.) create alternative discourses which differ significantly from

discourses produced by authorities. For instance, British photo artists Laurie Griffiths and Jonty Tacon in their art project „Babocka“[2] develop a narrative on post-industrial landscape which embraces elements of environmental ecological discourse and has some connotations with post-apocalyptic vision and reference to the site of Chernobyl. Similar ideas and discourses are exposed in the documentary theatre performance „Žalia pievelė“, which presents not only place identity of Visaginas and the INPP but refers to global and European nuclear industry situation, discussing ecological consequences of nuclear industry after hundreds and thousands of years. Besides other representations, Visaginas is portrayed as a town on 3 nuclear-waste repositories -‚tombs‘. The play exposes associative connection of Visaginas and the INPP with Chernobyl. Thus, such depiction and presentation of post-apocalyptic and post-industrial discourses open the door to the ‚dark tourism‘on the one hand, on the other hand opens a new opportunity for education, critical pedagogy, to deal with envinronmental concerns drawing attention to postindustrial landscapes and social consequences of monoindustrial cities.

Scholars/ researchers

There are numerous researches done while investigating Visaginas phenomenon and providing various data and making intellectual insights on the town and the region. Researchers investigated topics on demographic profile, risk communication, nuclear energy efficiency and security, place identity in the post-socialism era, postindustrial landscape, multiculturalism and multilingual studies. Such problematic topics as construction of urban identities were discussed in scientific literature in Lithuania and abroad. Scholars reveal multilateral and ambiguous identity of Visaginas. These stakeholders express emancipation from dominant local discourses on national and place identity produced by local and national authorities. Scientific articles and monographs contribute to understanding of specificity and uniqueness of Visaginas (multiethnic profile, soviet heritage and strategies of post-soviet identities formation). All this input could contribute to development of educational, nuclear and cultural tourism in the region by applying strategies of self-exoticization and commodification.

Evaluation of interests, expectations and perspectives of these stakeholders allows to arrange ‘negotiations’ among them and find effective communication means to agree on new ideas on the route and create innovative strategies of representation of place identity in newly emerging nuclear tourism.

[2] More information on the project: http://www.babochka.co.uk/

Conclusions

Referring to scientific literature in the field and analysis of stakeholders in Visaginas, certain commodification strategies could be suggested for the development of nuclear and cultural tourism in Visaginas: transformation of existing Information Centre at the INPP into contemporary Science Center, self-exoticization of the town and tourism workers as the Other. The self-exoticization could be realized by representing the INPP and Visaginas as distinctive and 'exotic' object of atomic industry site and atomic town, by promoting representations of soviet identity and sticking into a newly emerging trend of socialist heritage tourism. Multicultural, multiethnic and multilingual profile of the town could become an important resource and asset of cultural tourism. At the same time this multicultural profile could be associated directly with narratives and storylines of socialist heritage tourism. These main strategies could be complemented by images of green and comfortable city with beautiful nature. In the process of developing nuclear tourist route in Visaginas and the INPP region the scholars and local stakeholders recognize inevitability of (self-) commodification which becomes constituent element of tourism as a "commercialized hospitality'. Empowering strategies of stakeholders in the process of (self-) commodification would imply learning to construct different "commodified personas" (Bunten, 2008) by designing different routes, recognizing and identifying different tourist groups, by representing local and place identities in relation to this variety of tourists. At the same time, one more strategy of (self) commodification should be elaborated – resistance to being objectified according to stereotypes. The widespread stereotype of Visaginas as a soviet city could be challenged by strengthening new layers of identity of the town when Visaginas could be represented as a place of residence of artists and their creative projects, the town with energetic, ambitious, intercultural and open-minded youth (the second and the third generation of inhabitants).

The research revealed the value of collaborative and empowering approach for the development of nuclear tourism route while involving local and national stakeholders, negotiating and mediating ways and strategies of local identity building within the framework of more democratic politics of identity and memory. Involvement of the local community creates a bond through mutual understanding and trust.

The research delineates that different groups of stakeholders have different expectations and interests in the development of cultural and nuclear tourism in Visaginas. The official and institutional discourse is reluctant to display identity of the town referring to the socialist past. Meanwhile scholars and artists create alternative discourses which refer to ideas and images of postindustrial landscapes

and post-apocalyptic imaginary, to socialist and soviet identity of the town. Current art projects on Visaginas demonstrate transforming power of the artistic expression to present alternative discourses and negotiate the process of constructing place identity.

Acknowledgements

This article presents findings of the research project 'The Didactical Technology for the Development of Nuclear Educational Tourism in the Ignalina Nuclear Power Plant (INPP) Region (EDUATOM)'.

This research was funded by a grant (No. 01.2.2-LMT-K-718-01-0084/232) from the Research Council of Lithuania.

References

Baločkaitė, R. (2010). Post-Soviet Transitions of the Planned Socialist Towns: Visaginas, Lithuania. *Studies of Transition States and Societies 2* (2), 63 – 81.

Baločkaitė, R. (2012). 'Coping with Unwanted Past in Planned Socialist Towns: Visaginas, Tychy, and Nova Huta. *Slovo 24* (1), 41 – 57.

Beetlestone, J. G., Johnson, C. H., Quin, M., & White, H. (1998). The Science Center Movement: contexts, practice, next challenges. *Public Understanding of Science, 7*, 5-26.

Bramwell, B., & Lane, B. (1999). Collaboration and Partnerships for Sustainable Tourism. *Journal of Culture or Selling Out Sustainable Tourism 7*, 179–181

Bunten, A. C. (2008). Sharing? Developing the Commodified Persona in the Heritage Industry. *American Ethnologist, Vol. 35, No. 3 (Aug., 2008)*, 380-395.

Cassel, S. H., & Maureira, T. M. (2017). Performing identity and culture in Indigenous tourism – a study of Indigenous communities in Québec, Canada. *Journal of Tourism and Cultural Change, 15:1*, 1-14, DOI: 10.1080/14766825.2015.1125910

Galı´-Espelt, N. (2012). Identifying cultural tourism: a theoretical methodological proposal. *Journal of Heritage Tourism, Vol. 7, No. 1, February 2012*, 45–58.

Freimane, I (2014). *Dwelling in Visaginas: The Phenomenology of Post-Socialist Town.* Master's Thesis. University of Glasgow and University of Tartu.

Jackson, L. (2006). Ameliorating the negative impacts of tourism: a Caribbean perspective. *International Journal of Contemporary Hospitality Management, 18*, 574-582.

Young, C., & Kaczmarek, S. (2008). The Socialist Past and Postsocialist Urban Identity in Central and Eastern Europe. The Case of Łódź. *Poland European Urban and Regional Studies. 15* (1), 53-70.

Murtagh, B., Boland, P., & Shirlow, P. (2017). Contested heritages and cultural tourism. *International Journal of Heritage Studies, 23:6*, 506-520, DOI: 10.1080/13527258.2017.1287118

Nyaupane, G. P., Morais, D. B., & Dowler, L (2006). The role of community involvement and number/type of visitors on tourism impacts: A controlled comparison of Annapurna, Nepal and Northwest Yunann, Nepal. *Tourism Management, 27* (6), 1373–1385.

Stronza, A. (2008). Through a new mirror: Reflections on tourism and identity in Amazon. *Human Organization, 67* (3), 244–257.

Tukamushaba, E. K., & Okech, R. N. (2011). Tourism training and education, community empowerment and participation in tourism planning and development: A case of Uganda. *Journal of Tourism, 12* (1), 79-102.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 159-174

МОДЕЛИРОВАНИЕ КЛАСТЕРНОЙ СИСТЕМЫ ДОПОЛНИТЕЛЬНОГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ В УСЛОВИЯХ КАЧЕСТВЕННЫХ И СТРУКТУРНЫХ ИЗМЕНЕНИЙ ЭКОНОМИКИ РЕСПУБЛИКИ САХА (ЯКУТИЯ)

Modeling of the Cluster System of Additional Professional Education in Conditions of Qualitative and Structural Changes in the Economy of the Sakha Republic (Yakutia)

Evgenia Mikhailova

Olga Chorosova

Galina Solomonova
M.K. Ammosov North-Eastern Federal University, Russian Federation

Abstract. *The process of implementing the cluster approach in education requires the awareness of its theoretical, methodological and applied aspects taking place in Russia. The basis of the cluster methodology in education is the consideration of forms of socio-economic relations aimed at creating a modern innovative products as an holistic set of elements in conjunction relations between them. The cluster approach needs the methodological basis of interdisciplinary processes, scientific and theoretical awareness of key tasks and strategic orientations in professional and additional professional education since the management theory of educational clusters, the regulation of establishment and functioning has not yet received proper development in regional conditions. The following methodological principles are used in the research of clusters and cluster systems: systematic approach for the research of economic development of the region considering the clusters and cluster systems of external and internal environment; use of the regional features of functioning; the feasibility of modeling activities results of cluster systems.*

The research aim is to develop a cluster system model of additional professional education at NEFU capable of meeting the needs of Yakutia by highly qualified personnel. Objectives: to analyze the conceptual field of the cluster system in the educational space of NEFU with regard to additional professional education; the comparative research of the clusters of the North-Eastern Federal University, the Sakha Republic (Yakutia) in assessing its activity and influence on innovative, technological and social development of the region etc.

Keywords: *project, region, professional and educational cluster model, additional professional education.*

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3408

Введение
Introduction

Новая роль университетов заключается в том, что они становятся центрами регионального развития и формирования конкурентоспособного человеческого капитала в федеральных округах. Проблемное поле исследования определяется в соответствии с современными функциями профессионального образования, включая дополнительное профессиональное образование: обеспечение экономики квалифицированными кадрами; гарантия получения обучающимися необходимой квалификации или повышение ее уровня в соответствии с профессиональными стандартами; обеспечение готовности обучающихся к интеграции в рынок труда. Данные функции обеспечиваются современными технологиями профессионального образования, его взаимодействием с рынком труда, работодателями, государственными органами и общественными организациями, что находит свое воплощение в кластерном подходе в образовании (Mikhailova, 2013, 2014; Rudneva, 2017).

Несоответствие темпов развития дополнительного профессионального образования современным темпам социально-экономического развития общества актуализируют задачу внедрения инновационных механизмов интенсификации в модернизационные процессы в образовании. К таким механизмам мы относим моделирование кластерной системы дополнительного профессионального образования.

Актуальность проекта для Республики Саха (Якутия) обусловлена происходящими структурными и качественными изменениями экономики Республики Саха (Якутия), которые вызваны социально-экономическими, политическими, инновационными и глобальными трендами, а также принятием в декабре 2016 года стратегического документа «Стратегия социально-экономического развития Республики Саха (Якутия) до 2030 года с целевым видением до 2050 года», определяющего точки роста региона. Акцент сделан на развитие человеческого капитала, на пространственное развитие региона, на развитие базовых отраслей промышленности и формирование креативной индустрии.

В Стратегии социально-экономического развития Республики Саха (Якутия) на период до 2030 года с определением целевого видения до 2050 года определяется новое качество образования, в том числе в отношении дополнительного профессионального образования и непрерывного образования взрослых. Так, для достижения цели по формированию открытого пространства конкурентоспособной системы образования с учетом потребностей общества и инновационного развития экономики одними из задач, требующих решения, являются: формирование открытого

профессионального образовательного пространства, ориентированного на подготовку конкурентоспособного человека труда (внедрение новых профессий, требующих высокой квалификации (сложные профессии с творческим компонентом).

Изученность проблемы
Problems

В результате проведенных в 2016-2017 гг. исследований выявлены особенности современного состояния дополнительного профессионального образования в Республике Саха (Якутия), что освещалось в предыдущих публикациях (Mikhailova & Chorosova, 2017: 72 -75; Chorosova & Solomonova, 2017).

На основании анализа научной литературы, публикаций региональных, российских экспертов выявлены основные тенденции, критические ситуации, перспективные технологии, которые будут оказывать влияние на развитие человеческого капитала в Республике Саха (Якутия); определен спектр управленческих решений, необходимых для развития человеческого капитала региона.

Выявлены сложившиеся противоречия между:

- интенсивным социально-экономическим развитием региона, предъявляющим повышающиеся требования к трудовым ресурсам, квалификациям специалистов различных отраслей экономики и возможностью существующей системы ДПО удовлетворить эти потребности;
- востребованностью современного опережающего дополнительного профессионального образования в Республике Саха (Якутия) и отставанием системы ДПО от темпов социально-экономического развития региона;
- имеющимся потенциалом (наличие кадровых, научно-методических и материально-технических, информационно-коммуникационных и др. ресурсов) для реализации современных форм дополнительного профессионального образования, включая сетевое, дистанционное образование, электронное обучение) и отсутствием запроса со стороны организаций и предприятий реального сектора экономики, социальной сферы и бизнеса по обучению своих кадров на территории РС (Я) силами и ресурсами лицензированных образовательных организаций, реализующих ДПП.

В России процесс экономической кластеризации, т.е. кластерообразования, в настоящее время осуществляется преимущественно стихийно. В связи с этим его теоретико-методологические и прикладные аспекты изучены не в полной мере. Как правило, в современных исследованиях авторы отмечают актуальность применения данных подходов, однако не определяют сущность феноменов, лежащих в основе организации процесса экономической кластеризации: «кластерная политика», «кластерная инициатива», «кластерная технология», «кластерный консалтинг», что убеждает в необходимости конкретизации терминологии.

В основе кластерной методологии лежит рассмотрение формы экономических отношений, направленных на создание современного инновационного продукта, как целостного множества элементов в совокупности отношений и связей между ними. Таким инновационным продуктом может стать модель региональной кластерной системы дополнительного профессионального образования. Между тем, кластерный подход в профессиональном и дополнительном профессиональном образовании нуждается в методологическом обосновании междисциплинарных отношений на стыке педагогической и экономической наук, а теория управления образовательными кластерами, регулирования процесса их создания и функционирования еще не получила должного развития в региональных условиях.

Изучение научной литературы показало, что в настоящее время образовательные кластеры, имея важное значение для развития государственно-общественного партнерства, усиления связей науки, образования и производства, тем не менее обладают высокой степенью риска и неопределенностью некоторых результатов деятельности, которая, в свою очередь, обусловливается неопределенностью целеполагания.

Ускорение темпов смены производственных технологий в современной экономике приводит к увеличению разрыва между квалификацией, полученной выпускниками организаций профессионального образования (в первую очередь, в части ее практической составляющей), и быстро меняющимися требованиями работодателей. В этих условиях усиливается роль дополнительного профессионального образования, которое сегодня должно основываться на тесном взаимодействии с работодателями – предприятиями, запросы которых к квалификациям своих профессиональных кадров быстро меняются в соответствии с качественными и структурными изменениями экономики региона. Для того, чтобы стать одним из факторов развития человеческого потенциала региона, дополнительное профессиональное образование нуждается в реализации кластерного подхода, когда в сфере образования реализуются и

получают свое развитие экономические категории и механизмы развития (Future of the Sakha Republic (Yakutia), 2014; Sakha Republic (Yakutia), 2050; Foresight study, 2014).

Университеты все в большей мере становятся движущей силой в развитии общества, региона и страны в целом, разрабатываются концепции повышения эффективности российских вузов для регионального развития, что подтверждается комплексными научными исследованиями в этой области. Так, рассматриваются роль и потенциал Северо-Восточного федерального университета им. М. К. Аммосова в развитии территории Дальнего Востока (Mikhailova, 2013).Университет становится институтом развития общества, общественно-культурным центром и «фабрикой мысли», традиционные функции – подготовка высококвалифицированных кадров и научные исследования – должны дополняться новыми функциями: университет становится ключевым субъектом развития региона, генерирует стратегические идеи, инициирует программы развития, разрабатывает необходимые подходы и технологии для развития экономики, социальной сферы, культуры (Sakha Republic (Yakutia), 2050; Foresight study, 2014).

Вопросы развития федерального университета, его роли и потенциала в развитии Дальнего Востока и российской Арктики рассматриваются в контексте модернизации страны, реализации крупномасштабных инновационных проектов развития макрорегиона, а также процессы становления университета как ведущего научно-образовательного, инновационного, экспертно-аналитического центра Северо-Востока России (Mikhailova, 2014).

В России, как и во всем мире, осознание значимости кластерного подхода было связано прежде всего с решением задач модернизации и технологического развития национальной экономики. Однако реализация российских кластерных проектов затрудняется различного обстоятельствами: недостаточностью методической и информационно-консультационной, финансовой поддержки кластеров; нескоординированностью деятельности федеральных и региональных органов исполнительной власти, органов местного самоуправления и субъектов кластерных объединений.

Кластерный подход сегодня является наиболее перспективной формой взаимодействия образования, науки и промышленности. Учитывая наличие многих вопросов, возникающих в процессе реализации кластерного подхода в профессиональном образовании, в том числе дополнительного профессионального образования, исследуются понятийное поле данного термина, кластерные инициативы в СВФУ и место профессионально-

образовательного кластера ДПО в кластерной системе федерального университета.

Существует множество определений собственно понятия «кластер», том числе «кластерная политика», что рассматривается в работах отечественных авторов достаточно длительное время (Tsihan, 2003; Smirnov, 2010; Sokolova, 2014; Shchinova, 2015, Kuzmenko, 2015).

Кластеры в образовании определяются чаще понятиями образовательный кластер (Vasenin, 2013; Galiakhmetova, 2013; Smirnov, 2010) и научно-образовательный кластер (Chuchkalova, 2013), так как под ним понимается система, создающая не только кадровый потенциал, но и научную продукцию. Научно-образовательные кластеры как явление реальной жизни и объект теоретических исследований явление достаточно новое и поэтому освещается в научной литературе весьма дискуссионно. Учитывая взаимосвязи научной и образовательной деятельности в организационном, функциональном и целевом аспектах во многих работах предпочтение отдается понятию «научно-образовательный кластер» (НОК) (Bogatyrev et al., 2016; Agaeva et al., 2014; Shaydullina, 2013).

В настоящее время образовательные кластеры обладают высокой степенью риска и неопределенностью некоторых результатов деятельности, что обусловливается неопределенностью целеполагания при их создании, например, образовательных кластеров.

Изучение научной литературы позволило определить главную функцию профессионально-образовательного кластера ДПО: подготовка и развитие высококвалифицированных кадров с новым типом мышления в контексте инновационного этапа развития экономики и запросов работодателей в квалификациях кадров.

Исследование позволит провести сравнительное изучение кластеров, созданных и создающихся в СВФУ, Республике Саха (Якутия) и северо-восточных регионах РФ (Магаданская область, Чукотский автономный округ и Камчатский край) с точки зрения их сущности и содержания, приоритетных функций, базовых характеристик, цели и стратегии, принципов развития.

Цель и задачи исследования
Purpose and objectives of the study

Разработка модели кластерной системы дополнительного профессионального образования на базе СВФУ, способной удовлетворять потребности Якутии и других северо-восточных регионов России в высококвалифицированных кадрах, требует решения следующих задач.

Анализ понятийного поля кластерной системы в образовательном пространстве федерального университета применительно к дополнительному профессиональному образованию; изучение статистических данных, сравнение показателей ДПО по северо-восточным регионам РФ; сравнительное изучение кластеров СВФУ, Республики Саха (Якутия), северо-восточных регионов РФ с точки зрения оценки эффективности их деятельности и влияния на инновационное, технологическое и социальное развития региона – это те основы, на которых будет основываться проектирование дизайна модели регионального профессионально-образовательного кластера (ПОК) дополнительного профессионального образования в рамках развития в регионе элементов цифровой экономики и формирования регионального цифрового пространства.

Если мы говорим о подготовке и развитии высококвалифицированных кадров с новым типом мышления в контексте инновационного этапа развития экономики и запросов работодателей в квалификациях кадров, моделирование кластерной системы невозможно без выявления качественных и количественных характеристик с учетом структурных изменений и трендов рынка труда в РС (Я), выявления потребности в ключевых компетенциях и квалификациях, необходимых для соответствия профессиональным стандартам и профессиональным требованиям рынка труда. Это потребует проведения мониторинга в отраслях экономики, сбора, анализа и интерпретации статистических данных.

Научная новизна исследования заключается в идее разработки модели кластерной системы дополнительного профессионального образования на базе СВФУ как фактора инновационного развития региона и оценке его эффективности в контексте технологического, инновационного и социального развития Республики Саха (Якутия). Моделирование кластерной системы дополнительного профессионального образования в Республике Саха (Якутия) предпринимается впервые, но основывается на научном подходе, результатах комплексного исследования современного состояния дополнительного профессионального образования в регионе в 2016-2017 гг., выявлении сильных и слабых сторон в контексте взаимосвязи с особенностями развития экономических зон Якутии, прогнозировании перспектив его развития.

Предлагаемые подходы и методы, и их обоснование для реализации цели и задачи исследований
Proposed approaches and methods and their justification for the realization of the research aim and objectives

В процессе исследования кластерови кластерных систем используются следующие методологические принципы: системного подхода к исследованию экономического развития региона с учетом внешней и внутренней среды функционирования кластерови кластерных систем; многообразия форм исследования и комплексных оценок; учёта региональных особенностей функционирования; информационной обеспеченности; кластерных систем; практической реализуемости результатов моделирования деятельности кластерных систем.

При исследовании кластеров и кластерных систем применяются методы экономического, функционального, структурного и статистического анализа, организационного моделирования, экспертных оценок, планирования и программирования. Кроме того, используется методика проведения комплексного социально-экономического мониторинга региона с учетом его особенностей.

Таким образом, используется комплекс методов исследования: теоретические (изучение научной литературы, нормативно-правовых документов); констатирующие (изучение статистических данных в области дополнительного профессионального образования, социально-экономической ситуации в регионе и стране); экспериментальные (различные виды социологических опросов, математические методы обработки собранного материала); сравнительный анализ (кластеров университета и региона; развития дополнительного профессионального образования в северо-восточных регионах России (Республика Саха (Якутия), Чукотский автономный округ, Камчатский край, Магаданская область) в контексте его влияния на их инновационное, технологическое и социальное развитие.

Прогнозируемые результаты и их значимость
Prospective results and their relevance

Научная значимость проекта заключается в планируемом изучении теоретико-методологических и прикладных аспектов формирования кластерной системы дополнительного профессионального образования в регионе, конкретизации терминологии, методологическом обосновании кластерного подхода в профессиональном и дополнительном профессиональном образовании. В процессе реализации проекта будут

изучены региональные особенности кластерного подхода в профессиональном образовании в северо-восточных регионах России, разработана модель региональной кластерной системы дополнительного профессионального образования и проведено сравнительное изучение кластеров Республики Саха (Якутия), кластеров СВФУ с точки зрения оценки эффективности их деятельности и влияния на инновационное, технологическое и социальное развития региона; будут определены параметры эффективного взаимодействия между субъектами профессионально-образовательного кластера, разработаны теоретические основания развития кластерной системы дополнительного профессионального образования: сущность и содержание, приоритетные функции, базовые характеристики кластеров, цель и стратегии, принципы развития; концепция и модель развития кластерной системы дополнительного профессионального образования в регионе.

Социально-экономическая значимость исследования видится в определении и создании условий для обеспечения доступности и качества дополнительного профессионального образования в Якутии; разработке механизмов синхронизации тенденции развития дополнительного профессионального образования с потребностью региональной экономики в трудовых кадрах; развитии человеческого потенциала региона.

Таким образом, профессионально-образовательный кластер ДПО (ПОК ДПО) станет механизмом объединения научно-образовательного комплекса и учреждений ДПО, объединений работодателей и общественных организаций макрорегиона, способствующим своевременному удовлетворению производственных и социальных потребностей экономических зон макрорегиона; согласованию целей и интересов важнейших управляющих субъектов по отношению к человеческому капиталу региона: это федеральная власть, региональная власть, крупный бизнес, население региона, инновационные учреждения социальной сферы; консолидации административных, финансовых ресурсов (федеральных, региональных и муниципальных бюджетов) для достижения баланса интересов образовательных организаций и др.

Заключение
Conclusions

1. Новая роль университетов в качестве центров регионального развития и формирования конкурентоспособного человеческого капитала предполагает выполнение следующих функций: обеспечение экономики квалифицированными кадрами; гарантия получения

обучающимися необходимой квалификации или повышение ее уровня в соответствии с профессиональными стандартами; обеспечение готовности обучающихся к интеграции в рынок труда.

2. Качественное профессиональное образование, дополнительное профессиональное образование предполагают формирование открытого профессионального образовательного пространства, ориентированного на подготовку конкурентоспособного человека труда (внедрение новых профессий, требующих высокой квалификации (сложные профессии с творческим компонентом).
3. В Якутии, как и в целом в России, не в полной мере изучены теоретико-методологические и прикладные аспекты кластерного подхода в образовании. В настоящее время образовательные кластеры, имея важное значение для развития государственно-общественного партнерства, усиления связей науки, образования и производства, тем не менее обладают высокой степенью риска и неопределенностью некоторых результатов деятельности, которая, в свою очередь, обусловливается неопределенностью целеполагания.
4. В условиях ускоренного развития и смены производственных технологий в современной экономике увеличивается разрыв между квалификацией, полученной выпускниками организаций профессионального образования (в первую очередь, в части ее практической составляющей), и быстро меняющимися требованиями работодателей. Дополнительное профессиональное образование сегодня должно основываться на тесном взаимодействии с работодателями – предприятиями, запросы которых к квалификациям своих профессиональных кадров быстро меняются в соответствии с качественными и структурными изменениями экономики региона.
5. Существующие сегодня противоречия между интенсивным социально-экономическим развитием региона и возможностью существующей системы ДПО удовлетворить эти потребности; востребованностью современного опережающего дополнительного профессионального образования в Республике Саха (Якутия) и отставанием системы ДПО от темпов социально-экономического развития региона и др. могут быть решены при условии реализации кластерного подхода в образовании. С пониманием этого факта сегодня в Северо-Восточном федеральном университете создается кластерная система: социокультурный, медицинский, строительный, профессионально-образовательный, туристско-сервисный кластеры, кластер арктических инноваций, а также университетские инжиниринговые центры, ориентированные на кадровое обеспечение инновационного развития региона. Северо-Восточный федеральный университет сегодня

переживает трансформацию в университетский центр инновационного, технологического и социального развития северо-восточных регионов России. Глубинный характер трансформационных процессов требует качественных изменений в подходах к профессиональному образованию в контексте тенденций социально-экономического развития региона. Кластерный подход сегодня является наиболее перспективной формой взаимодействия образования, науки и промышленности. Так, главная функция профессионально-образовательного кластера ДПО заключается в подготовке и развитии высококвалифицированных кадров с новым типом мышления в контексте инновационного этапа развития экономики и запросов работодателей в квалификациях кадров.

6. Моделирование кластерной системы дополнительного профессионального образования в Республике Саха (Якутия) предпринимается впервые, но основывается на научном подходе, результатах комплексного исследования современного состояния дополнительного профессионального образования в регионе в 2016-2017 гг., выявлении сильных и слабых сторон в контексте взаимосвязи с особенностями развития экономических зон Якутии, прогнозировании перспектив его развития.
7. Социально-экономическая значимость исследования видится в разработке механизмов синхронизации тенденции развития дополнительного профессионального образования с потребностью региональной экономики в трудовых кадрах; развитии человеческого потенциала региона. Профессионально-образовательный кластер ДПО призван стать механизмом объединения научно-образовательного комплекса и учреждений ДПО, объединений работодателей и общественных организаций макрорегиона, способствующим своевременному удовлетворению производственных и социальных потребностей экономических зон макрорегиона.

Summary

1. The new role of universities is to become centers of regional development and the formation of competitive human capital in Federal districts. The problem field of research is defined in accordance with the modern functions of vocational education including additional professional education: providing the economy with qualified personnel; the guarantee that students will receive the necessary qualifications or improve its level in accordance with professional standards; the readiness of students to integrate into the labour market. Discrepancy in rates of developing additional professional education to modern rates of economic and social development in society increases introduction of innovative intensify

mechanisms joining the modernization processes in education. Such mechanisms include the modelling the cluster system.

2. The Strategy of social and economic development of the Sakha Republic (Yakutia) defines a new quality of education for the period up to 2030 with the target vision until 2050 including with regard to additional professional education and continuing education for adults: one of the objectives is the formation of an open professional and educational space focused on the preparation of competitive labour person (the introduction of new professions that require high qualification (complex profession with a creative component)).

3. Study of the Problem. As a result of conducted in 2016-2017 years researches reveal the features of the current state of additional professional education in the Sakha Republic (Yakutia), which was covered in previous publications (Mikhailova & Chorosova, 2017: 72 - 75; Chorosova & Solomonova, 2017).

The existing contradictions between:

- intensive socio-economic development of the region, increasing requirements for labor resources, qualifications of specialists in various economic sectors and the ability of the existing DPO system to meet these needs;
- the demand for modern advanced additional professional education in the Sakha Republic (Yakutia) and the backwardness of the APE system from the pace of social and economic development of the region;
- the available potential (availability of personnel, scientific, methodological and material, information, communication and other resources) for the implementation of modern forms of additional professional education including network and distance education, e-learning and the lack of a request from organizations and enterprises of the real sector economy, social sphere and business on training their personnel in the territory of the Sakha Republic (Yakutia) by the forces and resources of licensed educational organizations implementing the APE.

4. In Russia, the process of economic clustering is currently carried out mainly spontaneously. In regard to this, theoretical, methodological and applied aspects have not been fully studied. Cluster methodology is based on consideration of the form of economic relations aimed at creating a modern innovative product as an integral set of elements in the aggregate of relations and relationships between them. The cluster approach in professional and additional professional education needs a methodological justification for interdisciplinary relations at the intersection of pedagogical and economic sciences and the theory of managing educational clusters regulating the process of their creation and functioning has not yet been properly developed in regional conditions.

5. Acceleration of the pace of changing production technologies in the modern economy leads to an increase in the gap between the qualifications received by the graduates of professional education institutions (primarily in terms of its practical component) and the rapidly changing demands of employers. In these conditions, the role of additional professional education is intensified, which today must be based on close interaction with employers - enterprises whose requests to the qualifications of their professional staff are rapidly changing in accordance with qualitative and structural changes in the region's economy. In order to become one of the factors in the development of the human potential of the region, additional professional education requires the implementation of the cluster approach when the economic categories and development mechanisms are implemented and developed in the sphere of education (Future of the Sakha Republic (Yakutia), 2014; Sakha Republic (Yakutia), 2050; Foresight study, 2014).

6. Today, the cluster approach is the most promising form of interaction between education, science and industry. Considering the presence of many issues arising in the process of implementing the cluster approach in professional education including additional vocational education the conceptual field of the term, NEFU cluster initiatives and the place of the professional and educational cluster of APE in the cluster system of the federal university are explored.

7. Currently, educational clusters have a high degree of risk and uncertainty in some performance results, which is due to the uncertainty of goal setting when they are created, for example, educational clusters.

The study of scientific literature made it possible to determine the main function of the professional and educational cluster of APE: the preparation and development of highly qualified personnel with a new type of thinking in the context of the innovative stage of economic development and employers' requests for personnel qualifications. The study will allow a comparative study of clusters created at NEFU, in the Sakha Republic (Yakutia) and the northeastern regions of the Russian Federation (Magadan Oblast, Chukotka Autonomous Okrug and Kamchatka Krai) in terms of their nature and content, priority functions, and strategy and principles of development.

8. Purpose and objectives of the study. Analysis of the conceptual field of the cluster system in the educational space of the federal university in relation to additional professional education; the study of statistical data, comparison of the indicators of APE in the northeastern regions of the Russian Federation; a comparative study of clusters of NFU, the Sakha Republic (Yakutia), the northeastern regions of the Russian Federation from the point of view of assessing the effectiveness of their activities and influencing the innovative, technological and social development of the region - these are the bases, on which the design of a model for a regional professional education cluster (VEC) of additional professional education within the framework of development in the region of elements of the digital economy and the formation of a regional digital space.

9. The scientific novelty of the research is the idea of developing a model of the cluster system of additional professional education based on the NEFU as a factor of the region's innovative development and its effectiveness in the context of technological, innovative and social development of the Sakha Republic (Yakutia). Modeling of the cluster system of additional professional education in the Sakha Republic (Yakutia) is being undertaken for the first time but is based on the scientific approach, the results of a comprehensive study of the current state of additional vocational education in the region in 2016-2017, the identification of strengths and weaknesses in the context of the relationship with the features of economic development zones of Yakutia forecasting the prospects of its development.

10. In the process of studying clusters and cluster systems, the following methodological principles are used: a systematic approach to the study of the economic development of the region, taking into account the external and internal environment of the functioning of clusters and cluster systems; diversity of research forms and integrated assessments; accounting for regional features of functioning; information security; cluster systems; practical implementation of the results of modeling the activity of cluster systems. In the study of clusters and cluster systems, methods of economic, functional, structural and statistical analysis, organizational modeling, expert assessments, planning and programming are applied. In addition, the methodology of complex socio-economic monitoring of the region is used with its features.

11. Predictable results and their significance

The scientific significance of the project lies in the planned study of the theoretical, methodological and applied aspects of the formation of a cluster system of additional professional education in the region, the concretization of terminology, and the methodological substantiation of the cluster approach in professional and additional professional education. In the process of the project implementation, regional features of the cluster approach in professional education in the north-eastern regions of Russia will be studied, a model of the regional cluster system of additional professional education will be developed and a comparative study of the clusters of the Sakha Republic (Yakutia), NEFU clusters from the perspective of assessing the effectiveness of their activities and impact on innovative, technological and social development of the region; the parameters of effective interaction between the subjects of the professional and educational cluster will be determined, theoretical bases for the development of the cluster system of additional professional education are developed: the essence and content, priority functions, basic characteristics of clusters, the purpose and strategies, development principles; concept and model of development of the cluster system of additional professional education in the region.

The socio-economic significance of the study is seen in the definition and creation of conditions for ensuring the accessibility and quality of additional professional education in Yakutia; the development of mechanisms for synchronizing the development trend of additional professional education with the need for a regional economy in labor personnel; development of the human potential of the region.

12. The vocational and educational cluster of the APE will become a mechanism for combining the scientific and educational complex and APE institutions, associations of employers and public organizations of the macroregion, contributing to the timely satisfaction of the production and social needs of the economic zones of the macroregion; the coordination of the goals and interests of the most important governing entities in relation to the human capital of the region: it is the federal government, regional government, large business, the population of the region, innovative institutions of the social sphere; consolidation of administrative, financial resources (federal, regional and municipal budgets) to achieve a balance of interests of educational organizations, etc.

APE - additional professional education

VEC - vocational education cluster

Литература
References

Chorosova, O. M., & Gerasimova, R. E. (2017). Monitoring kak instrument povyshenija kachestva obrazovatel'nyh uslug dopolnitel'nogo professional'nogo obrazovanija. *Obrazovanie cherez vsju zhizn': Nepreryvnoe obrazovanie v interesah ustojchivogo razvitija*, 479 – 486.

Chorosova, O. M., Gerasimova, R. E., & Solomonova, G. S. (2017). Metodologicheskie podhody k izucheniju nepreryvnogo professional'nogo obrazovanija v Respublike Saha (Jakutija*). Mezhdunarodnyj nauchno-issledovatel'skij zhurnal*, *3* (57), 72-75. Downloaded from*:* https://research-journal.org/category/2017/march2017/

Chorosova, O. M., & Solomonova, G. S. (2016). Upravlencheskie strategii v obnovlenii nepreryvnogo professional'nogo obrazovanija. *Vestnik Severo-Vostochnogo federal'nogo universiteta imeni M.K. Ammosova; Serija «Pedagogika. Psihologija. Filosofija», 2,* 31-39.

Chorosova, O. M., Gerasimova, R. E., & Solomonova, G. S. etc. (2016). Northern Teacher in Conditions of the Current Renewal Processes in Education. *The European Proceedings of Social & Behavioral Sciences. Future Academy; IFTE 2016: 2nd International Forum on Teacher Education*, 439-445. Downloaded from: https://apps.webofknowledge.com/summary.do?product=WOS&search_mode=GeneralSearch&qid=11&SID=N17iIVWVaPOSExUejD2

Cihan, T. V. (2003). Klasternaja teorija jekonomicheskogo razvitija. *Teorija i praktika upravlenija,* 5. Downloaded from: http://www.subcontract.ru/Docum/DocumShow_DocumID_168.html

Efimov, V. S., Lapteva, A. V., & Mikhailova, E. I. (2014). The impact of urbanization on the transmission of the culture and language of the Sakha people: a sociological analysis. *Archaeology, Ethnology and Anthropology of Eurasia, 43* (4), 127-134. Downloaded from http://foresight.sfu-kras.ru/node/317

Gerasimova, R. E., Nikulina, A. A., & Gorohova, N. I. (2017). Monitoring kachestva dopolnitel'nogo professional'nogo obrazovanija. *Pedagogicheskij zhurnal,* 5. Downloaded from: http://publishing-vak.ru/file/archive-pedagogy-2017-5/16-gerasimova-nikulina-gorokhova.pdf

Kuz'menko, N. I. (2015). *Obrazovatel'nye klastery kak sostavljajushhie innovacionnogo razvitija regiona*. Downloaded from: https://elibrary.ru/item.asp?id=24395300; https://elibrary.ru/download/elibrary_24395300_97191293.pdf

Mikhailova, E. I. (2013). Universitet – intellektual'naja platforma innovacionnogo razvitija severo-vostoka Rossii. *Vestnik mezhdunarodnyh organizacij: obrazovanie, nauka, novaja jekonomika, 1*, 80-86.

Mikhailova, E. I. (2014). Contribution of the North-Eastern Federal University to advancement in the mining industry of the Republic of Sakha, *Yakutia. Gornyi Zhurnal, 9,* 4-12. Downloaded from: http://www.rudmet.ru/journal/1562/article/26810/

Mikhailova, E. I., & Chorosova, O. M. (2017). Federal University: Synchronising Trends of Sustainable Development of a University and Region. *The European Proceedings of Social & Behavioral Sciences. Future Academy; IFTE 2017: 3rd International Forum on Teacher Education*, 518-526. Downloaded from: http://www.futureacademy.org.uk/publication/EpSBS/IFTE2017KazanFederalUniversityRussia

Mikhailova, E. I., & Chorosova, O. M. (2017). Razvitie sistemy dopolnitel'nogo professional'nogo obrazovanija RS (Ja) v uslovijah kachestvennogo i strukturnogo izmenenija jekonomiki regiona. *Pedagogika. Psihologija. Filosofija. Serija Vestnika SVFU, 4*, 96-108.

Respublika Saha (Jakutija) 2050. Forsajt issledovanie (2014).

Rudneva, T. I. (2017). Osnovnye napravlenija issledovanij v oblasti professional'nogo obrazovanija. *Obrazovanie v sovremennom mire: strategicheskie iniciativy*, 41-45.

Shhinova, R. A., Suvorova, L. A., & Zaushicyna, L. L. (2015). Klasternaja politika kak instrument povyshenija konkurentosposobnosti jekonomiki regiona. *Vestnik UrFU. Serija jekonomika i upravlenie, 3,* 457-473. Downloaded from: https://elibrary.ru/item.asp?id=24099615; https://elibrary.ru/download/elibrary_24099615_93396890.pdf

Smirnov, A. V. (2010). *Obrazovatel'nye klastery i innovacionnoe obuchenie v vuze*. Kazan'.

Sokolova, E. I. (2014). Termin «innovacionnyj obrazovatel'nyj klaster» v ponjatijnom pole sovremennoj pedagogiki. *Nepreryvnoe obrazovanie: XXI vek*. Downloaded from: http://lll21.petrsu.ru/journal/article.php?id=2371

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 175-184

PROBLEMS OF CONTENT PRODUCTION IN REGIONAL MASS MEDIA

Sandra Murinska
Rezekne Academy of Technologies, Latvia

Abstract. *This article examines problems and importance of content production in regional information space. This is an emerging question within a rapidly restructuring media landscape, and globalized information flows with aim to manipulate and destroy democratic order. Policy guidelines for Latvian media 2016 – 2020 describes five steps how to fight against these hazards. One of the steps are the strengthening of local information area and facilitating media pluralism, many tasks are dedicate to support regional media, realizing media fund programs with aim to ensure the availability of information for people in the regions.*
Regional journalism is classified as unexplored field of research, especially in Latvia, there is a lack of researches about how local journalism should work and what are their working strategies and problems.
This article analysis data of survey made among local journalists about their content production practices. The aim was to explore a) what are criteria for content production and selection of news, b) what kind of information is making local information space, c) what are the threats for journalism in regions. Respondents were local journalists in Latgale region of Latvia working in local newspapers, radio and television.
Results encountered a very strong attachment to local community and identity construction not to so much dealing with journalistic mission and techniques.
Keywords: *content productions, local journalism, regional journalism, hyperlocal news, media usage, community integration.*

Introduction

It seems in the 21st century is quite unpopular to talk about regional (or local) media, where the dynamics of communication and opportunities created by social media is dominating over society. Often these conditions are referred as a threat to regional and local media. This kind of media, which mainly focuses on geographically limited spatial representation of events, is looking for ways to continue to exist - within help of private investors as well as the state assistance. So called “big themes”, global communication – these are features you can`t find in regional journalism. Still it is important source of information in a particular environment.

Adjunct Professor of Journalism Studies at the University of South Australia Ian Richards explains idea of local news researcher Kannis who already in the

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3336

beginning of 90ties found "that local news is anything but inconsequential and that the news media 'produce local identity as much as they produce news" (Kannis, 1991, cited from Richards, 2012).

In Europe, countries with strong mass media traditions regional journalism, for example, printed press is described as opposite to capital or *big* journalism. "Even in countries like Germany – with a still 'healthy' local news market, local papers with high circulation, and a majority of professional journalists working in this field – local news tends to be seen as secondary to the national print and broadcasting sector in terms of quality and status", (Harnischmacher, 2014). The situation is similar in science as well. "Local news' has certainly not been among the prime research subjects in our field in the past decade. In fact, it appears to be a kind of neglected stepchild of both journalism and journalism research" (Harnischmacher, 2014).

In much of the literature such journalism is presented as 'merely a "smaller" version of the journalism practised in major cities with few, if any, distinguishing characteristics beyond the size and scope of its audience' (Bowd, 2010: 2). Although this journalistic status is assessed as insignificant in the global communication, however, regions, it exists and is part of the information spaces builders. In much of the literature, too, there is a lack of clarity around concepts such as 'local' and 'community' which are central to understanding rural and regional journalism. Yet the importance of such journalism has been apparent for years (Richards, 2012). Regional media is an important urban and regional operating practices, in order to inform the public of what is happening here is the neighbor's house, which is or is not doing, who is not responsible for its promises, government to ask for help, etc.

Since its inception, the local media, particularly newspapers, have had to take on the role of local watchdogs for communities. These media and journalists are close to their community, they have similar aims, and they understand audiences, their needs, interests and desires. Moreover, the most important thing – it is a message that is not reflected only in the local medium. However, local media environment also shows the involved parties when operating and / or affect the media. Also, the content of each of the journalistic methods and techniques differ. Especially in the era of new media which is counted as changing environment. Local media researcher Michael Harnischmacher says „there are worries about the diminishing role of traditional journalism or, more precisely, traditional journalistic virtues in the process of content production and one of those forces in many countries is the intrusion of alternative news websites on a local level, which are challenging newspapers' monopoly on local and regional information" (Harnischmacher, 2014).

Consequently, local and regional journalism environment raises questions about the principles, values and thus content building trends. The question is, of

course, not restricted exclusively to local journalism, it is a vital problem for journalism in general. The main purpose of this article is to state problems faced in local journalism in content creation process in region of Latgale *a) what are criteria for content production and selection of news, b) what kind of information is making local information space and c) what are the threats for journalism in regions.* The questionnaire and qualitative interviews was make to investigate opinion of local journalists point of view in Latgale region of Latvia.

Theoretical issues: the role of local media

Taking into account the diverse range of mass communication means, especially the electronic ones, local print media still plays a significant role in people's everyday life, even though local media has a marginal role in the theoretical literature and science in general.

Researchers in nowadays are worried about the changing nature of journalism in the era new media environment. There are worries about the diminishing role of traditional journalism or, more precisely, traditional journalistic virtues in the process of content production (Harnischmacher, 2014). Looking on the existing researches in local and regional media field, it looks it is one of the stable journalism practice because of its location and functions in the community. Researchers emphasize local journalism as a mediator because it joins the regional and the national: “Local and regional newspapers seem to specialize in local journalism, i.e. they cultivate local journalism as a niche product for local audiences and advertisers. Further, there is evidence that these media are important communication channels for local as well as national political actors” (Skogerbø & Winsvold, 2011). Studies of theoretical literature show that the role and functions of local media are mainly related to the link between identity and journalism and the local community. Although the importance of the features mentioned above cannot be questioned, each cultural and social environment has its own difference in practice, because it is affected by media policy, economic conditions, technological options, etc. As Coxon says “since the early 2000s, the media has become driven primarily by its own (commercial) interests and is now more an author than a mediator of culture” (Coxon, 2017). The importance of community news is attributed to the two processes it can (and should) facilitate: (1) revealing the social structure to the residents and (2) cultivating a collective sense of belonging and a cohesive set of identities by providing discursive resources for the symbolic construction of community (Janowitz, 1967 [1952]; Lowrey et al., 2008). Results of the study that explored the role of local media in facilitating community communication and understanding, and, through this, to shed light on their possible contribution to

regional social capital in Australia (Richards, 2014) concluded, "local media facilitate communication between journalists and non-journalists to the benefit of the local community. In each region, local people rely on "their" media for news and information about local happenings and assume that this news and information will be presented in ways which support the common interests of the region. For their part, local journalists rely on local people to let them know of matters, which can be published, or broadcast, and to inform them of the context in which these matters have developed. What enters the public arena through the local media as a result of this reciprocal relationship was considered by all to be different from the content typically provided by larger metropolitan or national media". Author reminds about one of the central value of journalism – it is community building, by publishing material which elicits empathy, admiration or pride in others' achievements, journalists can enhance the bond that joins people together as a society (Richards, 2014), through the emphasis on common values rather than on the solution of conflicting values. Thus local media are making network around itself.

Still, in some local markets, the traditional local press faces a new competitive environment. Contemporary changes in local media are tied with a wider change in the way in which we live our lives, the way in which the economy works, and the way in which politics works (Nielsen, 2015). In addition to the websites of the legacy media, independently produced news sites can be found, with a wide array of appearances from weblogs to community-based forums to semiprofessional and professional online 'newspapers' (Harnischmacher, 2014). It could come one of the challenges for traditional local media market and is called a hyperlocal media that operates in Web 2.0 environment, using different journalistic genres and sources and making concrete social organization. It makes concrete audience as well. For example, local news websites content are made both of journalists and reader's content, which is typical community network making hyperlocal news. As in this research local website representatives were included in survey, it is noteworthy to pay attention to such occurrence.

Such way of information space construction and content production has been described as *hyperlocal*. Rather than dwelling on its typology, the term 'hyperlocal' is used as a metonym to signify the focal tensions around its relationship with the community and its civic function (Zhang, 2017). Hyperlocal media have been described as "a hybrid of civic, community, statewide public affairs, and alternative newspaper movements combined with the interactive and broadcast abilities accompanying Web 2.0" (Dickens, Couldry, & Fotopoulou, 2015). There are made several reseraches to explore and concept and expression of hyperlocal news in local communities because it`s potential to reach and activate community: analysed the relationship between local storytelling and civic engagement: when local stories are missing from mainstream media, or existing

publications fail to talk about the collective problems of a specific community or neighbourhood, Web-based storytelling platforms can enhance civic engagement and inter-group interaction (Dickens, Couldry, & Fotopoulou, 2015). This activity could be described with human geographer Tuan`s conception. He posits that two elements construct this notion of attachment to urban environments: public symbols (prominent landmarks or monuments) and fields of care, or 'networks of interpersonal concern' (Tuan, cited in Boyles, 2016). Fields of care exist when urban residents possess emotional ties and/or attachment to geographic space and when citizens are vocally aware of this sensing and/or spatial connection (Boyles, 2016). Definitely, mass media is very important tool to make emotional ties. It is a way to be acquainted with local environment. Researchers argues that "today's new media products – particularly blogs and hyperlocal websites – continue to 'stimulate our appetite for consuming the local'. Further examination of digital news production and its ability to establish fields of care stand essential to understanding how social identity is established in urban space, as well as how news organizations can better connect with their local audiences, who are increasingly difficult to reach (Zukin, 2009; Boyles, 2016).

Hyperlocal movements and activities can make impact on local media environment, because they become competitive force for local journalists or on the contrary to make them aware of emerging competition. But it is a one of they ways to realize main local media functions, because the assumed mechanism is premised on the model of watchdog journalism and citizen participation, substantiated in hyperlocal's enhanced capacity to create and consume hyperlocal content and facilitate engagement with local affairs and community formation through interaction online. Together, the emphasis is on informing, monitoring, and participation (Zhang, 2017). Nowadays it is a vital question because many of people are leaving regional territories for socio-economic conditions but such way of communication let them stay integrated into local community. The concept hyperlocal is becoming as a part of local communication environment and some of communication channels already use this type of journalistic practice, for example, local news websites who accepts and stresses some civic activity.

Nevertheless, Director of Research at the Reuters Institute for the Study of Journalism Dr. Rasmus Kleis Nielsen emphasizes "People everywhere rely on wide and diverse media repertoires to be entertained and stay informed. But when it comes to local news, local newspapers have historically played a central role" (Nielsen, 2015). It means traditional media still is important source of local news. And in regional areas in Latvia local newspapers are one of the most common mean of mass communication but as in many countries they "Are under tremendous pressure today" (Nielsen, 2015). By this paper author tries to state problems local media is faced.

Methodology

This questionnaire covered four thematic areas: content (such as thematic selection, news values, and research principles), identity (such as professional roles, self-evaluation), tendencies in the last year and plans for the future.

There are 20 journalists participated in the survey, they were representatives from local newspapers, radio and television. There should be pointed that most of respondents were journalists of local newspapers (75 %) as it is one of the most popular type of local media in media market. The average age of participants 36,3 and the most of them were women (85 %). For each question, there could be more answers.

To become acquainted with the new emerging communication tool in regional space qualitative interviews (4) were made with local website editors to get deeper inside in this novel way of information production for local community. It was interesting that majority of doesn`t feel like doing journalistic work and although they are working with content production and realize a lot of journalism functions and tasks.

The region of Latgale is object of this research because of its geographic position and situation in mass media space which is characterized one who has two information spaces. The Sub-programme “Information Space of Latgale” of the Transport and Communications Programme “Connections”) is developed in the The Action Programme “Latgale Programme 2010-2017”. Several actions are mention in *The Mass Media Policy Guidelines of Latvia 2016-2020* to strengthen the public service media, which includes increase in the proportion of original content there in. The Plan also includes activities to restrict illegal distribution of electronic mass media content (including in the border area of Russia) and to increase the ability to implement the supervisory function of the NEMMC – which is directed towards in creasing the securitability of the mass media environment of the whole Latvia, inter alia of Latgale (The Mass *Media Policy Guidelines* of *Latvia* 2016-2020, 2016).

Findings and discussion

The last paragraph will highlight results from both the interviews and the survey. The focus of the analysis presented here is to determine whether regional journalism feel changes in journalism, mentioned in theoretical part, for example, the impact of new media and what are the tendencies in content production process and do regional journalists are making qualitative journalism.

It is clearly seen that results of survey shows findings based in theoretical issues. Journalists working in local media highlights aspects of belonging, main mass communication functions and strong relationships with community. As a

primary function of local media, respondents see strengthening of regional identity. The second most mentioned answers were to educate, to inform about actualities and to defend interests of community. As it is seen the very strong tendency is to inform community, to see what respondents understand by informative functions there were included two provocative answers – to inform about problems and to inform about actualities. It shows distinct feature of regional journalism – to highlight positive events happening in community not so concentrate on local problems. Thus, it is a bit controversial because the answer to defend interests of community apply to understanding of local community problems. Anyway, regional identity is easier to raise emphasized pleasant activities. Richards mentions one of the biggest problem for local journalists, "Unlike most media in large urban centers, local journalists often develop a world view which they share with those whose activities they report, a world view which revolves around the core aim of promoting the common good of the community. This situation raises some important questions about the role and nature of regional journalism" (Richards, 2012).

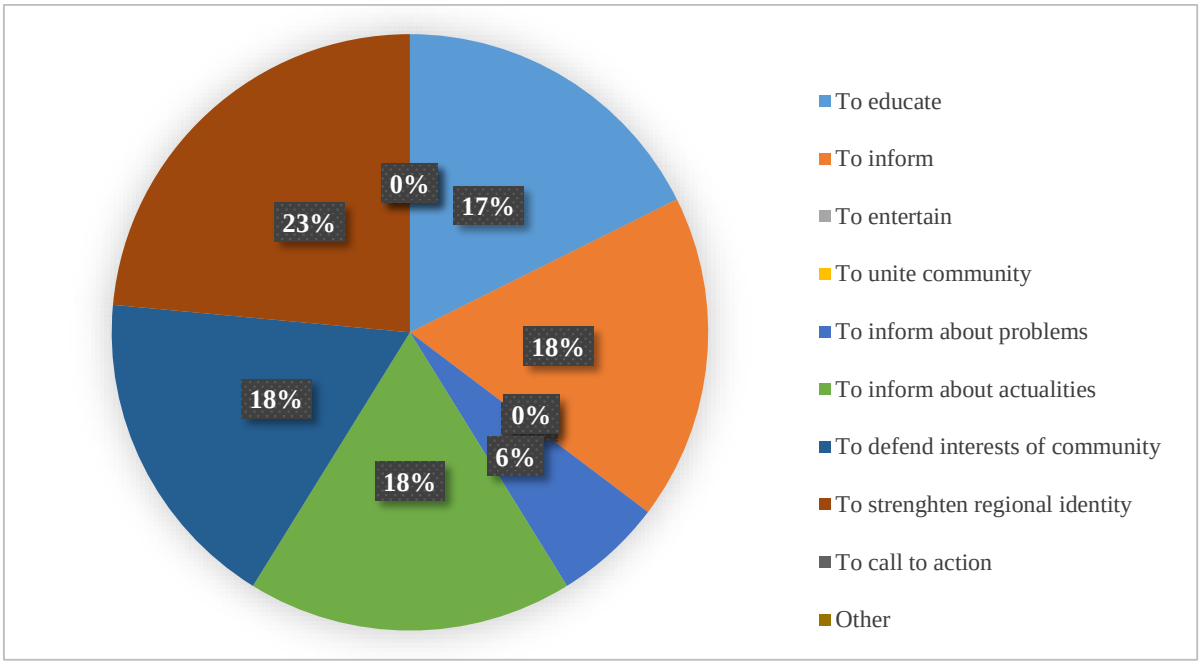


Figure 1. **Functions of the local media**

The tendency shows the most important thematic areas or topics journalists as well. So-called "hard" news (politics and economics) are in the end of the list, the most popular are topics culture, social topics and education. Education is characterized as soft news because this topic gives a lot of information for content production, as schools are one of the center of local community. Especially in those communities of less amount of people. Local media are more cautious and

softer in it`s expressions, they don`t highligtht so much negative things and try to maket ties to local community or local place by using personification and personalization. Conclusion confirms opinion of media researcher Janowitch more than 50 years ago, that „Under the framework of community integration, the principal role of the community news was 'to maintain local consensus through the emphasis on common values rather than on the solution of conflicting values" (Janowitz, 1967). This is confirmed by answers on the question about threats to mass media. Journalists answered, first, it is a lack of audience and educated journalists, and the second, it is a presence of news websites. The results pointed toward an emphasis on informative and identity construction function.

Journalistic formats and sources

The results of used sources for content producing showed that in most of cases is press releases and Internet. It means Internet as a source is important for printed as well as for electronic media. Relying on the Internet materials, critical thinking skills should be very developed.

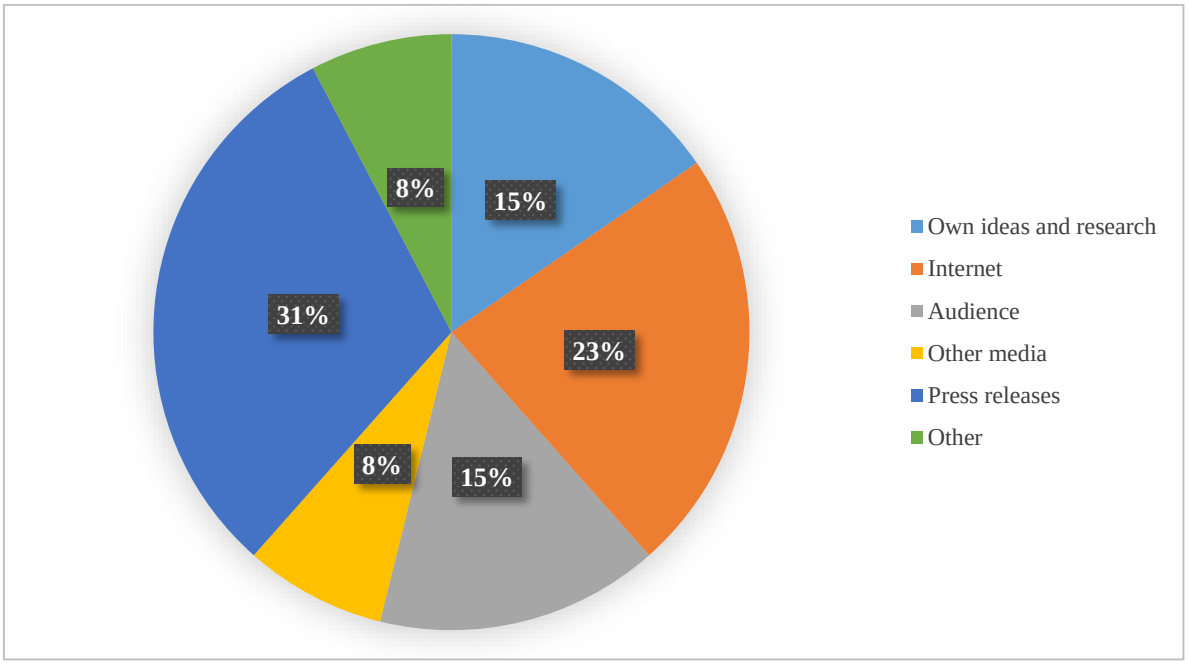


Figure 2. **Use of sources by local journalists**

The answer other (*event organizers and local people call and report on happenings)* shows that still those are already made news not originally made articles with comments and opinions. The third and fourth most popular are the own ideas and audience requests. Other media has a less role in producing stories.

Results of most popular genres (Figure 3) for regional mass media showed that running commentary and interview are amongst popular. It means that

content is formed by sources opinion and interpretation not so much on journalists analysis. Other genres have less meaning in content creation process.

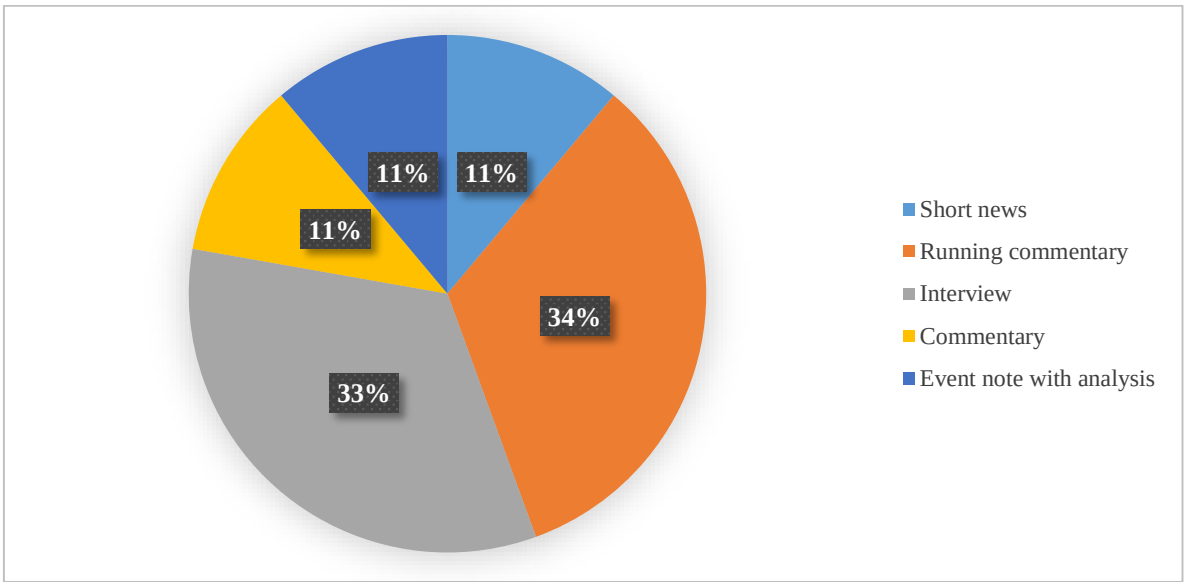


Figure 3. **Journalistic genres in local media**

For journalists it is important that local community can do personalization with events and people mentioned in the media content. It is the first answer what characterizes production of local content. Local relevance and proximity as well as positive information is mentioned as the second condition.

Asking do they see themselves as creative persons, the most of respondents answered that they agree (50 %) and more agree (50 %), no one chose answer don`t agree. The question, if they are critical to their sources, journalist's answers were contrary. Most of them more agree that agree, but still 25 % answered that rather disagree, and all of respondents agree they can influence public opinion. Journalists themselves characterizes as relevant occupation. 75 % respondents more agree it is a prestige profession.

Results showed content production in regional media is focused on positive community evaluation not so much on development of new ways of reaching audience, for example, using digital distributing platforms or methods of information representation. Thus the question how to make qualitative information space and what is the future for regional journalism in much cases relies on national or public media. Thus, there is still lack of qualitative journalism and realization of local media functions – to be a watchdog and take care about local community. Probably this function will be taken by so-called hyperlocal websites that is growing phenomenon in regional information space and made by local journalists and partly by users. For example, some of newspapers are already doing that. The newspaper website is becoming a place where community can

actively participate as commentators realizing function of sources for content creation. The exploration of the local websites will be the next step in the research of content production in Latgale, as it is concluded that existing local media can strengthen local media space working mainly for identity construction. There are major doubts whether it is sufficient to strengthen information space.

References

Boyles, J. L. (2016). Building an audience, bonding a city: digital news production as a field of care. *Media, Culture & Society, 39*, 7, 945-959.

Coxon, K. (2017). Attention, Emotion, and Desire in the Age of Social Media. In Prado, C., G. Khadija Coxon. *Social media and your Brain. Web-Based Communication is changing how we think and express ourselves (49).* Santa Barbara, Calfornia: Praeger.

Dickens, L., Couldry, N., & Fotopoulou, A. (2015). News in the community?, *Journalism Studies, 16*, 97-114.

Skogerbø, E., & Winsvold, M. (2011). Audiences on the move? Use and assessment of local print and online newspapers. *European Journal of Communication, 26*, 216.

Harnischmacher, M. (2014). Journalism After All: Professionalism, content and performance - A comparison between alternative news websites and websites of traditional newspapers in German local media markets. *Journalism, 16*, 1062-1064.

Janowitz, M. (1967). *The Community Press*. Chicago, IL: University of Chicago Press.Kanniss P. (1991) *Making Local News*. Chicago, IL: University of Chicago Press.

Nielsen, R. K. (2015). Introduction: The Uncertain Future of Local Journalism. In Nielsen, R.K. (Ed) *Local Journalism. The decline of newspapers and the rise of digital media* (4-7). London, New Yourk: I.B. TAURIS.

Richards, I. (2012). Beyond city limits: Regional journalism and social capital**.** *Journalism 14*, 628-638.

The Mass Media Policy Guidelines of *Latvia 2016-2020*. (2016). Available: https://www.km.gov.lv/uploads/ckeditor/files/EN/media_policy/Mass%20Media%20Policy%20Guidelines%20of%20Latvia%202016-2020.pdf

Tuan, Y. F. (1979). Space and place: humanistic perspective. In: Gale S., Olsson, G. (Eds) *Philosophy in Geography* (415-416). London: D. Reidel.

Zhang, I. (2017). Bounding and bonding community: Ethnic diversity and the ethic of inclusion in hyperlocal news. *Journalism, 1*, 3-4.

Zukin, S. (2009). *Naked City: The Death and Life of Authentic Urban Places*. Oxford: Oxford University Press.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 185-195

EVALUATION OF LEGAL AND SOCIAL RESPONSIBILITY: THE CASE OF FUTURE POLICE OFFICERS

Rūta Nedzinskienė
Kaunas University of Technology, Lithuania

Egidijus Nedzinskas
Lithuania Business University, Lithuania

Abstract. *Changes in today's global political, economic, demographic and cultural situation make the relations in society to get sophisticated. Legal and social responsibility becomes critical important in these processes. Because of their professional duties, police officers must be professionals with a very high level of responsibility. However, there is a lack of scientific researches with a particular reference to future police officers responsibility evaluation. This leads to the aim of this research: to evaluate legal and social responsibility of future police officers. The research was based on systematic and comparative scientific literature analysis and statistical data analysis. The study was conducted in 2011 and 2015 in one of Lithuanian universities. 102 recipients of the study program "Law and Police Activities" participated in the survey in 2011 and 109 – in 2015. It was found that students – future police officers feel legal as well as social responsibility. Although the greatest impact on the formation of respondents' responsibility had a family, the relevance of the university's contribution has grown from 2011 to 2015. It is also to notice that 66 % of respondents marked that they are legal responsible in 2011 and this proportion increased to 82 % in 2015. The obtained results will contribute in further investigations making analysis of future professionals' responsibility and its factors.*
Keywords: *Future Professionals, Legal Responsibility, Police Officers, Social responsibility.*

Introduction

Nowadays the development of a qualified professional who is able to deal with the different types of social problems is in the major respect. Thus, police officers must be professionals with a very high level of legal and social responsibility. It poses major challenges for future education of professionals. The current situation encourages educational institutions to respond flexibly to the environment and society needs and focus on the professional education of specialists.

However, until a person becomes a qualified professional, the development of future professionals' responsibility begins in the early stage of their life,

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3328

continues at school and at the university. In this situation, a very important question arises: how to evaluate the responsibility of a future police officer.

Responsibility issues were raised and analysed in papers of Vasiljevienė (2012), Duch et al. (2014), McDonald (2015), Miller (2015), Pickard (2015), Ramasastry (2015), Hébert & Hauf (2015). The legal liability concept was analysed by Morawski (2000), Vaišvila (2009), Okoye (2009), Lange et al. (2012). Social responsibility concept was analysed by Argandona et al. (2010), Russell (2010), Michelsen, et al. (2011), Fenwick (2011), Tauginienė (2013), Jeppsson (2014). The police officers, their activities and roles were analysed in scientific papers of Scott, et al. (2013), Maran et al. (2014), Davies & Dawson (2014), Bush & Kimberly (2014), Normore et al. (2015), Guclu & Can (2015), O'Neill (2015), Christopher (2015), Chen (2016). The responsibility of police officers topic was analysed by Williams & Foce (2002), Laurinavičius (2003), Misiūnas (2010), Palšis (2014).

However, a very important point is that the responsibility of professional police officer develops from the early stage of his life. Responsibility of a future police officer is a result of person's environment, general education factors: family, school, self-learning as well as university. There is a lack of scientific researches with a specific focus to the future police officers responsibility.

The goal of this article is to evaluate legal and social responsibility of future police officers. The article aims to reveal the theoretical concept of legal and social responsibility, to justify empirical research methodology and to evaluate empirical responsibility of future police officers.

The results of this article is based on scientific literature analysis and statistical data analysis.

Theoretical framework

Nowadays professional responsibility and competence of professionals providing social services becomes critical. Thus, responsibility is one of the most important characteristics of a professional police officer.

Responsibility is determined as the highest personal value, fundament of ethics and morality, one of the criteria of justice and traits, personality and self-identity mechanism, the freedom to choose actions and the obligation to be accountable for the performed actions related to the perception of guilt and righteousness (Nedzinskas & Nedzinskienė, 2017). Responsibility is the respect for moral and legal requirements. Personal responsibility includes police officers' control when they respect the law and equal conduct with citizens. Person's responsibility reveals in professional activity. A police officer, without knowing his professional responsibility, can not successfully complete his professional

duties (Janušauskaitė, 2012). Professionals in their daily roles face legal liability and social responsibility (Bankauskienė & Nedzinskas, 2010).

Legal liability is an obligation regulated by law to be responsible for your actions. Responsibility as a legal status element of a subject is a juridical guarantee that appropriate institution or official will perform its tasks, functions and duties properly and on time. According to the type of violation of law, legal liability could be criminal, administrative, civil, disciplinary, material (Vaišvila, 2000). According to Laurinavičius (2006) legal liability obligates police officers to discharge their duties and rights properly.

The legal liability is often related to a person's fear that in case of an offence he will be punished under the relevant law (Šatas, 2004). A mistake of police officer or improper judgment of situation may "cost" him/her material wealth, career or even freedom. It is the application of state violence to protect established and regulated social relations, to ensure legal requirements. Legal liability reveals in the condemnation of an offender's act and in the application of legal sanctions for which the offender experiences negative moral, property, physical and organizational consequences.

Responsibility appears from duty to respect and defend human honour and dignity, support and protect rights and the main liberties of all people. Police officers have quite wide authorization for their activity and have right to choose the most suitable method for solving the problem (Bankauskienė & Nedzinskas, 2013).

It might be noted that under various circumstances when discharging substantial officer's duties, police officer must comply with certain specific requirements, characteristic to this particular occupation, and related to official, pecuniary, administrative and criminal liability.

The main attribute of **social responsibility** is that a person knowingly assumes social part, becomes an engaged community subject and decides himself/herself about a proper conduct. So social responsibility develops as human relations under certain conditions. According to Guogis (2006), moral liability arises as a result of violations of some moral requirements: traditions, decency requirements. Police officer, who had perceived role imposed on him/her, voluntarily decides to execute certain social functions as generally important and necessary.

Social responsibility is considered not to be a one-day action, but a process, a permanent commitment to the public, realizing social obligations for the stability and sustainable development of the society (Vaišvila, 2009). However, society involves in investigation of various practical situations and modelling of solutions but has very few concerns about police professional status (Vaišvila, 2009). Thus, society firstly evaluates the quality of police officers' activity. Social responsibility often promotes moral values, ideal social relations and human

development, is social rightness, democratic participation in public life Fenwick (2011) it is also an ethical concept Argandona & Von Weltzein (2010). However, issue of police ethics is not raised in police professional ethics and professional activity itself is not analysed. Moral assessment of police officers is the concern of society. Issues of professional ethics are: how institution executes its functions and what is conduct of police officers (Nedzinskas, 2012). Misiūnas (2010), analysing social responsibility, points out that disciplinary statutes and codes lay down requirements for a police officer not only for his professional duties but also for his personal life – obliging him to avoid discretisation in his actions and to keep prestige of police. Guclu & Can (2015) and Chen (2016) emphasize that next to crime prevention, another very important role of the police is the social service to citizens. Police officer in his/her job constantly meets the situations that require for determinate communication independent from believes, but dictated by the present social role. According to scientists of democratic countries, social control asserting through attentiveness to police officers' conduct and its critical assessment is the power which makes police changing its working style and attitude towards its duties and responsibility.

It is to summarize that social responsibility is inner, perceived and experienced as moral sense while legal liability shows as external sanction which is applied in case of offence. Social responsibility exists all the time while legal liability is applied only in case of lack or absence of social responsibility or when interests of society or other people are harshly violated.

Responsibility education of future professionals. The concept of lifelong learning is emphasized since a professional police officer's responsibility is developed from the early stage of life, at school, at university, and even when he becomes a professional. The majority of European countries pay big attention to the quality of police officers education and training.

One can distinguish the following main factors in early stage education: family, school and self-education. These factors help to develop personal character traits and values such as creativity, a sense of duty and responsibility.

University education of future professionals is focused on the development of professional skills, inter-disciplinarily, broader practical application of knowledge, generation of ideas, independent solution of problems and responsibility in solving complex operational challenges. University studies are aimed to prepare future professionals, who will be able to solve the global problems in the context of other sciences, who are professionals generalists actively involved in the creative process, who successfully adapt themselves in the multicultural communities, who may change themselves their professional identity, who are close to diverse artistry and creative expression.

Methodology

The research instrument. In order to evaluate future police officers responsibility and to perform empirical research, the original questionnaire was used as the main research instrument. The research logical construction is as follows:

1) The first part of questions aims to establish a common understanding of future professionals' responsibility and the key factors that help to develop the respondents' legal liability and social responsibility;
2) The second part of questions aims to identify the influence of the rules at school to the development of respondents' responsibility;
3) The third part aims to define obligations ad desires contributing to the responsibility education of students during study process at the university;
4) The fourth part is devoted to the collection of demographic characteristics of respondents.

Data set. A written survey was conducted out in one of Lithuanian universities where future police officers are educated. It was aimed to assess the dynamic changes in the responsibility's education of the future professionals. 102 recipients of the study program "Law and Police Activities" took part in the main survey in 2011 and 109 recipients – in 2015. The first year students were chosen as a target group, since the responsibility's education path from school to university and during the studies in the chosen program at the university was emphasized and the students were asked to retrospectively remember the responsibility's education at school and during the studies at the university. This study was carried out at the end of the first year, when the students were able to evaluate their responsibility's education during the first academic year. During the first year students complete most of general university modules which inspire the students to understand the social responsibility and legal liability. The students complete basic courses of Law sciences during the first year. These courses are expanded during subsequent years and help the students in their education of legal liability.

Statistical data analysis techniques allowed quantitative processing of students written survey results. The equality of average values were tested and calculations of Spearman and Cramer's V coefficients for the assessment of correlations between the variables were made. Data processing was carried out using IBM SPSS 23.0.

Results

General factors of future professionals' responsibility. Firstly, it was tested whether the students possess the legal liability and social responsibility

(1 - no possession; 2 – partly possession; 3 – possession of responsibility) and whether it differs in 2011 and 2015. The 78 % of respondents marked that they are social responsible in 2011 and this proportion was 84 % in 2015, however no significant difference was detected between the answers. It is also to notice that 66 % of respondents marked that they are legal responsible in 2011 and this proportion increased to 82 % in 2015. The significant difference between the answers about social responsibility in 2011 and 2015 was detected with a significance level of 0.05. Moreover, Spearman's correlation was calculated and it was proven that there is a relation between future professionals' legal and social responsibility ($r=0.355$; $p<0.001$). If a student possesses social responsibility he/she is also likely to possess legal liability and vice versa. In addition, it was found that there are no significant correlations between respondents' legal and social responsibility and their demographic characteristics (gender, type of secondary school they finished, study results) with a significance level of 0.05.

Students, who marked that they are legal and social responsible, were asked to choose the factors that had the greatest influence to the development of their responsibility. More than one answer could be selected. The results are presented in Table 1.

Table 1 **Factors influencing future professionals' responsibility**

Factors	Legal liability		Social responsibility	
	2011	**2015**	**2011**	**2015**
Family	48%	50%	60%	74%
School	21%	22%	24%	11%
Self-learning	39%	29%	33%	29%
University	19%	26%	9%	12%

Although the greatest impact on the formation of respondents' responsibility had a family and self-learning, the relevance of the university's contribution has grown from 2011 to 2015.

Future police officers responsibility's development at school. Since the formation of a social responsibility and legal liability starts already at school, respondents were asked about their attitude to different rules they learned at school: School's internal rules, Pupil's Rules, Fire safety rules, Road rules. It was found that most of the respondents who participated in the survey were familiar or not only aware of the rules, but also compliance with them. The respondents' attitude to the rules were not significant different in 2011 and 2015 year. The correlations between respondents' attitude to the rules and their responsibility were also tested. It is to notice, that a statistical significant correlation existed between the attitude to Fire safety rules and legal liability. Future professionals understand that it is important to comply with these rules so that they do not pose

a real risk to human life, health and property, as failing to comply with the requirements of these rules would pose a real threat to public security and would face legal consequences. A statistical significant correlation also existed between attitude to School's internal rules and social responsibility. Sense of social responsibility helped respondents to adjust themselves to the acceptable behaviour norms within the community and promote theses norms. Developed sense of social responsibility contributes to the respondents' behaviour in the school community and is basis for further responsibility education at the university.

Future police officers responsibility development at the university. Analysing responsibility development at the University, the students' desires and obligations in self-education of legal liability and social responsibility were taken into consideration.

Table 2 **Obligations and desires influence on the development of future professionals' responsibility**

Legal liability					**Social responsibility**				
Year	**Mean**	**t**	**df**	**p-value**	**Year**	**Mean**	**t**	**df**	**p-value**
I am obliged to follow the rules and regulations of the university, because the university administration knows what is needed									
2011	2,93	-2,377	176	0,019*	**2011**	2,75	-3,604	160	<0.001*
2015	3,22				**2015**	3,20			
I want to follow the rules and regulations of the university because they can lead to successful learning									
2011	3,04	-1,559	194	0,121	**2011**	2,96	-2,729	176	0,007*
2015	3,22				**2015**	3,29			
I am obliged to meet the requirements of a teacher because he knows how to teach									
2011	3,19	-1,175	197	0,241	**2011**	2,96	-2,606	186	0,010*
2015	3,31				**2015**	3,26			
I want to meet the requirements of a teacher because I am convinced that they are successful in studying									
2011	3,34	-1,433	181	0,153	**2011**	3,14	-2,151	187	0,033*
2015	3,48				**2015**	3,39			
I am obliged to be responsible for my studies and successful exams, because otherwise I can be suspended from the university									
2011	3,19	-4,202	170	<0.001*	**2011**	3,18	-2,742	176	0,007*
2015	3,64				**2015**	3,50			
I want to be responsible for my studies, because I am a dutiful person knowing what I am aiming for.									
2011	3,68	-0,371	188	0,711	**2011**	3,60	-0,238	191	0,813
2015	3,71				**2015**	3,62			

**Significant at 0.05*

Students were asked to assess if different obligations and desires at the university have the influence to the development of their responsibility in the scale from 1 (no influence) to 4 (very high influence). The results are presented in Table 2.

Performed study revealed that the students' obligation to comply with the rules of the university, to be responsible for his/her studies and exams success over the years is becoming increasingly important in the development process of both: legal liability and social responsibility. Moreover, the obligation to meet the requirements of a teacher as well as the desires to follow the rules and regulations of the university and to meet the requirements of a teacher became more important for the development of social responsibility in 2015 comparing with 2011.

Conclusions

The police officer, showing his legal liability and social responsibility while concerning about community issues, will gain the trust of community. Education of responsibility is the object of life-long learning process, thus the development of future professionals' responsibility must be highlighted.

The empirical research results showed that the majority of future police officers possess legal and social responsibility and there is a significant correlation between each other. The most important factor influencing the development of responsibility is family, however the relevance of the university‘s contribution has grown from 2011 to 2015. The possession of responsibility is not correlated to respondents' demographic characteristics. Before entering the Law and Police Activities studies at the university, the majority of respondents were familiar or compliance with the rules at school. Thus, it can be stated that the legal and social responsibility of future professionals was educated already at school. It was also found that the influence of obligations and desires at the university for the development of students' legal and social responsibility increased in 2015 year while comparing with 2011. It is to conclude that future professionals' responsibility develops in each stage of life during their studies at school and at the university and is influenced by different factors, that is why a great interest must be paid to the education of responsibility in order to have qualified police professionals.

References

Argandona, A., & Von Weltzein H. H. (2010). Corporate Social Responsibility: One Size Does Not Fit All. Collecting Evidence from Europe. *Journal of Business Ethics, 89* (3), 221-234.

Bankauskienė, N., & Nedzinskas, E. (2010). Teachers about responsibility training of future specialists. *Global cooperation in engineering education: innovative technologies, studies and professional development,* 86-90.

Bankauskienė, N., & Nedzinskas, E. (2013). Social responsibility and legal responsibility of police officers. *Bezpieczenstwo w procesach globalizacji – dzis I jutro*. Wyzsza szkola zarządzania marketingowego i językow obcych w Katowicach; pod redakcją Zbigniewa Grzywny. Katowice: Wyzsza szkola zarządzania marketingowego i językow obcych w Katowicach, 9-18.

Bush, M. D., & Kimberly, D. D. (2014). Police Officers as Peace Officers: A Philosophical and Theoretical Examination of Policing from a Peace-making Approach. *Journal of Theoretical & Philosophical Criminology Police Officers as Peace Officers, 6* (3), 194.

Chen, A. Z. (2016). Measuring police role orientations in China: An exploratory study. *International Journal of Law, Crime and Justice*, *44*, 43-67.

Christopher, S. (2015a). The police service can be a critical reflective practice…If it wants. *Policing, 9* (4), 326-339. DOI: 10.1093/police/pav007

Davies, G., & Dawson, S. E. (2015). The 2011 Stanley Cup Riot: police perspectives and lessons learned. *Policing: An International Journal of Police Strategies & Management, 38* (1), 132-152.

Duch, R., Przepiorka, W., & Stevenson, R. (2014). Responsibility Attribution for Collective Decision Makers. *American Journal of Political Science, 59* (2), 372-389.

Fenwick, T. (2011). Learning 'social responsibility' in the workplace: conjuring, unsettling, and folding boundaries. *Pedagogy, Culture & Society, 19* (1), 83-89.

Guclu, I., & Can, A. (2015). The effect of socio-demographic characteristics on the information-seeking behaviors of police officers. *Policing: An International Journal of Police Strategies & Management, 38* (2), 350-365.

Guogis, A. (2006). Kai kurie korporatyvinės socialinės atsakomybės ir socialinio teisingumo aspektai. *Viešoji politika ir administravimas, 18*, 73-74.

Hébert, A., & Hauf, P. (2015). Student learning through service learning: Effects on academic development, civic responsibility, interpersonal skills and practical skills. *Journal of Studies in International Education, 16*, 37-49.

Janušauskaitė, A. (2012). Atsakomybės ir profesinės kompetencijos svarba teisininko veikloje. Mokslinių straipsnių rinkinys. *Visuomenės saugumas ir viešoji tvarka*, *8*, 119-129.

Jeppsson, S. M. I. (2014). Responsibility problems for criminal justice. *Front. Psychol. 5:821*. doi: 10.3389/fpsyg.2014.00821

Lange, D., & Washburn, N. T. (2012). Understanding attributions of corporate social responsibility. *Academy of Management Review, 37* (2), 300-326.

Laurinavičius, A. (2003). *Tarnybinė teisė: statutinės valstybės tarnybos teisinis reguliavimas.* Vilnius: LTU, 203.

Laurinavičius, A. (2006). Problems of Implementation the European Convention on Human Rights in the Statutory Public Administration Institutions. *Jurisprudencija. Mokslo darbai. 3* (81), 47-55.

Leliūgienė, I. (2002). *Socialinė pedagogika.* Kaunas: Technologija, 427.

Maran, D. A., Varetto, A., Zedda, M., & Franscini, M. (2014). Stress among Italian male and female patrol police officers: a quali-quantitative survey. *Policing: An International Journal of Police Strategies & Management, 37* (4), 875-890.

McDonald, J. R. (2015). Developing a peace course in police studies: how a culture of peace can enhance police legitimacy in a democratic society. *Journal of Peace Education, 12*, 74-91.

Michelsen, G., Siebert, H., & Lije, J. (2011). *Nachhaltigkeit lernen*. Suedost Verlags Service.

Miller, S. (2015). Joint Epistemic Action and Collective Moral Responsibility. *Journal Social Epistemology, 29*, 280-302.

Misiūnas, E. (2010). *Policijos pareigūnų teisinis statusas.* Daktaro disertacija. Socialiniai mokslai, teisė (01 S). Vilnius: MRU.

Morawski, L. (2000). *Wstęp do prawozvawstwa,* Toruń.

Normore, A. H., Bone, D., Jones, J., & Spell, S. (2015). To Protect and Educate: Legal Mandates and Complex Leadership of School Resource (Police) Officers. *Advances in Educational Administration, 24*, 201-220.

Nedzinskas, E. (2012). *Police officers' liability and social responsibility. Bezpieczenstwo – ujęcie kompleksowe*. Wyzsza szkola zarządzania marketingowego i językow obcych w Katowicach; pod redakcją Zbigniewa Grzywny. Katowice: Wyzsza szkola zarządzania marketingowego i językow obcych w Katowicach, 455-466.

Nedzinskas, E., & Bankauskienė, N. (2016). Socialinės atsakomybės ugdymas studijų procese. Iššūkiai ir socialinė atsakomybė versle. *Challenges and Social Responsibility in Business,* 5-13.

Nedzinskas, E., & Nedzinskienė, R. (2017). Medical professional as the social sensitive group: analysis of responsibility. *Medical Physics in the Baltic States 2017. Proceedings of the 13th International Conference on Medical Physics*, 81-84.

Okoye, A. (2009). Theorising Corporate Social Responsibility as an Essentially Contested Concept: Is a Definition Necessary? *Journal of Business Ethics, 89* (4), 613-627.

O'Neill, M. (2015). *Police community support officers in England: a dramaturgical analysis. Policing and Society: an International Journal of Research.* DOI: 10.1080/10439463.2015.1020805

Palšis, B. (2014). Bendruomenės pareigūno pareigybė: Teisėtvarkos ir socialinio darbo vaidmenų derinimas. *Social Work. Experience & Methods / Socialinis Darbas: Patirtis ir Metodai, 14*(2), 55-78.

Pickard, H. (2015). Choice, deliberation, violence: Mental capacity and criminal responsibility in personality disorder. *International Journal of Law and Psychiatry, 40*, 15-24.

Ramasastry, A. (2015). Corporate Social Responsibility Versus Business and Human Rights: Bridging the Gap Between. *Responsibility and Accountability, 14* (2), 237-259.

Ruiz Mora, I. M., & Soria Ibáñez, M. (2009). Responsabilidad Social en las Universidades de España. *Razón y Palabra, 70*, 1-2.

Russell, E. O. (2010). *CEO and CSR: business leaders and corporate social responsibility.* Doctoral Thesis. The Robert Gordon University, UK.

Scott, A. J., Nixon, K., & Sheridan, L. (2013). The Influence of Prior Relationship on Perceptions of Stalking. *Criminal Justice and Behavior, 40* (12).

Siebert, H., Michelsen, G., & Lije, J. (2011). *Nachhaltigkeit lernen.* Suedost Verlags Service, 124.

Šatas, J. (2004). *Lietuvos teisės pagrindai.* Vilnius, 575.

Tauginienė, L. (2013). *Socialinė atsakomybė universiteto mokslinės veiklos valdyme.* Daktaro disertacija. Mykolo Romerio universitetas. *Socialiniai mokslai, Vadyba ir administravimas.* Vilnius.

Vaišvila, A. (2000). Teisės teorija. Vilnius: *Justitia,* 348-356.

Vaišvila, A. (2009). *Teisės teorija.* Vilnius: *Justitia,* Vilnius, 456.

Vasiljevienė, N. (2012). Permąstant integralumo vertybę. *Societal Innovations for Global Growth*, 1026.

Williams, G., & Foce, G. T. (2002). A Liability to Law Enforcement? *FBI Law Enforcement Bulletin, 71* (6), 14-19.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 196-205

LEISURE TIME AND ACTIVITY OF SENIORS AS EXEMPLIFIED BY THE CZĘSTOCHOWA CENTRE FOR SENIOR ACTIVITY

Monika Joanna Nowińska

Daniel Bakota
Jan Długosz University, Częstochowa, Poland

Abstract. *Over the last quarter of a century the changing age structure in Poland could be observed. A significant part of the society is made up of seniors, which enforces senior policies whose mission is to provide model solutions to the problems of the elderly. A wide range of offers makes it possible to encompass any needs of the elderly in different aspects of their existence, including: health, activity/sport, managing leisure time and a number of areas concerning economic, social, cultural, and other problems in order to improve the quality of their lives. The ageing society results in the avalanche of needs, including those related to health. A person of advanced age becomes less efficient with health problems appearing on the physical and mental plane, which is associated with the financial burden of the State, queues in healthcare and many other, equally unpleasant effects. To a large extent, this could be prevented by providing the elderly help in maintaining physical fitness and mental well-being. The aim of this paper is to draw attention to the fact how the elderly manage their leisure time, which, at the same time, will be indicative of their needs in this respect. The examined group (50 people) are the elderly - women and men of different educational backgrounds, aged 60 or more who most often already have fixed income. From among these fifty, 25 people spend their leisure time in the Częstochowa Centre for Senior Activity, and the remaining 25 respondents - for comparison - are people who act on their own in order to fill their spare time for themselves. The method used for the survey was a diagnostic opinion poll, and the research tool - a questionnaire survey.*
Keywords: *leisure time, seniors, activity, needs.*

Introduction

The completeness of the spiritual and material wealth, which people have collected, enriched and multiplied over the years has allowed for culture to be created. The motive which has made this act possible is leisure time. The ways of taking advantage of leisure time throughout history have been different in quality and depended on a number of factors. However, one cannot specify the values which leisure time is guided by. In every culture using this time looks differently, which has resulted in many theories of leisure time encompassing its different aspects and values. The attempts to define it revolved around

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3222

philosophy, mythology and theology. It was only between the 19th and 20th century that the focus shifted to scientific deliberations on the subject (Truszkowska-Wojtkowiak, 2012).

The definition of leisure time in reference books is variously captured, but the meaning is the same. The simplest way to put it - it is the time when a person does not work, does not carry out their duties and only engages in what they like and freely want to do during this time (Pięta, 2014).

There are a lot of conditions which influence the quality of spending one's leisure time. These include, among other things: age, sex, independence, marital status, place of residence, health, education, income or social position.

The period of old age is the time when people in view of the fact that they have reached the retirement age, i.e. are not engaged in professional activity any more - have a lot of leisure time. According to the demographic forecasts in the year 2019 the population of elderly persons will constitute 27 % of the Polish society, i.e. more than 9,621,000 seniors (Pikuła, 2013).

A significant increase in the number of elderly people has contributed to the considerable development of activities in support of that group at every level of life. In view of the above, attending to the quality of seniors' life and filling their leisure time, which accounts for a significant part of their lives, started to be taken care of. A lot of institutions, organizations, and activities were established in support of the elderly, which while filling their leisure time also attend to their fitness, spiritual and cultural experience, personal growth, entertainment or tourist and recreational activity. They take actions that have a high impact on their healthy lifestyle, which for a long time now has been downright trendy, preferred by a significant part of the population, including seniors.

Activity during the period of old age is particularly important. It is on this activity, among other things, that it depends how the general public perceives senior citizens, whether it accepts them, perceives as role models, or considers a useless, infirm and hampering group of the population. The concept of activity has taken on a comprehensive meaning. In literature it has been divided into the following groups:

- solitary - a senior is mainly engaged in reading books and the press, watching television, developing their hobbies, interests, all activities focus on one person;
- formal - this group includes volunteering, local and community works, activity in social associations;
- informal - meeting friends, neighbours, ongoing contact with a family (Pikuła, 2012).

A great part in seniors' life is played by physical and motor activity, too. A leisure form such as dancing, games and motor activities is particularly desired by the elderly (Matusiak, 2006). Yoga has become popular with seniors (a training of the body and mind with elements of meditation); as well as attending fitness classes, which are specially prepared and organized for the elderly people; endurance classes at home and organized in indoor facilities (Marchewka, 2012), in a swimming pool; and also weight training e.g. outdoors. These are basic types of exercise which allow an elderly person to keep fit and healthy while - in the case of trainings in groups - enabling contact with people. They also inspire to take more action, stimulate ambitions, encourage people to take up something new, as well as prevent social isolation and loneliness.

Another, as a matter of fact very popular, form of spending one's leisure time in an active way is volunteering. Seniors who feel great despite their age, often dedicate their time to help the elderly who are not in good physical or mental shape. They offer their assistance by e.g. cleaning the house or doing shopping for the people who are ill or unable to cope. Walking or watching films together has a good influence on a lonely person as well as on the volunteer, who has a sense of doing something good. Volunteering can also refer to seniors visiting the ill in hospices or lonely persons in hospitals. It is also children in hospitals or children's homes who benefit from volunteering offered by elderly people, i.e. reading books, help studying - private lessons, walking together, talking, benefiting from the wisdom and advice of the elderly, also on the basis of a mutual transaction.

Tourism and recreation have become another stimulus to the seniors' activity (Marzec, 2016). The combination of learning about the world, people, cultures with great fun have turned out to be an ideal solution for seniors. This age group also has a significant impact on the tourist industry (Alen et al., 2016; Cristobal-Fransi et al., 2017). Additionally, at present there are a lot of actions aimed at adapting areas, degraded as a result of human activity, for tourist and recreational purposes, which can later be used by everyone, including senior citizens (Dwucet, 2016).

Cultural and educational classes have also met with increasing success. Seniors make use of cheaper or sometimes free tickets and become acquainted with culture available at cinemas, theatres, concert halls, concerts, festivals, operas, museums, art galleries, exhibitions or lectures (Szarota, 2009).

Recently, Universities of the Third Age have become valuable, where the opportunity to deepen their interests, mainly in the educational aspect, has become common among seniors. The first such university was established in France in 1973 owing to P. Vellas. Organizing seminars, conducting foreign language courses, lectures and discussions are their fundamental concept (Orzechowska, 2001). The universities are a good place conducive to

integration, making new contacts and friends, which can be further developed outside of classes. Other, equally important, objectives include: improving the conditions and quality of life of the elderly, physical, mental and intellectual activation of the elderly - essential to maintain cognitive function for as long as possible (Bulska, 2003). The Universities of the Third Age operate at higher education establishments, cultural, scientific and social associations, as well as at social welfare centres. In Poland there are about 200 of them. In other countries, like Italy or Germany, educational facilities for seniors are dubbed differently, e.g. Intergenerational Universities, Universities of Leisure Time, Senior Academies or Senior Universities (Zych, 2010).

Spending leisure time differs depending on whether it takes place in cities or villages. People from villages may benefit from the goods offered by cities, but the journey or transport of an elderly person to such an institution could be an impediment.

The main activities of senior citizens in rural areas are, among others, gardening (Vespalec et al., 2017), including in allotment gardens, often working on the farm, helping children with the care of their grandchildren, religious practice, sleep (Borkowska-Kalwas, 2002), making preserves, mushroom picking, taking care of the house and yard, or feeding animals.

To sum up, the elderly have a wide range of opportunities to spend their leisure time regardless of the place where they live (village, city). They can use it for sightseeing, travelling (Omelan et al., 2016), learning, studying, making art, culture, gaining new experiences, talents, inspirations, integration with the society, helping others, getting to know their own potential - thus proving, to themselves and others, that an old person doest not always equal somebody who is lonely, passive, silent, maladjusted (Kuchcińska, 2000), unpleasant, pessimistic, infirm, stubborn, parochial, redundant and lifeless.

Materials and methods

The study was conducted in 2017. The examined group are people between 64 and 89 years of age. Some of these people: 15 women and 10 men - are members of the Częstochowa Centre for Senior Activity (CCSA), the remaining ones: 15 women and 10 men - do not use the services of this institution. A method used for the survey was a diagnostic opinion poll, and the research tool - a questionnaire survey.

Results and discussion

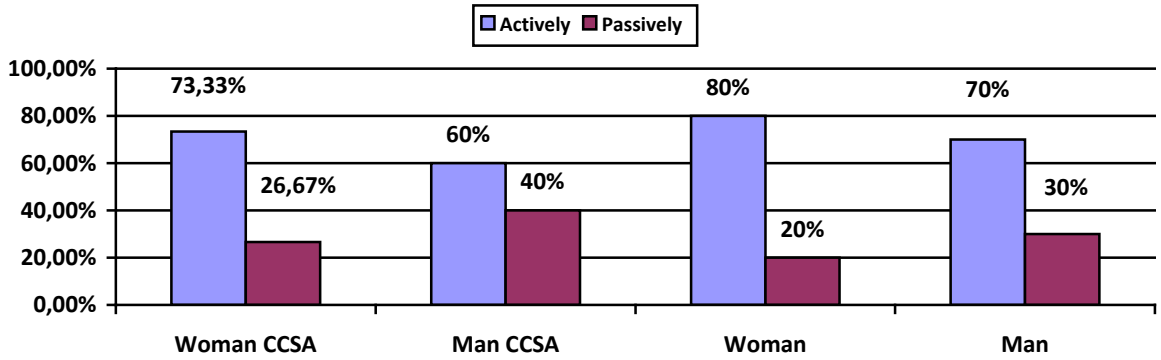


Figure 1. **Forms of spending leisure time by seniors (%)**

Figure no. 1 shows that 73.33 % of women and 60 % of men from CCSA and 80 % of women and 70 % of men outside of CCSA spend their leisure time actively. The remaining ones, i.e. 26.67 % of women and 40 % of men who are members of the institution and 20 % of women and 30 % of men who are not members of the facility, spend their leisure time in a passive way. The vast majority of the respondents in both groups prefer the active form of spending leisure time. This is especially noticeable in the case of women. A small percentage of people spend their leisure time passively, i.e. do not engage in any physical activity.

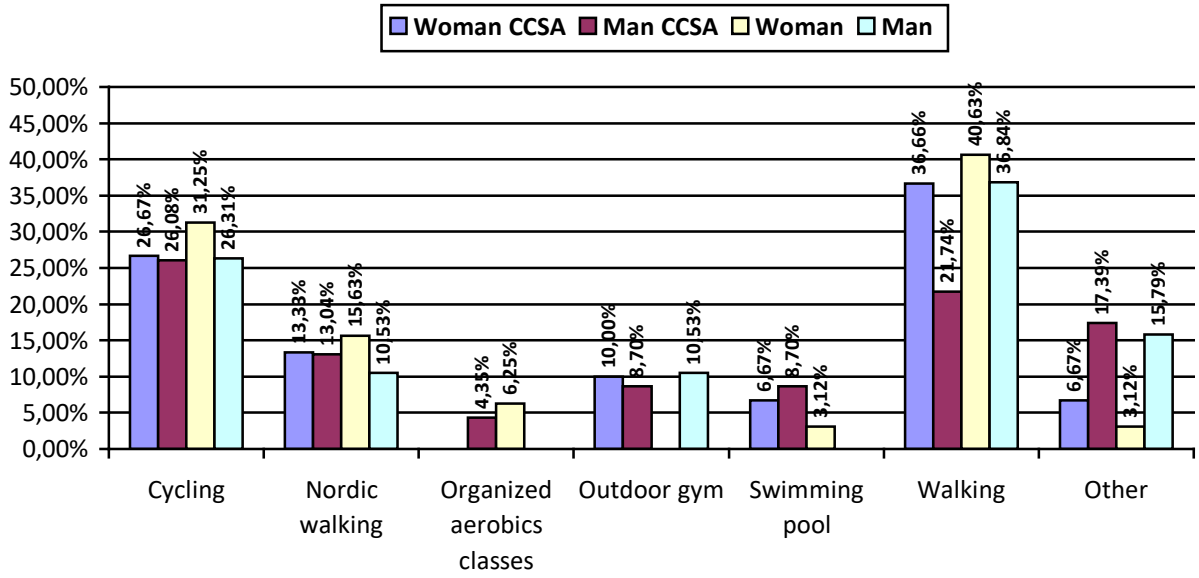


Figure 2. **Activities which seniors engage in most often in their leisure time (%)**

A significant proportion of seniors engage in physical activity, which as a result allows them to maintain their physical well-being and keep fit, and, in

addition, allows them to maintain social contacts, which prevents withdrawal or isolation of the elderly. Among the proposed activities included in the survey (it was possible to indicate more than one answer), walking was the most popular among seniors in both groups. In the examined group from CCSA as many as 11 women (which accounted for 36.66 % of answers) and 5 men (21.74 %) prefer such form of activity. In the second group as many as 13 women (40.63 % of answers) and 7 men (36.84 %) opt for walking as an activity practised most frequently. Cycling tours are ranked the second and nordic walking takes the third place (see figure 2).

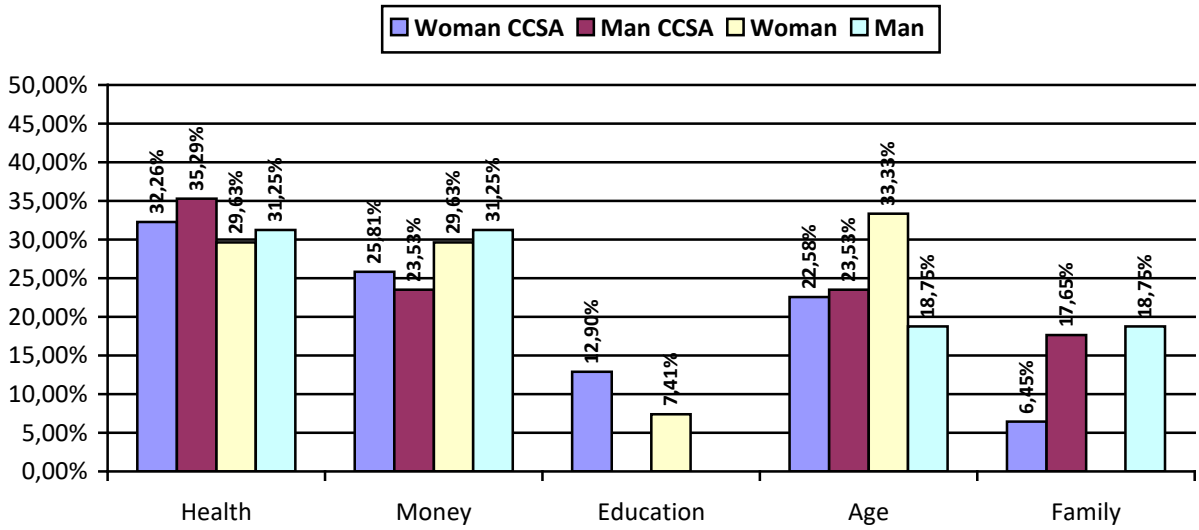


Figure 3. **Factors which seniors need more to be able to enjoy leisure time (%)**

In the next question, where more than one answer was also possible, 10 women (accounting for 32.26 % of answers) and 6 men (35.29 %) of CCSA and 8 women (29.63 %) and 5 men (31.25 %) outside of CCSA, in order to enjoy their free time fully need health. The subsequent 8 women (25.81 %) and 4 men (23.53 %) of CCAS and 8 women (29.63 %) and 5 men (31.25 %) who do not use the services of the institution think that they need more money to feel truly happy. The issue of education was pointed out by 4 women (12.90 %) from CCSA and 2 women (7.41 %) from the second group. The factor of the age of seniors proved equally important in this regard, 7 women (22.58 %) and 4 men (23.53 %) from the institution and 9 women (33.33 %) and 3 men (18.75 %) from the second group believe that, in order to enjoy one's free time in the period of old age, it would be good to be much younger. The subsequent 2 women (6.45 %) and 3 men (17.65 %) from CCSA and none of the women and 3 men (18.75 %) outside of CCSA claim that a family would make them truly happy (see figure 3).

In connection with the last-mentioned factor, the figure clearly shows that it is the men who miss the family more in both groups than the women. The additionally provided answers indicate that these are single men who have never had a family or those whose wife died and children live far away.

The next figure shows whether the activities which seniors engage in are satisfying for them, if they enjoy the activities practised.

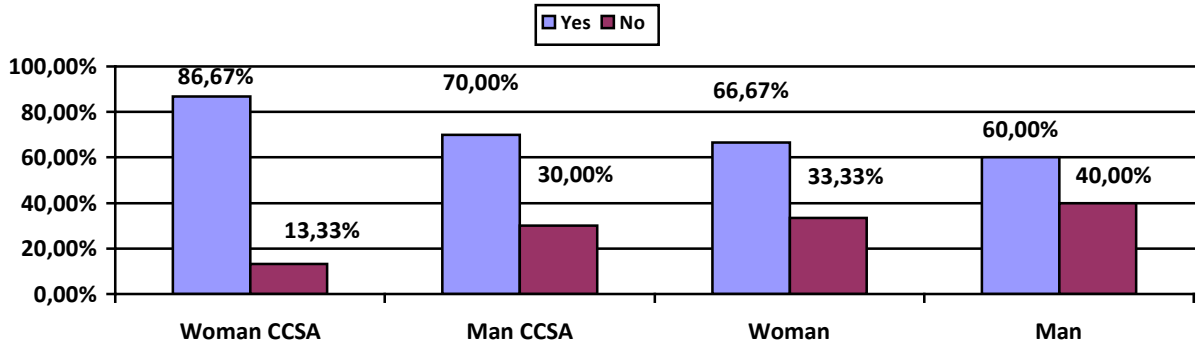


Figure 4. **Satisfaction with the forms of activities practised by seniors in their leisure time (%)**

86.67 % of women and 70 % of men from the institution and 66.67 % of women and 60 % of men outside of CCSA are satisfied with the form of activity they practise in their leisure time. Dissatisfaction was expressed by 13.33 % of women and 30 % of men from the institution and 33.33 % of women and 40 % of men from the second group. The main reasons for dissatisfaction with the forms of spending leisure time are the factors analysed above, which, as it turned out, influence the quality of seniors' life. These include among others: age, health condition, income and education.

The results of research obtained (taking into account first of all activities undertaken by the seniors in their free time) are similar to those obtained in 2015 by Blanka Gosik who conducted the study among a much larger group (400 inhabitants of Łódź at the age of over 60 years old were examined). One can say that the elderly are keen on quite similar forms of physical activity. The seniors of Łódź province, taking into account - as the author of the article described - sports activity most often pointed to cycling. Nordic walking was ranked the second and swimming the third. In turn, most respondents who are not engaged in sports activity pointed to walking (83.4 %) (Gosik, 2015). However, most importantly of all, the elderly actively spend their leisure time. All the more so because numerous studies have confirmed the salutary effect of physical activity on the life of the elderly people (Gregg et al., 2003). Physical activity in seniors, among other things, reduces the risk of their death, increases life expectancy (Stessman et al., 2009) and significantly reduces the incidence rate of chronic diseases, including type 2 diabetes (Demakakos et al., 2010).

Conclusions

People in the period of old age have a lot of leisure time. The vast majority of the people examined are able to manage their time dividing it into the active forms of leisure and the rest. Seniors, in order to maintain their physical well-being and keep fit go for walks, cycle, work out in outdoor gyms. When taking a rest the elderly most often watch television, listen to the radio, read books and the press, play cards with their neighbours.

In the case of people who do not take advantage of any offers for seniors, one must consider whether such people do not have time indeed to take part in such projects or ventures, or are just unable to manage it. Other reasons could be e.g. lack of knowledge regarding the offers prepared by institutions for the benefit of seniors, fear of something new for them, fear of being rejected by the group, and in extreme cases an elderly person's retreating from the world, withdrawal, and even the result of exclusion or marginalisation of an individual. One must consider which actions must be taken to be able to reach the biggest possible number of the elderly.

The choice of a form of activity to a large extent is also affected by interests and passions of the elderly people. Some of the respondents like singing, others enjoy dancing. Some are interested in space, others walk in the mountains, and still others play the stock market. Each of them is different and each does what they like. The most popular activities practised are walks, cycling tours and nordic walking. This is noteworthy as improvement in the functioning of human mental and physical health promotes preventive health care. The aim is optimal functional improvement, taking into account the individual context of each person (Ortenburger et al., 2017; Wąsik & Wójcik, 2017).

There are several factors which are inherent in the period of old age. Some of them make it difficult for the elderly to be active with all of them to a lesser or greater extent influencing the quality of their life. These include the ones examined in the study: health condition, age, income, lack of family, and even the level of education.

Despite all the obstacles that the elderly face and difficulties related to their daily routine, a significant portion of the people examined claimed that they are satisfied with their current age, which can be associated with all life events, barriers they have overcome in their lifetime and their memories. Most of the people examined feel satisfied with their life and activities practised.

References

Alen, E., Losada, N., & Domingues, T. (2016). The Impact of Ageing on the Tourism Industry: An Approach to the Senior Tourist Profile. *Social Indicators Research, 127* (1), 303-322, DOI: 10.1007/s11205-015-0966-x.

Borkowska-Kalwas, T. (2002). Sposoby spędzania czasu wolnego. In: Halik, J. (Eds.), *Starzy ludzie w Polsce. Społeczne i zdrowotne skutki starzenia się społeczeństwa* (pp. 52-61). Warszawa: Instytut Spraw Publicznych.

Bulska, J. (2003). Promocja zdrowia ludzi starszych na progu XXI wieku. In: Marzec-Holka, K. (Eds.), *Pomoc społeczna, praca socjalna: teoria i praktyka* (pp. 584-594). Bydgoszcz: Wydawnictwo Akademii Bydgoskiej.

Cristobal-Fransi, E., Ferrer-Rosell, B., & Daries-Ramon, N. (2017). Segmentation of seniors based on products bought on the Internet: impact on tourism industry. *Cuadernos de Turismo, 40,* 175-201.

Demakakos, P., Hamer, M., Stamatakis, E., & Steptoe, A. (2010). Low-intensity physical activity is associated with reduced risk of incident type 2 diabetes in older adults: evidence from the English Longitudinal Study of Ageing. *Diabetologia, 53* (9), 1877-1885.

Dwucet, K., Rzetala, M., & Snieszko, Z. (2016). Regeneration and adaptation of strongly anthropogenically altered areas for recreation and tourism purposes – case study of the Silesian Upland. *3rd International Multidisciplinary Scientific Conferences on Social Sciences & Arts SGEM 2016. Book 2. Political Sciences, Law, Finance, Economics & Tourism. Conference Proceedings, vol. IV. Economics & Tourism, Sofia, Bulgaria,* 551-558.

Gosik, B. (2015). Rekreacja i aktywność ruchowa starszych osób. Przykład mieszkańców województwa łódzkiego. In: Janiszewska, A. (Eds.), *Jakość życia ludzi starych - wybrane problemy* (pp. 151-163). Łódź: Wydawnictwo Uniwersytetu Łódzkiego.

Gregg, E. W., Cauley, J. A., Stone, K., Thompson, T. J., Bauer, D. C., Cummings, S. R., & Ensrud, K. E. (2003). Study of Osteoporotic Fractures Research Group: Relationship of changes in physical activity and mortality among older women. *Journal of the American Medical Directors, 289,* 2379-2386.

Kuchcińska, M. (2000). Postrzeganie ludzi starych przez dzieci i młodzież. In: Marzec-Holka, K. (Eds.), *Społeczeństwo. Demokracja. Edukacja. Nowe wyzwania w pracy socjalnej* (pp. 376-385). Bydgoszcz: Wydawnictwo Akademii Bydgoskiej.

Marchewka, A. (2012). Aktywność fizyczna - oręż przeciw niepełnosprawności osób w wieku starszym. In: Marchewka, A., Dąbrowski, Z., Żołądź J. A. (Eds.), *Fizjologia starzenia się: profilaktyka i rehabilitacja* (pp. 386-429). Warszawa: Wydawnictwo Naukowe PWN.

Marzec, A. (2016). Tourism as a form of health and recreation activity of the elderly. *3rd International Multidisciplinary Scientific Conference on Social Sciences and Arts SGEM 2016. Conference Proceedings, Book 1. Psychology and psychiatry, sociology and healthcare, education conference proceedings, vol. 3. Education and Educational Research,* 1221–1226, DOI: 10.5593/SGEMSOCIAL2016/B13/S03.160

Matusiak, A. (2006). Aktywność zabawowa podopiecznych Domów Dziennego Pobytu w Zielonej Górze. In: Nowicka A. (Eds.), *Wybrane problemy osób starszych* (pp. 275-282). Kraków: Oficyna Wydawnicza „Impuls.

Omelan, A., Podstawski, R., & Raczkowski, M. (2016). Tourist Activity of Senior Citizens (60+) Residing in Urban and Rural Areas. *Physical Culture and Sport. Studies and Research*, *72* (1), 51-65.

Ortenburger, D., Rodziewicz-Gruhn, J., Wąsik, J., Marfina, O., & Polina, N. (2017). Selected problems of the relation between pain-immunity and depression. *Physical Activity Review*, *5*, 74–77, DOI: 10.16926/par.2017.05.10

Orzechowska, G. (2001). *Aktualne problemy gerontologii społecznej*. Olsztyn: Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego.

Pięta, J. (2014). *Pedagogika czasu wolnego*. Warszawa: Wydawnictwo FREL.

Pikuła, N. (2012). Zdrowie i aktywność społeczna jako determinanty jakości życia osób starszych. In: Zych A. A. (Eds.), *Poznać, zrozumieć i zaakceptować starość. Wybór materiałów konferencyjnych* (pp. 313-324). Łask: Over Group.

Pikuła, N. (2013). *Senior w przestrzeni społecznej*. Warszawa: Wydawnictwo BORGIS.

Stessman, J., Hammerman-Rozenberg, R., Cohen, A., Ein-Mor, E., & Jacobs, J. M. (2009). Physical activity, function, and longevity among the very old. *Archives Internal Medicine*, *169* (16), 1476-1483.

Szarota, Z. (2009). Seniorzy w przestrzeni kulturalno-edukacyjnej społeczeństwa wiedzy. In: Stopińska-Pająk, A. (Eds.), *Edukacja wobec starości – tradycja i współczesność* (pp. 77-96). Katowice: Wydawnictwo Uniwersytetu Śląskiego.

Truszkowska-Wojtkowiak, M. (2012). *Fenomen czasu wolnego*. Gdańsk: Harmonia Universalis – Grupa Wydawnicza HARMONIA.

Vespalec, T., Scholz, P., & Stara, J. (2017). Gardening as the optional physical activity for seniors. *8th International Scientific Conference on Kinesiology*, 316-320.

Wąsik, J., & Wójcik, A. (2017). Health in the context of martial arts practice. *Physical Activity Review*, *5*, 91-94, DOI: 10.16926/par.2017.05.13

Zych, A. A. (2010). *Leksykon gerontologii*. Kraków: Oficyna Wydawnicza Impuls.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 206-212

APPLYING THE RESEARCH SKILLS FOR DEVELOPMENT OF BACHELOR'S THESIS

Mirdza Paipare
Liepajas University, Latvia

Līga Enģele
Liepajas University, Latvia

Olga Blauzde
Liepajas University, Latvia

Abstract. *We live in the age when research skills are required regardless of person's field of activity and experience, therefore it is important to acquire the research skills as key competences already in the school years. Also it is possible to purposefully develop the research skills working on the course papers, bachelor's thesis, master's thesis and doctoral dissertation. In Liepaja University, the Bachelor's study program Teacher/ Music teacher gives the students the opportunity to participate in the development of science, ensuring the academic research principles in the science of pedagogy.*
The authors of this article analyse the choice of research topics selected by the students of Liepaja University, study program Teacher/ Music teacher, as well as the content of the Bachelor's papers, evaluating the applied research skills. The aim of this research: to explore the students' ability to apply the research skills in the process of Bachelor's thesis development. The research method: This study is designed as analysis and review of the defended Bachelor's thesis. As the result, the topicality and specifics of the Bachelor's papers is evaluated, keeping in mind the selected qualifications in the context of lifelong education, also analysing the students' ability to apply the research skills while working on Bachelor's thesis.
Keywords: *Bachelor's thesis, life-long education, music teacher, research skills.*

Introduction

In nowadays' pedagogy, independent learning skills and judgement building skills are the primary means of personal self-realization. Working on bachelor's thesis students use knowledge and skills gained in professional and general education and practical life experience and activity goals (Vygotsky, 1986; Čehlova, 2002; Rudzītis, 1997; Žogla, 2001; Maslo, 2006).

Paying attention to research field in educational institutions, integrating scientific researches and technology development in study process improves the quality of higher education and strengthens the collaboration between higher education institutions and employers (Bundule & Jansons). The process of writing bachelor's thesis reveals students' diverse experiences of individual professional

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3208

development that are based on individual personal traits, motive for choosing themes for the bachelor's thesis that are personally significant.

Teacher training programmes in Liepajas University have quite a long history. Liepajas University (LiepU) as Liepajas Pedagogical Institute was founded in 1954 on the basis of Teaching Institute. Till the beginning of nineties university trained mostly primary school and nursery school pedagogues, math teachers, Latvian and literature teachers for entire country. If official statistics were completed, we could find a teacher who has graduated from Liepajas University in every region of Latvia. Liepajas University in its development has gone through many changes in its title: Liepajas Pedagogical Institute, Liepajas State Pedagogical Institute, Vilis Lācis Liepaja State Pedagogical Institute, again Liepajas Pedagogical institute, Liepajas Pedagogical Higher School, Liepajas Pedagogical Academy and Liepajas University (since 16th july 2008).

During the time from 1997 to 2010 more than 60 music teachers have been trained in Liepajas University. Since 2011, study programme has been transformed and exists with title *Teacher/Music teacher*. In its obligatory courses (A area) students in various modules learn knowledge, skills and acquirements necesary for all subject teachers. During the time period from 2010 to 2018, in study programme *Teacher/Music teacher* 43 bachelor's theses have been elaborated and defended.

Lifelong learning is known for a long time. In the context of European education, it has come forward in 20th century during sixties and seventies, but in Latvian it has become current only in the last decade.

Cross (1981) defines lifelong learning as self-motivated growth, *which means - to understand oneself and the world, learn skills and improve abilities, that are truly real values which can never be lost.* Accenting the necessity of music teacher's profession in the context of latvian cultural identity, it is also important to abide by lifelong learning principle in study programme organization as well. As L. Kriumane (2004) writes: "first aspect of lifelong learning, as study programme development principle, is: traditional and for contemporary educational system too superficial and simplified understanding of the term *lifelong learning*, as education that has been started in childhood, continued in higher education establishments after high school, but after higher education is continued as professional qualification improvement in self-study form or as attendance of some courses in further education (even seminars and conferences)".

In nowadays perspective the term *lifelong learning* in aspect of study programme development, is explained as a chance to continue learning in master or doctor studies or even return to educational system various times to obtain new, additional qualification. Real-life evidence shows that the change of first qualification or basic profession often happens into a completely different

direction. In authors' opinion such a student transition to another educational level (to master and even doctor studies) confirms the latest explanation of *lifelong learning*. To achieve transition to the next level in education, students need to develop research skills during the studies.

While doing research activities, students' level of these skills can differ. At the beginning students work on course paper's goals, analysing those together with consultant of the paper. The role of university lecturer is to point out the problem, help students to uncover most efficient ways in organizing independent work, and to share their knowledge and experience. The more sustainable research skills become, the bigger the student's level of independence will become. Development of research skills is considered both – cognitive process (because it demands from students active awareness about their research process and its results) and student-lecturer interaction process, because it is based on development of motivation and attitude in the student-lecturer collaboration (Odiņa, Linde, & Gerke, 2016).

Mastering research skills contributes to students' confidence in their own powers, to the trust in their research activity in general, which makes a positive experience in research consistent and allows students to judge external research factors in the context of their own experience. While using the research approach in the pedagogical practice process, students acquire the ability to obtain data for the experimental part, the ability to observe pedagogical situations, interpret data, skills to offer answers, explanations and predictions (Kalniņa, 2004).

Research organization and results

Research is designed as a review of all presented bachelor's theses. As the result, the topicality and specifics of the Bachelor's theses are evaluated, keeping in mind the selected qualifications in the context of lifelong education, also analysing the students' ability to apply the research skills while working on Bachelor's thesis.

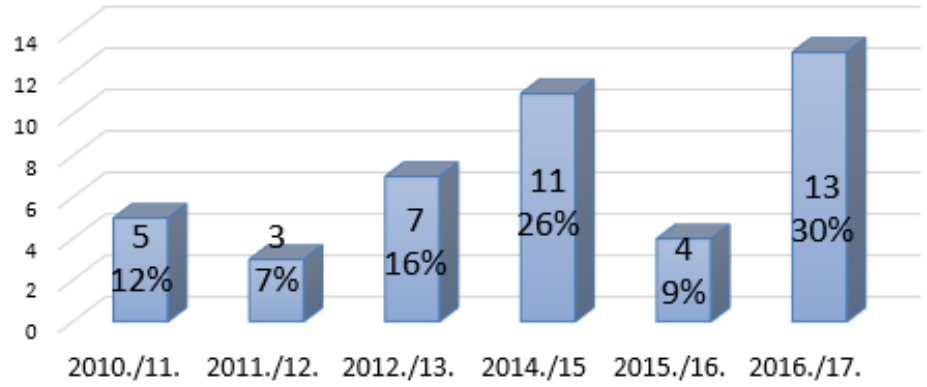


Fig. 1**. Number of defended bachelor theses in each study year (2010-2018)**

During the time period from 2010 to 2018, there were 43 bachelor's theses elaborated and defended (see Fig. 1). Most of bachelor's theses were defended in 2014/2015 study year (26 % of researches or 11 papers) and in 2016/2017 study year (30 % of researches or 13 papers).

Research topics and explorable features

Summarizing and analysing topics of bachelor's theses, authors concluded that (see Fig. 2):

1) most of researches (20 bachelor's theses) are done on gradeschoolers, emphasizing:
   a) importance of musical skill development;
   b) possibilities to develop musical intonation skills for off-tune singers;
   c) necessity to use vocal exercises;
   d) application of jazz music making to music lessons;
   e) comparison of music listening approaches in Latvia and Belgium.
2) raising the question of improving the quality of music making and artistic performance, as well as reducing performance anxiety for adolescents and youth, 17 bachelor's theses were defended;
3) 9 bachelor's theses were written about use of varied methods in music lessons in preschool age group.

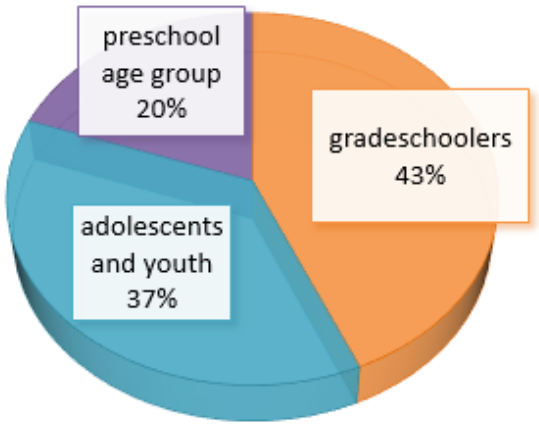


Fig. 2**. Researched age groups in bachelor's theses**

Some researches by future music pedagogues emphasize also the necessity for modern technology application in music lessons, but most of them reveal the significance of motivation, socialisation, creative activities and use of interactive methods in general education schools and interest-related education. By analysing bachelor's theses in music, authors of this article established that students'

researches cover most of the learning principles listed as important in learning process in *The National Basic Education Standard.* The most significant in music are:

1) self-expression and creative aspect (pupils acquire creative experience by participating in the artistic process, developing imagination and fantasy, knowing their abilities and understanding the meaning of creative self-expression in a person's life);
2) analytically critical aspect (the pupil acquires the experience of intellectual activity, learning to think independently and critically, learning about the link between music in different eras);
3) valuing (moral and aesthetic) aspect (getting to know various types of music, pupils get the opportunity to complete their system of values and attitudes, to develop their aesthetic taste, to develop a national identity and self-esteem);
4) social (cooperation) aspect (the pupil develops cooperation skills in collective music making);
5) the aspect of communication (pupils express their feelings and emotions, characterizing the music, express their attitude towards it);
6) the aspect of learning and practical activities (the pupil learns and uses the possibilities offered by the learning environment and modern information technologies).

In *The Basic Elementary Education Standard* in regards of the subject *Music* it is stated that the musical training content consists of three structural components:

1) musical language (48 %);
2) musical perception and artistic performance (47 %);
3) music as an element of culture (5 %).

The bachelor's theses of music teacher's programme pay a lot of attention to enforcing the possibilities and quality of the content and tasks in the subject, provoking the question of the necessity to use more advanced methods for all three structural components in musical training.

Interesting researches and insights are reflected in the bachelor's theses on artistic performance, the importance of increasing the music perception, the reduction of performance anxiety, ability and development at different age groups, and the significance of musical games in the process of personality formation.

Much attention in bachelor's theses is paid to the structural component of musical perception and creative activity and to three types of musical activities (see Fig. 3) – singing, instrument playing/music making and music listening activity, emphasizing the importance of gaining personal experience in the music playing process.

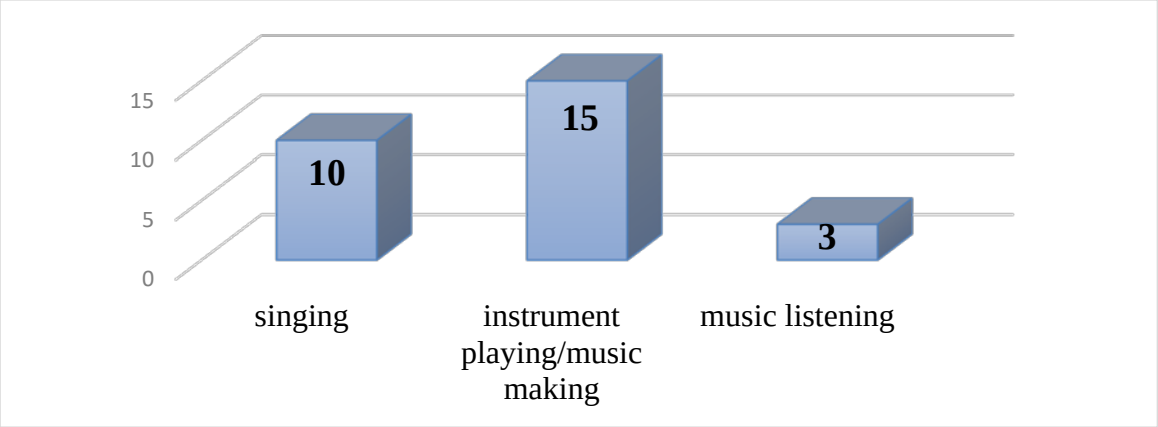


Fig. 3**. Reviewed musical activity types in bachelor's theses**

Conclusions

1) In nowadays perspective the term *lifelong learning* is being explained as a chance to continue learning in master or doctor studies or even study various times to obtain new, additional qualification.
2) To graduate and transition to the next level of education (master, doctor) students need to develop research skills. Mastering them also helps students to gain confidence in their own abilities, trust in their research activity in general, make a positive experience in research and make it possible to build their own experience.
3) This research is designed as a review of all defended bachelor's theses. During the time period from 2010 to 2018, there were 43 bachelor's theses elaborated and defended.
4) Some researches emphasize also the necessity for modern technology application in music lessons, but most of them reveal the significance of motivation, socialisation, creative activities and use of interactive methods.
5) Most of researches (20 bachelor's theses) are done on gradeschoolers, emphasizing the importance of musical skill development, possibilities to develop musical intonation skills for off-tune singers, necessity to use vocal exercises and application of jazz music making to music lessons, comparison of music listening approaches in Latvia and Belgium.
6) By analysing bachelor's theses in music, authors of this article established that students' researches cover most of the learning principles listed as important in learning process in *The National Basic Education Standard*.
7) The most significant learning principles in music are: self-expression and creative aspect, analytically critical aspect, valuing (moral and aesthetic) aspect, social aspect, the aspect of communication and the aspect of learning and practical activities.

8) Much attention in bachelor's theses is paid to the structural component of musical perception and to three types of musical activities – singing, instrument playing/music making and music listening activity, emphasizing the importance of gaining personal experience in the music playing process.

References

Bundule, M., & Jansons, J. (2005). Starptautiskā zinātniskā sadarbība. *Zināšanu sabiedrību veidojot,* 70-93.

Cross, K. P. (1981). *Adults as Learners*. San Francisco: Jossey-Bass.

Čehlova, Z. (2002). *Izziņas aktivitāte mācībās*. Rīga: RaKa.

Kalniņa, D. (2004). Pētnieciskās mācīšanās prasmes attīstība dabaszinību apguves procesā. *Starptautiskā zinātniskā konference: teorija un prakse skolotāju izglītībā II,* 614-615.

Koķe, T. (1999). *Pieaugušo mācīšanās sociāli pedagoģiskie pamati*. *Habilitācijas darba kopsavilkums*. Rīga: LU.

Kriumane, L. (2004). Mūžizglītība – viens no mūzikas skolotāju studiju programmu veidošanas principiem. *Starptautiskā zinātniskā konference: teorija un prakse skolotāju izglītībā II,* 187-191.

Maslo, E. (2006). Skolēnu, skolotāju, studentu un docētāju spēju pilnveide savas mācīšanās izpētes procesā. *Zināšanām uz kompetentu darbību: mācīšanās antropoloģiskie, ētiskie un sociālkritiskie aspekti,* 57-59.

Mācību priekšmeta standarts 1.-9.klasei, 14.pielikums. Retrieved from https://likumi.lv/doc.php?id=268342#piel14&pd=1

Odiņa, I., Linde, L., & Gerke, S. (2016). Studentu patstāvīgās mācīšanās prasmju attīstība universitātes studiju procesā. *Pedagoģija: teorija un prakse, VII zinātnisko rakstu krājums,* 102-115.

Rudzītis, G. (1997). *Gribas un rakstura veidošana mācību darbā un pašizglītībā*. Jelgava: Latvijas Lauksaimniecības universitāte.

Vygotsky, L. (1986). *Thought and Language*. Cambridge, Mass: MIT Press.

Žogla, I. (2001). *Didaktikas teorētiskie pamati*. Rīga: RaKa.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 213-223

APPLICATION OF INFORMATION COMMUNICATION TECHNOLOGIES IN THE STUDY PROCESSES OF THE UNIVERSITIES OF THE THIRD AGE

Irena Žemaitaityte
Mykolas Romeris University, Lithuania

Agne Balčiūnaite
Mykolas Romeris University, Lithuania

Abstract. *The article reviews the experience of people arranging studies involving information and communication technologies into the University of the Third Age studies organization. Life expectancy is longer and the birth rate is lower in proportion to older age people; due to these facts, the ageing is even more noticeable. This situation requires certain measures, which would be effective in the future. Non-formal education institutions, including University of the Third Age, react to the changes and offer trainings which help older people to maintain working-capacity, physical, social and psychological health. In order to provide greater benefits, it is important to pay attention not only to the students of the Third Age but to the needs and changes of society on the whole. It is obvious that in the twenty-first century life is hardly imaginable without information-communication technologies (ICT), which are not only rapidly growing and modifying but are also integrating and changing each and every one aspects of people`s lives, regardless of their age. Therefore, it is extremely important that elder persons have at least minimal of computer literacy and ICT skills in order to conform to modern society standards.*
Keywords: *information communication technologies, older adults, non-formal adult education, University of the Third Age.*

Introduction

Fast ageing of the society, growing emigration, plunge in birth rate in Lithuania motivate the society to acknowledge the ever-expanding segment of society, the elderly adults. At the start of 2011 in Lithuania there lived 484,7 thousand or 13,9 percent of elderly people. The forecast is that in the year 2030 Lithuania will see almost a third of its population (28,9 percent) as aged people (EU 27–30,4 percent), the part of society aged 80 and older will increase 1,5 times (Zumeras, 2013). Because of these reasons, new challenges and new requirements arise for the present society. Adult learning and education is one of the possibilities to deal with such societal problems as increase in adult people`s work

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3205

engagement, and adaptation mechanisms to the changing conditions. Universities of the Third Age help this vulnerable group of society become a fully established group, to develop as individuals and to share interests with others, to become more fit physically, psychologically and socially. The extended life span of people, the growing number of elderly people provide grounds for opening Universities of the Third Age where people could learn new and develop already acquired content, perfect their qualifications, choose from a variety of courses, and satisfy the need of learning and socialisation. The older adults often indicate the need for self-realisation; wish to develop and to communicate with others as the motives for learning. At present in Lithuania (Statistic, 2016) there function 70 non-formal adult education schools, which structure their function not only along specific needs of adult learning and education but also along the fast changing society and the developmental direction towards "the knowledge society". One of the key reflective aspects of the modern society is the application of the information communication technologies (ICT). Though a spectrum of technologies have found its way to Lithuania relatively recently (they were first introduced to Lithuania 20-30 years ago), many older adults have no skills, no intention nor possibilities to use ICT, which are critical for successful function in the society.

The paper seeks to discuss the experience of people who organise studies with the application of information and communication technologies to the study processes at the Universities of the Third Age.

The role and input of information communication technologies to the function of the Universities of the Third Age

We cannot image today`s life without computers, mobile phones, the Internet nor without technologies functioning in the broadest sense of their understanding. They are introduced in many diverse companies (where manual labour is substituted by the computerised work, digitalised content, introducing of different software or even robotics), public life (electronic systems are operating in public transport, in electronic banking, in car rentals), politics (many politicians open their personal web pages; a system for online voting is under construction), and other areas of life, education being one of them (studies are arranged through distance, computers, tablets, other technological devices are used as tools for preparation and display of presentations; and the like). The spread of technologies is happening regardless of the age group, which is going to be exposed to their complexity and use; therefore, all age groups will have to adapt to be able to function appropriately in modern society. New technologies are cable and satellite television, computerised communication, personal computers, new bureau technologies, specifically online information services (Webster, 2006; Tomczyk, 2010). Tomczyk, (2010) define information technologies as a totality of

information processing methods and tools. Researchers identify that the effect of new technologies on the humanity is multiple: it is related to building material and spiritual values, and social-cultural environment (Wagner & Kozma, 2005; Dagienė, 2008; Feist & McDougall, 2013). The accent falls on the characteristics that the skills to use ICT are indispensable for all social groups and layers. They are instrumental for the successful participation in societal life. Modern ICT are applied to many areas of societal life, therefore, abilities and skills to use them are of importance to all groups of society.

Petkunas (2007) while dealing with the effects of the Information Communication Technologies upon the educational paradigm, separates two approaches – educational and technological. Technological approach sees ICT as a supporting means to diversify traditional pedagogy; while educational approach connects ICT to the changes that happen to the learning and teaching. Most often technologies are developed to easily a human life. In education technologies also easily the access of individual needs to studies, also they are developed for the modernisation of the whole educational process. Tolutiene and Puskorius (2014) highlight the fact that the main goal of ICT use in education is to modernise the process of education and to provide conditions to seek modern goals of education: 1) to develop important societal skills for complete life in the knowledge society (abilities to learn, critical thinking, creativity, information technology skills); 2) to update teaching content and to integrate diverse data; 3) to apply new teaching methods; 4) to form new learning and life culture. These goals are oriented to the learning individual and the individual adaptation to the fast changing society.

The Universities of the Third Age (UTA) are institutions of non-formal adult education, which provide non-formal teaching for older people and continuous studies, to harmonise their knowledge and competences with the developmental needs and cultural requirements (Zemaitaityte, 2014). The main goals of the non-formal education of the University of the Third Age are:

- to help an individual to satisfy self-learning needs, to develop cultural interests;
- to develop personal creative skills and capacities;
- to help an individual to become an active citizen of the democratic society;
- to provide conditions for acquiring theoretical training and practical skills for professional activities and for augment of the qualification competences (Analysis of UTA system performance, 2012).

The University of the Third Age participates in finding solution to one of the fundamental goals of adult education in society; the UTA provides an opportunity for older adults to adapt to the evolving situation and to implement personal needs. Researchers (D'Orazio & Florenzano, 2000; De Camillis, 2000; Zemaitaityte,

2007; Gustaitiene & Beneviciene, 2014) state that the UTA guarantee a better integration of older adults into society, enrich their life; sustain their labour condition; keep up standards of information, culture; let them share their life experiences. This form of education is acceptable for older adults, it helps critically to self-reflect and assess their life conditions, to find new potentials for upgrading living conditions and to start constructive alterations. In Lithuania the UTA is often seen as a cooperation of elderly people for the achievement of different goals of action (not only academic growth, but also artistic function, tourism, and the like) and self –development (Analysis of UTA system performance, 2012). This explains how the study process serves the needs of the society and the students. The persons who arrange the study processes are oriented towards these spheres and pay a lot of attention to the needs of UTA students. The Universities of the Third Age appeared in Lithuania in a relatively recent period (in 1995 the first UTA was founded and until 2008 8 more universities opened on the initiative of private individuals). After 2008 the situation changed and the universities were opened on the initiative of the local municipalities and other universities. In spring 2014 in Lithuania there functioned Universities of the Third Age in 40 towns; they encouraged education of older adults, upgraded life quality of elderly people, contributed to the cultural, social, and physical well-being of the older adults. In arranging the educational processes technologies often are taken as aids, yet, technologies play an important part in the study process, they let arrange the studies in a more effective way and for larger audiences of people, achieve positive microclimate, diversify study process, give students new opportunities for learning to use ICT and, what is of paramount importance, apply them on day-to-day basis.

Methodology of Research

In the attempt to identify the experiences of the people who arrange studies with modern ICT into the curriculum of the UTA, a qualitative survey was carried out. It is chosen because of the holistic approach to the object, extraction of qualitative data, openness of the research, the acknowledgement of the instrumental status of the researcher for obtaining knowledge, acquiring and putting to practice experience in describing the object of the survey itself. Bitinas states (2006) that *holistic approach to the object* is when the object is seen as a single complex system. The researcher seeks to reveal categories and dimensions, to penetrate the details, to interpret all within the context of the totality. The attention is paid to the processes of education, the evolution of the individuals and cultures (Kvale, 2007; Yin, 2011; Flick, 2014). This approach makes the researcher identify the ICT application opportunities and also measure the value of the application of the ICT as a detail in educational process for the whole

process and, most importantly, for the informants, personally. For the purpose of the research the narrative strategy is chosen, when the data selection method is a semi-structured interview method. 11 interviews were carried out with the average length of an individual interview - 40 min. The data was recorded, transcribed, printed and a qualitative data analysis for the narratives was carried out.

The University of the Third Age was chosen on the principle of availability, targeted selection was undertaken. In selecting the university the data of 2012-2013 research „Analysis of the University of the Third Age System Function" was studied regarding the major Universities of the Third Age functioning in Lithuania at the moment of research. The invitation was sent to the representatives of all faculties who organise studies with the expectation to receive diversified answers without any prior attitude. *Research participants* - people who arrange study processes at the University of the Third Age. *Research ethics issues* - the informants were provided with the letters of agreement to participate in the survey which were signed by signatures or other credentials. All informants were participating on a voluntary basis. The survey material in the transcribed matter and in the analysis does not reveal a single informant`s personal data. All the names, surnames and other data for the identification of the persons were changed at the researcher`s advice. The data was processed ethically. The citations provided in the work were not changed after the agreement of the informants was granted. The data was coded by the authentically listed phrases.

Analysis of the Research Data

In the analysis of the informants` responses, three main themes were identified: study processes organisation; application of the Information Communication Technologies; process valuation. This article seeks to focus on one of the themes – application of the Information Communication Technologies to the organisation of the study processes of the University of the Third Age.

In the period of research it became obvious that the informants mostly spoke of the type of Information Communication Technologies which they use in their work, in other words, the participants of the research did not touch in their discussions upon the technologies they are not using directly in organising study processes, neither they talked about broader opportunities that ICT maybe applied to. While reviewing the experiences of the informants to use ICT the focus was directed towards their importance to the experiences of the informants and their opinions of ICT tools. The organisers defined ICT in very general terms, stressing the fact, that Information Communication Technologies at the moment are very important in life, and in the University of the Third Age: "ah, those information technologies, well but work without hem is not impossible" *("ai, tos informacinės, nu bet darbas dabar neįmanomas be jų."),* "Let`s say a teacher, an

andragogue, or any other teacher in these days cannot be imagined without Information Communication Technologies" (*„Ir sakysim, ir dėstytojui, andragogui, ar kitam dėstytojui, sakysim, jau šiais laikais be tokių komunikacinių informacinių technologijų, sunku įsivaizduoti.“), "*But in the present time they are the engine of life*"(„Bet šiais laikais jos yra gyvenimo variklis.“),* "you know, there might have been a time when all seemed very frightening , since we are older people, at the end of our employment careers we had to work on computers, a lot, and now we cannot imagine without a computer" *("žinot, kažkada, gal atrodė, tokia kaip, nu kažkoks baisus dalykas, mes vis tiek jau esam vyresnio amžiaus, tai tiesiog tai buvo, kad bebaigiant darbinę karjerą jau teko dirbti kompiuteriu ir daug teko dirbti, o dabar tai neįsivaizduojama be kompiuterio"),* "It is clear, that in these days we could not live without it. No Dean is without a computer and without all those connections that are inevitable and necessary." *(„Tai aišku neįmanoma nebūtų šiais laikais gyvent. Ir nei vienas dekanas jau nėra be kompiuterio be tų visų ryšių kurie neišvengiami ir būtini.“), "*this imagination is, I gather, very limited, but on the other hand present day life without them is unimaginable, without these technologies*" (tas įsivaizdavimas mūsų taip pat, labai sakyčiau toksai ribotas yra, bet iš kitos pusės, be jų, šiuolaikinis gyvenimas neįmanomas yra, be šitų technologijų").* It is possible to notice, that the informants stress the importance of ICT in the organising of the study process, delivering lectures, life and call them "the vehicle of life". Also the informants identified the impossibility to work without computers at the present moment of time. This means that computers are classified as one of the key means of ICT but in the past they were "frightening to use". Many Deans of the University of the Third Age are elderly people and ICT for them is quite a novelty. Study organisers when listing devices that they associate with ICT named the following tools: a computer, the Internet, an email, a mobile phone, a camera, a tablet, multimedia – "it associates with computers, of course, the Internet, all. First, of course, computers, then smart phones, then a variety of different programmes which we as our forefathers used to say never dreamed of came and other things." (*„asocijuojasi su kompiuteriais, be abejo, internetas, viskas. Pirmiausia, aišku kompiuteriai, paskui išmanieji telefonai, paskui įvairiausios įvairiausios programos, kurių mes anksčiau, kaip sakydavo mūsų senoliai, ir sapnuot nesapnavom, ir kiti dalykai.“),* "I hear that the tablets are now very popular and people of my age, many use tablets, for cameras, they have all." *(„Planšetės dabar girdžiu yra labai populiarios, ir mano amžiaus žmonės daug kas planšetes naudoja. ir fotoaparatas, ten viskas yra“),* "so its a computer. An email. Mobile devices. Local phones." *(„tai kompiuteriu. Elektroniniu paštu. Mobiliomis ryšio priemonėmis. Vietiniu telefonu.“),* "we ourselves, personally, have no such possibilities to use some fancy devices beside the Internet, beside a computer. Let`s say if this is a lecture so in it other devices are used as well multimedia, so

far, but so far so.“ *(„mes patys, asmeniškai, neturim tokių galimybių panaudoti kažkokius ypatingus prietaisus, apart interneto, apart kompiuterio. Na sakysim, jeigu paskaitoj tai ten panaudojama, reiškia, ir kitas, ir multimediją, kol kas, bet jau taip jau.“).* Some less used devices were also highlighted: television and radio, the portal of the University of the Third Age, recordings, phonograms – “it is possible to say that we use recordings for phonograms“ (*„galima sakyti, kad įrašus naudojam, pavyzdžiui būna fonogramos“),* “Very broadly used is our University page. Where you can find the newest information, or, let`s say the principle that everyone can be noticed and everyone can have one`s say and you can immediately find on the internet page.“ *(“Ir labai plačiai yra naudojamas mūsų svetainės puslapis. Kur, sakysim, pati naujausia informacija yra pateikiama arba šitas, sakysim, kokia, vat pavyzdžiui, pas mus yra laikomasi, kad kiekvienas turi būt pastebėtas, kiekvienas turi būt išklausytas, ką tu iš karto sužinai, ką tu pastebi ir pateiki iš karto internetiniam puslapy.“),* “I speak on televison, very often speak over the radio“ *(„kalbu ir per televiziją, labai dažnai kalbu per radiją“).* These answers show a broader understanding of our informants of what are Information Communication Technologies, but most often it comes down to the devices and technologies that they personally use.

While analysing the interviews the informants` experience in learning to use Information Communication Technologies came forth. The Organisers told their stories of how they learned to use ICT devices, who taught them, who motivates them to develop their skills. A part of the informants learned independently, a part attended courses, trainings. Some of the survey participants defined the learning process in both ways: “In technologies I am self-taught. I am not skilled myself, yet. I wanted to attend courses.“ (*„ogi technologijomis tai aš savamokslė. Ir dabar gi aš gerai nemoku. Norėjau eiti į kursus“),* “At first I could not attach a letter, then I learned with that clip, then there are many other things. And I started using them because I had to translate a book from Polish.“ *(„pradžioj gi nemokėjau prisegti laiško, tai išmokau su ta sąvaržėle, paskui gi yra visokių kitokių ką tau reikia, kažkokių. Ar dar, o pradėjau naudotis tai ko gero tuo, kad reikėjo versti knygą iš lenkų kalbos);* “In this way by sitting and picking with one finger trying to push every arrow mark and in this way I learned myself.“ (*„vat taip sėdint, vienu pirštu badant, ir ieškant kur čia kokią rodyklę pastumti, va taip per kažkokį tai laiką, pats per save ir išmokau“),* “Perhaps as the majority of people, reading instructions, my children helped, I attended computer courses.“ *(„Matyt kaip ir didžioji dauguma žmonių, ir instrukcijos skaitymas, ir padėjo mano vaikai, padėjo, lankiau ten kompiuterių kursus“),* “I learned independently, sometimes I need help, so I ask, of course, of my children and of my colleagues, in the other work.“ (*„pati savarankiškai, kai kur kai kada reikia pagalbos, tai aš be abejonės kreipiuosi, ir į vaikus ir šalia, kolegas, ir ten kitame darbe“).* The survey results reveal that the learning process associates for the survey participants with

different methods: self-studies, learning from colleagues, learning with others, attending courses, or a special school. This provides the spectrum of learning opportunities and adult learners find suitable methods of learning new things when the life situation changes, sometimes overcoming difficulties. This is confirmed by the „self-taught" informants` answers: " first, the son put up a simple computer for me, showed Word, so I figured out Word and started typing with one figure, learned to save, so that it would not disappear, archive so this was my first work. Later the Internet came, I was very interested in Internet." (*„pirmų pirmiausia tai sūnus pastatė tokį man prastą kompiuterį, na wordą parodė, tai wordą supratau ir pradėjau rašinėti su tuo vienu pirštu, supratau kaip užsiseivint kaip sakant, užseivint kad jis nepradingtų man, šiek tiek dokumentuot ir va toks pirmasis darbas buvo. O toliau jau buvo internetinis darbas, toliau labai domėjausi*"). However, in the courses and trainings the informants experienced certain emotions – "I was taught by a certain Vytautas, doctor of sciences, and I could not, practically, understand him, he was very friendly, caring, laborious, but for me it was too sophisticated." (*„toks Vytautas dėstė mums, mokslų daktaras ir aš jo, nu galima sakyti nesupratau, labai jisai buvo ir draugiškas ir darbštus ir rūpestingas ir iš tikrųjų rimtai dėstė, bet man tai buvo per aukštas lygis"),* "But as I came there for the first time, I saw all types of computers, I am shy I sat at the back of the room at a box , similar to a dog`s kernel. I tried to switch it on, but even the teacher had trouble in switching it on. She started explaining of how I can put pictures, texts and I saw that for me these things are unintelligible and I did not go there anymore" *(„Bet atėjau aš pirmą sykį, tenai pridėta visokių tipų tų kompiuterių, nesu nachalas, atsisėdau ten toli, tokia dėžė, dar tokia kaip šunio būda. Aš bandžiau įjungti, bet vos ir ta dėstytoja ir ta mokytoja vos įjungė. Ir kaip pradėjo jinai aiškinti, kaip dėlioti į tekstus paveikslėlius, aš pamačiau, kad čia man neįkertami dalykai ir aš ten daugiau nėjau*"). The experience of the informants indicates certain specificity of work with the elderly people: the information has to be presented clearly; it has to be repeated as many times as the elderly students need to understand the provided topic. However, some organisers when studying ICT were younger, middle aged, yet this learning was new to them, something difficult to understand. "So, how to use the menu I seem to know, its logic, and here is a different logic, and different thinking has to be. Then when you take this as we called mobile phone and it was not for me alone, a sweat breaks out." (*„Na kaip tuo meniu naudotis, atrodo, pripratęs vat tokia logika, o čia kita logika, kitas mąstymas turi būt. Pirma atsisėdi, ne man vienam čia, prie to telefono, kaip mes vadindavom, mobiliojo, atsisėdi ir prakaituoji".)*

This experience the informants associate with their employment, personal needs. "I did not know anything 20-30 years ago, I did not know anything about computers and , finally, when I was 80, my wife a bit younger, we bought a computer and started learning and working with it." (*„Aš nieko, prieš 20-30 metų,*

nieko nežinojau apie kompiuterius, ir pagaliau turėdamas 80 metų, žmona jaunesnė šiek tiek, mes nusipirkome kompiuterį ir pradėjome kažkiek tai mokytis dirbti su juo“), “ at that time computerisation just started and I changed my job to a place where, practically, without computer skills was impossible to make a move.“ (*„tais laikais, tik prasidėjo kompiuterizacija ir aš perėjau dirbti tokį darbą, kur praktiškai be kompiuterio buvo nei žingsnio.”)* It is possible to state that the informants were put into the position to learn ICT skills by their employment when computers were started to be used in Lithuania. Though only a few came across technologies immediately but a part of informants acknowledged that they were motivated to study IT devices since the day of their appearance because of their work position. Informants said that they had to study independently and to obtain technological devices was too costly. “They said the price that I paid for my cooperative flat, so that is what they said. <...> Then my brother bought a car, there was a car „žiguliai“ and the computer was more expensive than that car.“ *(„ir pasakė tada tokią kainą, aš buvau užmokėjusi pinigus už kooperatinį butą, va tiek pasakė. <...> O tada brolis, pirko automobilį, tai žiguliai buvo toks automobilis, tai buvo brangiau už tą automobilį kompiuteris“).* At that moment computers did not perform any communicative function and no information could be trasnmitted, but they accumulated, archived and carried out other functions. Later when the internet was introduced, computers were renewed their functions updated, they became ICT devices and new things were to be learned. This learning process in the opinion of the informants has to continue since these devices come out with updated functions, and the life of the informants and their activities require studying of new skills.

Speaking of ICT learning experiences the survey participants mentioned who taught them to use ICT. It turned out that most often the informants learned from the „young“, members of the family, colleagues and self-dependently. „I have a son, rather young, so it is clear that apart from the young people`s or without the colleagues` help we learn from each other.“ (*„Aš turiu sūnų tokį dar sąlyginai jauną, tai aišku be jaunimo pagalbos arba be kolegų pagalbos, vieni iš kitų mokomės*“), “My family has a person whose function is to help with Information Technologies. If I need something or something fails, or a problem arises, something not clear, I call and ask “Come“ and that is.„ (*„mano šeimoje yra žmogus, kur jo tiesioginis darbas informacinės technologijos. Jeigu jau tik man ko nors reikia, sugedo kas nors, neaišku kas nors, ar kaip, aš paskambinu – „atvažiuok“ ir viskas*“), “When sometimes my son helps me, he suggests to give me theory, but I respond, that I do not need theory, I will not put myself into it, just say which button to press, „mum, you forgot“, “I will take it down, now.“ (*„Bet na aš tai, na sūnus kai kada padeda, sako aš tau pasakysiu teoriją, sakau vaikeli man nereikia teorijos, aš neužsiimsiu, tegul, pasakyk kokius mygtukus man čia suspaudyt. „tu mama užmirši“, na aš užsirašysiu.“),* “I wanted to upgrade a

bit, so here is a UTA faculty of information technologies. I asked the Dean to be introduced into the group.“ („*Aš dar norėjau šiek tiek patobulėti čia TAU fakultetas yra informacinės technologijos, ... paprašiau dekano, kad jis leistų mane į grupę*“.) The answers the informants provided prove that UTA study processes organisers seek to upgrade their skills continually. They emphasised that they seek for learning aid in the immediate environment, among family members, friends and at work or other engagements. It is possible to state that young family members while training their elders participate vicariously in the organising the University of the Third Age study processes through application of the ICT.

While talking about learning to use ICT the informants mentioned the Faculty of Information Technologies, which provides teaching in computer literacy. It was noted that some Deans wish to enlist in the programme, some have already studied there since they wanted to be more literate in this area. Thus, the Faculty is important not only for the prospective students but for the organisers of the study processes themselves. “Perhaps we should mention that now there is that faculty, a new one, Information Technologies, so there is the place for those who have no computer literacy, to acquire it first of all.“ („*Reikėtų gal prisiminti, dabar yra tas fakultetas, naujas informacinių technologijų, tai ten aišku, kaip ir reikia, kad mokytųsi pirmiausia, tie, kurie iš viso neturi kompiuterinio raštingumo, kad išmoktų“),* “we prepare our seniors of the Third Age not only for the immediate life, but also for them to be able to use those communication technologies for enhancing their life quality.“ *(„mes savo Trečiojo amžiaus senjorus, ruošiam tokiam ne tik tai betarpiškam gyvenimui, bet kad jie ir tas komunikacines technologijas panaudotų ir savo gyvenimo kokybės pagerinimui“).* The informants pointed to the students’ needs while talking of ICT, they emphasised that it is important for students to study to use ICT for better life quality. However, to quote informants, some are illiterate in computer information, though their numbers are shrinking; most start learning because life conditions make them study.

Conclusions

In summing up, it is possible to state that the application of ICT in the University of the Third Age is rather wide. In the broadest sense, ICT could be applied as a teaching tool, learning environment, communication, administration and the task performance tool. The results of the survey showed that ICT application in organising studies at the University of the Third Age depends on the individuals who organise the studies, however, the process is influenced by the material resources of the institution, the specificity of the faculty, as well as the needs of the students and other individuals and the possibilities to use ICT.

The participants of the survey stated that almost all processes of study organising include ICT use. The research revealed that the Deans experienced relative difficulties in learning to use ICT devices, but these skills unquestionably make the organising of the processes easier as well as enhance their personal lives. At the present moment the informers learn from the "young "members of their families, colleagues and other persons. These people through their assistance in using ICT take vicarious participation in the organising of study processes at the University of the Third Age.

References

Analysis of UTA system performance (2012). Retrieved from http://www.upc.smm.lt/svietimas/tyrimai/TAU%20tyrimo%20ataskaita%202012.pdf

Dagienė, V. (2008). *Informacinės mokymo technologijos*. Vilnius: VU.

De Camillis, S. (2000). *Motivazioni all'educazione continua. Perché gli adulti frequentano i corsi di studio per tutto l'arco della vita*. Roma: EdUP.

D'Orazio, E., & Florenzano, F. (2000). *Studiare da grande. Conoscere e fare le università della terza età.* Roma: EdUP.

Feistm, H., & McDougall, K. (2013). Older people's use of new communication technologies: Research Findings & Policy Implications. *Australian Population & Migration Research Centre Policy Brief, Vol. 1, No. 8.*

Gustaitienė, L., & Benevičienė, V. (2014). Vyresnio amžiaus žmonių psichologinių bei socialinių veiksnių, psichosocialinio prisitaikymo ypatumai socialinių ir demografinių duomenų atžvilgiu. *Socialinis darbas, 13,* 248-262.

Petkūnas, V. (2007). The Cange of Educational Paradigm under the Influence of ICT Implementation: Reseach on Students' Attitudes. *Socialiniai mokslai, 3* (57), 54-65.

Statistics 2015. (2016). Vilnius: Statistics Lithuania.

Tolutienė, G., & Puskorius, S. (2014). Informacinių ir komunikacinių technologijų taikymas švietime: besimokančių suaugusiųjų. Požiūrio tyrimas. *Tiltai, 3*, 123–140.

Tomczyk, L.(2010). Seniorzy w świecie nowych mediów. *E-mentor, 4* (36).

Wagner, D. A., & Kozma, R. (2005). *New Technologies for Literacy and Adult Education: A Global Perspective*. UNESCO.

Webster, F. (2006). *Informacinės visuomenės teorijos.* Vilnius: UAB „Poligrafija ir informatika".

Zumeras, R. (2013). *Pagyvenusių žmonių fizinis aktyvumas ir sveikata.* Vilnius. Sveikatos mokymo ir ligų prevencijos centras.

Žemaitaitytė, I. (2007). *Neformalusis suaugusiųjų švietimas: plėtros tendencijos dabartinėje Europoje*: monografija. Vilnius: Mykolo Romerio universitetas.

Žemaitaityte, I. (2016). Older adult education in Lithuanian ageing society. *Society. Health. Welfare. Vol. 30 p.* 1-9. DOI: 10.1051/shsconf/20163000023

INFORMĀCIJAS TEHNOLOĢIJU IZMANTOŠANA IZGLĪTĪBĀ

INFORMATION TECHNOLOGIES IN EDUCATION

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 227-237

EXPLORING FACULTY MEMBERS' VIEWS ON ADOPTION OF CLOUD COMPUTING IN EDUCATION

Seren Başaran
Computer Information Systems, Near East University, N. Cyprus via Mersin 10 Turkey

Goran Omer Hama
Computer Information Systems, Near East University, N. Cyprus via Mersin 10 Turkey

Abstract. *The aim of the study is to investigate university faculty members' views towards adoption of cloud computing in higher education. The current status of the faculty on cloud computing usage in education and regional differences were discussed. Strengths, Weaknesses, Opportunities, Threats (SWOT) and Technology, Organization, Environment (TOE) frameworks were integrated. The data was collected through an adopted questionnaire based on these frameworks and demographic information were answered by 300 faculty members from north parts of Cyprus and Iraq. This study is exploratory and causal comparative which descriptive statistics with independent t-test were used to analyse data. The results showed that faculty members agreed mostly on the opportunities which followed by awareness of potential threats and weaknesses and lastly they accept the strengths of adopting cloud computing in education. They are highly in consensus on technological availability followed by organizational aspects and lastly on environment related regulations. Regional difference exists in the sub-dimension of TOE. Faculty members from north part of Cyprus agreed more upon the relative advantage of using cloud computing as compared to their counterparts. The study brought light on the comprehension of faculty members' views from comparative and integrated framework perspectives.*
Keywords: *Cloud computing; cloud computing adoption; higher education; SWOT; TOE.*

Introduction

While cloud computing technology is rapidly growing into an inevitable tool for data exchange and storage at minimized or no cost, cloud computing services have commenced to penetrate educational platforms recently. Higher education administrations and professionals are looking for new tools to handle not only management and communication, but also teaching and learning at the same time. Some higher education institutions are early adopters of such innovations, yet majority are still struggling through the early steps of planning to adopt it.

This study intends to investigate adoption of cloud computing by universities in north parts of Cyprus and Iraq with the involvement of faculty members (full-time academic staff holding at least MSc. degree) to identify the current status

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3290

and to extract any regional differences. Most importantly, to recognize which extent faculty members from various universities in both regions are using or aware of cloud computing and to obtain knowledge whether there is a great need to recommend its introduction to the educational systems. For this reason, two frameworks were combined namely; SWOT (Strengths, Weaknesses, Opportunities, Threats) and TOE (Technology, Organization, Environment) to identify not only internal but also external capabilities of the cloud computing adoption process. This study is believed to be among few studies that investigated this subject in a comparative perspective. Studies exist investigating adoption of cloud computing in education for Middle East region (Tashkandi & Al-Jabri, 2015a). However, comparing the results of 'early adopters', 'adopters' and 'non-adopters' of cloud computing in education for different regions are still known to be unavailable in the literature. Moreover, up till this date, no study has been identified using the integration of the SWOT and TOE frameworks together to investigate cloud computing adoption in higher education. SWOT framework helps to explore both the internal elements such as; strength and weaknesses and the external elements such as; opportunities and threats of cloud computing and TOE tries to look at the external elements from the technical, organizational and environmental aspects of cloud computing adoption which will help the higher education institutions to firmly understand cloud computing core advantages and limitations at the institutional level.

Overview of the Literature

Higher education institutions (HEI) are seeking innovative tools to implement emerging technologies in education. Accordingly, there is an urgent requirement not only for administrative facilities but also for learning and instructional activities that could be utilized as a part of enhancing correspondence among the parties involved in higher education. Therefore, HEIs are looking for new approaches to maintain such services at moderate or no cost (Ghilic-Micu & Stoica, 2011). Cloud computing remedies these issues by supplying HEIs required services at minimized or almost no expense. Implementing cloud computing in education does not require any expensive IT foundation or environment. Behrend et al. (2010) expressed that cloud computing is picking up ubiquity in educational settings, however the elements that prompt technology adoption in an advanced educational setting were relatively unexplored. The potential of using cloud computing as a medium for cutting edge instruction has been appreciated by various universities (Sultan, 2010). Cloud computing offers institutions the opportunity of concentrating more on teaching and research practices rather than spending time on a complicated IT execution on complex IT plan and programming systems (McCrea, 2009). The educational practices for the use of

cloud computing are varied. One of which is Virginia Virtual Computing Lab (Wyld, 2009). This allowed associations both to hack down IT costs by diminishing the necessities of approving and programming overhauling and to keep up its own specific server ranches, furthermore to improve IT resources for analysis. By including the use of cloud at institution, for instance North Carolina State University fulfilled a liberally reducing of expenses with programming approving and meanwhile to decrease the grounds IT staff from 15 to 3 agents with full working timetable (Wyld, 2009).

The use of cloud computing transforms into a need and are fully embraced recently by few universities. Eventually, a late study seeing using cloud computing as a piece of cutting edge technology shows that universities may even now be found in the time of "early adopters" for business and for regulation purposes (Katz et al., 2010). Adrees et al. (2015) discussed separating the thoughts of cloud computing, models, organizations and architecture with the objective of how to use and associated cloud computing architecture in cutting edge instruction, in developing countries. Researchers communicated that the usage of cloud computing development in cutting edge instruction addresses an authentic open entryway for some countries. Their study arrangements included to perform SWOT examination to choose the impact of the cloud computing use, for instance, SWOT in cutting edge instructional foundations of the selected developing countries, and that from the perspective of directors, teachers and students, to find the effect of characteristics, deficiencies, opportunities and perils when using cloud computing development as a piece of cutting edge instruction. Their study revealed positive results, on versatility and viability and ability to pick up learning.

The adoption of new technologies such as cloud computing is inevitably influenced by the technological, organizational, and environmental contexts in higher education. TOE framework provides suitable guidance with consistent theoretical base and support from extant literature due to its ability to explain inner level adoption processes adequately. However, a variety of other aspects needs to be considered in addition to TOE framework. At this stage, SWOT examination appears to be valuable in fundamental authority for all propelled instruction establishments while considering the transformation of present learning systems to cloud based structures (Odeh et al., 2015). Odeh et al. (2015) categorized elements that influence cloud computing adoption as internal and external respectively. Internal variables consist of strengths as minimized cost, anytime anywhere learning, backup and recovery of learning sources, duration, capability of handling expansion, portability, expanded storage, works on different platform with autonomous location, and weaknesses are; bound to service provider, technical problems and server errors, limited flexibility and control, risks of inaccessibility, inability to check accuracy of data. External variables include opportunities as endorsing interaction and collaboration, supporting knowledge

constructed smart environments, maximum integration and sharing of knowledge, digital learning activities, maximum data storage and accessibility of resources and threats as, security, controlled by vendor, spam messages, administration, regulations, and monitoring problems.

However, SWOT framework does not consider factors at the institutional level. TOE framework which focusses not only technical aspects but also the institutional and environmental factors was primarily used in for cloud computing adoption (Haag & Eckhardt, 2014). Tornatzky and Fleischer (1990) proposed TOE framework to clarify the procedure of advancement with regards to IT adoption. Innovative part of the TOE system alludes to both accessibility and qualities of the advancements. Any inside and outside technology that is important to the institution is a piece of the innovative perspective. TOE serves as classification for variables that encourage or restrain the selection of certain technology (Haag & Eckhardt, 2014). TOE has advantage over Diffusion of Innovation model because of the inclusion of the environmental elements (Alshamaila et al., 2013).

Tashkandi and Al-Jabri (2015a) stated that investigation of cloud computing is a growing area particularly in middle east region. Selection of new developments ought to be gone before by investigation of the additional worth, difficulties and sufficiency from innovative, authoritative and ecological points of view based on TOE framework. Three variables were discovered as the most noteworthy elements; relative advantage, data privacy and complexity. Noteworthy contrasts are in the areas of cloud computing similarity, multifaceted nature, seller lock-in and peer pressure amongst vast and little information was uncovered. Cloud administration supplier ought to address the protection and many-sided quality concerns raised by non-adopters in that study. Numerous aspects should be taken into account in the adoption of cloud computing in higher education sector due to the involvement of multifaceted procedures. Therefore, integrating multiple frameworks provides more functional and exhaustive inspection.

Research Methodology

This study compare and contrast faculty members' views towards cloud computing adoption in higher education. Corresponding research questions are:

1. What are faculty members' views from north parts of Cyprus and Iraq on the current status of cloud computing adoption in higher education?
2. Are there any significant differences in the views of faculty members towards cloud computing adoption in higher education with respect to region (north parts of Cyprus and Iraq)?

a. Are there any significant differences in SWOT dimensions among the views of the faculty members towards cloud computing adoption in higher education with respect to region?
b. Are there any significant differences in TOE dimensions among the views of the faculty members towards cloud computing adoption in higher education with respect to region?

Table 1 **Demographic information of participants**

	North Cyprus		**North Iraq**	
Demographics	***f***	***p %***	***f***	***p %***
Gender				
Male	56	44.8	111	63.4
Female	69	55.2	64	36.6
Total	125	100	175	100
Age				
25-27	38	30.4	35	20.0
28-30	53	42.4	39	22.3
30+	34	27.2	101	57.7
Total	125	100	175	100
Years of working at institution				
Less than 5 years	71	56.8	49	28.0
5-10 years	54	43.2	82	46.9
More than 10 years	0	0	44	25.1
Total	125	100	175	100
Teaching Experience				
Less than 5 years	71	56.8	49	28.0
5-10 years	54	43.2	82	46.9
More than 10 years	0	0	44	25.1
Total	125	100	175	100
Academic Title				
MSc/PhD	71	56.8	49	28.0
Assist/Assoc. Prof	54	43.2	82	46.9
Prof.	0	0	44	25.1
Total	125	100	175	100

The research design was descriptive and causal comparative with the independent variable is region (north parts of Cyprus and Iraq) and dependent variables are dimensions of SWOT and TOE. Average scores for each dimension were calculated and used as dependent variables in the analysis. The questionnaire was adopted from Odeh et al. (2015) and Tashkandi & Al-Jabri (2015a). The questionnaire subject to this research involves 2 sections; demographic information and the two frameworks which are SWOT dimensions drafted from the study of Odeh et al. (2015) and TOE which was drafted from

Tashkandi & Al-Jabri (2015a) where questions are 5 Likert scale ranging from "Strongly Disagree" to "Strongly Agree". Calculated Cronbach's alpha reliability (internal consistency) is 0.75 with the dimension reliabilities range between 0.71 and 0.89 that were considered as acceptable.

The data was collected from total of 300 faculty members of universities in north parts of Cyprus and Iraq. In north Cyprus; 2 public and 3 private universities were chosen for convenience and 125 valid questionnaires were retrieved. In north part of Iraq, 4 public and 1 private universities were chosen for convenience and 175 valid questionnaires were retrieved. Second author contributed to this study by collecting and coding data into SPSS. Descriptive statistics as frequencies and percentages and independent samples t-test to analyse data. Demographic information about participants given in Table 1 above are; male to female ratio is almost equal in north part of Cyprus faculty members whereas male faculty members are dominant in north Iraq. North Cyprus faculty members have younger age ratio as compared to their counterparts. Most of them work at their institution between 5-10 years. North Iraq faculty seems to have more teaching experience than their counterparts. North Cyprus faculty members have titles mostly MSc or PhD whereas north part of Iraq faculty members have professor titles.

Results

Current Status of Views on Cloud Computing Adoption in Education

Likert type responses for each item in the questionnaire were coded as 1 for "Strongly Disagree", 2 for "Disagree", 3 for "Neutral", 4 for "Agree", and 5 for "Strongly Agree". SWOT part (items 1-23) include 4 dimensions (strengths, weaknesses, opportunities and threats) and TOE part (items 24-45) has 3 main dimensions (technology, organization and environment) with 7 sub-dimensions as relative advantage, compatibility, complexity, management support, vendor lock-in, data concern and government regulations.

Table 2 below represents calculated mean scores and mean standard deviations for each dimension and sub-dimension of SWOT and TOE parts respectively. In general, faculty members' responses to SWOT and TOE dimensions regarding the adoption of cloud computing in education range from "agree" to "strongly agree" with some variations in responses across regions and with respect to dimensions/sub-dimensions. Subsequent paragraphs indicate detailed analysis of responses with respect to SWOT and TOE dimensions and sub-dimensions correspondingly.

For SWOT part, faculty members from both regions agreed mostly on the opportunities then threats, weaknesses and lastly on the strengths of adopting cloud computing in education.

Within strengths dimension, faculty members from north part of Cyprus agreed most on the simplicity of implementation whereas faculty members from north part of Iraq agreed most on that cloud computing offers using various devices at any location. They both agreed least on the increased storage capacity of cloud computing.

Within weaknesses dimension, faculty members from north part of Cyprus agreed most on that cloud computing having low level of data verification whereas north part of Iraq faculty members agreed most about depending highly on the service provider. Both faculty members admitted equally that cloud computing in education offers limited control and flexibility.

Within opportunities dimension, both faculty members accept most that cloud computing adoption in education will establish intelligent environments supported with knowledge building. North Cyrus faculty members agreed least on high data storage capacity and availability of resources while north Iraq faculty members agreed least on offering the high level of interactive and collaborative learning.

Within threats dimension, both faculty members agreed most on the data security issues. North Cyprus faculty members agreed least on the customer lock in issues whereas north Iraq faculty members agreed least on the management issues.

For the TOE part, faculty members agreed most on technology dimension then organization and lastly on environment dimension. Organization is the dominating factor in Sarmedy & Simamora (2014) where they conducted TOE analysis for adoption of a specific information system to 45 IT professionals.

Within technology dimension, faculty members from both regions agreed highly on the relative advantage then compatibility, and lastly on the complexity of adopting cloud computing in education.

Within relative advantage sub-dimension, both faculty members agreed highly on that cloud computing provides new educational and research opportunities and agreed least on that cloud computing can shorten information systems deployment time.

Within compatibility sub-dimension, both faculty members agreed most on that cloud computing is compatible with their institutions' operations and agreed least that it is compatible with their institutions' culture and values.

Within complexity sub-dimension, faculty members from north part of Cyprus agreed most on the complexity of the skills required for cloud computing adoption in their institution whereas faculty members from north part of Iraq mostly agreed on using cloud computing services could be frustrating. Both faculty members agreed least on the skills required for using cloud computing is too complex for them.

Within organization dimension, faculty members from north part of Cyprus agreed most on the vendor lock-in, then data concern and agreed least on management support whereas faculty members from north part of Iraq agreed most on data concern, then on management support and lastly on vendor lock-in.

Within management support sub-dimension, both faculty members agreed most on that top management supports the implementation of cloud computing in education and both agreed least on that top management understands the benefits of adopting cloud computing in education.

Within vendor lock-in sub-dimension, both faculty members agreed most on the ability of restriction in cloud computing moving to another service provider. Faculty members from north part of Cyprus agreed least on that cloud computing makes them dependent on the provider services whereas faculty members from north part of Iraq agreed least on that cloud computing authorizes the use of specific IT resources.

Table 2 **Mean and standard deviations for both regions**

	N. Cyprus		**N. Iraq**	
SWOT AND TOE DIMENSIONS	***M***	***S***	***M***	***S***
Strengths (items 1-8)	4.15	0.77	4.16	0.93
Weaknesses (items 9-13)	4.30	0.98	4.30	0.98
Opportunities (items 14-18)	4.56	0.82	4.58	0.78
Threats (items 19-23)	4.50	0.88	4.44	0.94
SWOT (items 1-23)	4.35	0.85	4.34	0.91
Technology Dimension				
Relative Advantage (items 24-27)	4.81	0.45	4.69	0.67
Compatibility (items 28-30)	4.53	0.85	4.64	0.71
Complexity (items 31-33)	4.50	0.84	4.50	0.83
Technology (items 24-33)	4.63	0.69	4.62	0.73
Organization Dimension				
Management Support (items 34-36)	4.50	0.79	4.50	0.80
Vendor Lock-in (items 37-40)	4.55	0.82	4.49	0.84
Data Concern (items 41-43)	4.54	0.85	4.63	0.72
Organization (items 34-43)	4.55	0.82	4.54	0.79
Environment Dimension				
Government Regulations (items 44-45)	4.52	0.81	4.47	0.91
TOE (items 24-45)	4.58	0.76	4.57	0.78

Within data concern sub-dimension, both faculty members highly concerned about the leakage of confidential data and concerned least on storing data in the cloud.

Within environment dimension and government regulations sub-dimension both faculty members agreed most on that laws and regulations are sufficient to protect use of cloud computing and they both agreed less on that laws and regulations facilitate the use of cloud computing.

Differences among Faculty Members' Views on Cloud Computing Adoption

In order to identify any differences among faculty members' views on cloud computing adoption with respect to region, independent samples t-test was employed. Significant difference was found in the relative advantage (RA) dimension among faculty members from north part of Cyprus (M=4.81, S=0.31) and faculty members from north part of Iraq (M=4.69, S=0.50) with t (292.90)= 2.38, p=0.02. While there exist no statistically significant differences among others dimensions. This significant result revealed that, faculty members from north Cyprus believed more that the use of cloud computing brings new educational and research opportunities and perform tasks more quickly with reduced IT expenses. This result is similar with that of Kim et al. (2012) who reported that significant difference occurs amongst UK, USA and South Korea in terms of cloud computing adoption and implementation. Also Hailu (2012) reported from their study with developing countries that there is that significant difference between these countries in terms of cloud computing adoption (Tashkandi & Al-Jabri, 2015a, 2015b).

Conclusion

In order to come up with better solutions for cloud computing adoption, the implications of the study findings could be fruitful for researchers, university administrations and service providers. Using integrated SWOT-TOE framework provides clues to identify the reason behind why some HEIs choose to adopt cloud computing services earlier than others to researchers and administrations. Furthermore, service providers could be informed about the current status and offer education specific solutions to institutions.

In general sense, faculty members from north part of Iraq seem to be slightly more optimistic on the adoption of cloud computing in educational settings. This might resulted from either they less frequently use cloud computing services as compared to faculty members from north part of Cyprus who are younger in mean age and can be considered as generation Y regarded as being more capable consumers of cutting edge technologies like cloud. Interestingly, both parties are

aware of the problems which could be resulted from adopting such innovation. Slight discrepancies detected among the views of the faculty members from both regions thus, for future studies more investigation is required to compare "early adopters" who already fully adopted cloud in educational settings and are already actively using it for a while to "adopters" or "non-adopters" from different regions. More internal and external aspects of other frameworks could be included to understand adoption process from different perspectives. Various communities as students, IT professionals and administrators could also be involved for further investigation of these issues.

References

Adrees, M. S., Omer, M. K. A., & Sheta, O. E (2015). Cloud computing architecture for higher education in the third world countries (Republic of The Sudan as Model*). International Journal of Database Management Systems, 7 (3)*,13-24.

Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the North East of England. *Journal of Enterprise Information Management, 26 (3)*, 250-275.

Behrend, T., Wiebe, E. N., London, J. E., & Johnson, E. C. (2010). Cloud computing adoption and usage in community colleges. *Behaviour & Information Technology, 30 (2)*, 231-240.

Ghilic-Micu, M. M., & Stoica, M. (2011). Main aspects of the adoption of cloud solutions in managing service-oriented organizations - the case of higher education. *Economy Informatics, 11 (1)*, 27 - 36.

Haag, S., & Eckhardt, A. (2014). Organizational cloud service adoption: A scientometric and content-based literature analysis. *Journal of Business Economics, 84 (3)*, 407-440.

Hailu, A. (2012). *Factors Influencing Cloud-Computing Technology Adoption in Developing Countries*. ProQuest LLC, Ph.D. Dissertation, Capella University.

Katz, R. N., Goldstein, P. J., & Yanosky, R. (2009). Demystifying cloud computing for higher education, *EDUCAUSE Center for Applied Research Bulletin, 19*, 1- 13.

Kim, M., Kim, J., & Lee, H. (2012). Analysis of the Adoption Status of Cloud Computing by Country. *Embedded and Multimedia Computing Technology and Service, 181*, 467-476.

McCrea, B. (2009). IT on Demand: The Pros and Cons of Cloud Computing in Higher Education. Campus Technology. Downloaded from https://campustechnology.com/articles/2009/08/20/it-on-demand-the-pros-and-cons-of-cloud-computing-in-higher-education.aspx

Odeh, M., Warwick, K., & Garcia-Perez, A. (2015). The Impacts of Cloud Computing Adoption at Higher Education Institutions: A SWOT Analysis. *International Journal of Computer Applications, 127 (4)*, 15-21.

Sarmedy, J., & Simamora, B. H. (2014). Cloud Computing Adoption Strategies at PT Taspen Indonesia, Tbk. *CommIT (Communication and Information Technology) Journal, 8 (2)*, 35-43.

Sultan, N. (2010). Cloud computing for education: A new dawn? *International Journal of Information Management, 30 (2)*, 109- 116.

Tashkandi, A., & Al-Jabri, M. I. (2015a). Cloud computing adoption by higher education institutions in Saudi Arabia: an exploratory study. *Cluster Computing, 18 (4)*, 1527-1537.

Tashkandi, A., & Al-Jabri, I. (2015b). Cloud Computing Adoption by Higher Education Institutions in Saudi Arabia: Analysis Based on TOE. *International Conference on Cloud Computing (ICCC)*, Saudi Arabia, 1-8.

Tornatzky, L. G., & Fleischer, M. (1990). *The Processes of Technological Innovation*. Massachusetts: Lexington Books.

Wyld, D. C. (2009). *Moving to the cloud: An introduction to cloud computing in government*. USA: IBM Center for the Business of Government.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 238-247

THE USE OF ICT IN THE DIDACTIC PROCESS OF STUDENTS' EDUCATION

Michał Cupiał

Anna Szeląg-Sikora

Maciej Kuboń
University of Agriculture in Krakow, Poland

Abstract. *The modern education process requires introduction of modern information and communication technologies (ICT) in order to make classes more attractive, to properly implement curricular content and, as a consequence, to provide students with education compliant with applicable standards. Some didactic classes are more predisposed to the use of ICT, and others to a lesser extent. The Faculty of Production and Power Engineering of the University of Agriculture in Krakow has been using modern IT solutions to support the teaching process for many years. The mentioned ICT tools include the e-learning platform Moodle, office packages (Microsoft Office, Open Office), groupware tools, Internet platform Google Apps, Microsoft IT Academy and many specialized software. This study presents a case study of the use of ICT tools during selected subjects at the faculty.*
Keywords: *ITC, e-learning platform, didactic, education.*

Introduction

At present it is not possible to teach in a modern way with no support of the cutting-edge technology, which not only accelerates the process of acquiring knowledge, but also makes it more effective and productive. The most important modern techniques and technologies applied in the teaching process include information and communication technologies (ICT). Information and communication technologies include all activities related to the production and use of telecommunications and IT (information technologies) devices, and services accompanying them, as well as to collecting, processing, sharing information in electronic form using digital techniques and all electronic communication tools (Stevenson, 1997).

Among the software supporting the didactic process in higher education, one can name Internet browsers, office packages, instant messengers, specialized software appropriate for the lessons, software supporting group work, and above all, the e-learning platforms (Grooms, 2018).

Distance learning is a technique which uses all available electronic media, namely: the Internet, satellite broadcasting, video, interactive TV, etc. However,

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3441

as a rule the computer is currently responsible for the transfer of knowledge and examination thereof (Bates, 2014). Consequently, the center of gravity in teaching has been transferred from the teacher to the student (Liebowitz & Frank, 2016, Uskov et al., 2015).

Distance learning is widely applied not only in education (Fallon & Brown, 2016). It became very popular while training HR departments of enterprises and institutions, mainly due to the cost reduction of raising qualifications as well as the opportunity to complete the knowledge of people located in various places around the world (Cupiał et al., 2017, Kuboń & Krasnodębski 2010, Wyslocka, 2015). Many companies create e-learning courses, thus giving the opportunity to acquire knowledge to people who would not be able to participate in the training in its traditional form. Such courses are usually developed as a single event and subsequently made repeatedly available to their recipients. The tools offered by the e-learning platforms are also applied in order to conduct exams, both remotely and under controlled conditions - in computer laboratories. The last example of application combines the possibility of objective evaluation of the course participants with the possibility of automatic and instant evaluation, as well as recording results on the server.

Distance learning has several advantages however, it has its disadvantages as well (Arkorful & Abaidoo, 2015). Among the advantages one can distinguish reduction of training costs, time saving opportunity, ability to administer the courses easily, quick and easy updating of the presented content, control over the education process and, above all, the opportunity to learn anywhere and at any time. The ease of archiving events occurring during the education process is quite crucial. The greatest disadvantage thereof is the reduced teacher-student interaction (lack of personal contact) and the requirement of the student to have strong internal motivation and self-discipline. As far as the course organizer is concerned, a large initial workload and extensive costs associated with commissioning the course and the fact that not every training can be conducted without the personal contact demonstrate the greatest disadvantages.

Software supporting distance learning can be based on cloud computing solutions or be installed on the servers of the training organization. Among a number of available tools, commercial and free of charge solutions, usually distributed under Open Source licenses might be distinguished. One of the most popular platforms is Moodle (Futa & Gocłowska, 2015), which is a free of charge solution available at moodle.org. A large community using the platform guarantees that the problems arising during operation will be solved. The Moodle platform is very flexible, easy to use, safe and above all – is free of charge. It has been widely used by schools, universities and companies since its development in 2002. Currently, the project is being built by a large team and is regularly updated. Moodle is equipped with such features as a gradebook, calendar and modules

which make it possible to verify the knowledge and upload files in a quick way. Therefore, the system is one of the most frequently installed solutions of this type all over the world.

Material and method

The Faculty of Production and Power Engineering has been using the Moodle e-learning platform to support the teaching process for many years. They adopted the principle that the e-learning platform is supposed to support contact classes with students, and not replace them entirely (Cupiał Szeląg-Sikora, 2011). As a consequence, platform mechanisms complete the traditional form of education, which allows the best results. The Moodle platform is applied mainly for posting teaching materials, completing tasks, checking messages using tests, and communication between teachers and students. The platform is available at http://student.wipie.ur.krakow.pl, and each students has his/her own account.

Apart from the e-learning platform, the teaching process is supported by many applications, some of which can be regarded as applications supporting distance learning. Moreover, students use applications and services facilitating the process of studying, which might include the USSOS support system of studies. Students during their studies have their accounts on the Google platform set up that make it possible to use the groupware tools, e-mail account, online documents, calendar, disc, etc. The system of remote work also provides access to Microsoft's cloud tools, including Office 365, as well as many other programs and systems available within Microsoft IT Academy.

This study analyzes two courses which were conducted at the faculty in the specialty of Production Engineering and Management. The classes conducted in the first year (the first semester) and the fourth year (the seventh semester) in the form of full-time and weekend studies were compared herein. In the first year the subject was called “Information Technology” and in the fourth “Information Systems in Production Management”. Both the first and the second subjects regarded IT issues and were conducted in the computer laboratory. As part of the exercises, the students prepared some projects after the lessons. During the classes in the computer laboratory, students were obliged to perform some of the tasks using the e-learning platform, most of the work at home was an optional (not obligatory) work for the student.

The study covered the period from January 2015 to December 2017. The analysis included a total number of 10 courses:

- 2 course editions of full time studies in the first year,
- 2 course editions of weekend studies in the first year,
- 3 course editions of full time studies in the fourth year,

- 3 course editions of weekend studies in the fourth year.

The user activity on the e-learning platform obtained from the Moodle system logs was subject to the analysis. The graphs show the activity of individual users, which was measured (recorded) by the activities registered by the system, such as e.g. opening a document with didactic materials, sending a task (attaching a file), verifying the grades or completing a test (quiz). The numbers to be found on vertical axes indicate the number of actions performed by the people using the platform. The numbers on scales indicate thousands of performed actions (1 on the scale corresponds to 1,000 activities).

A total number exceeding 69,000 activities was registered, 35,000 of which refer to the first-year students of full-time studies, 13,000 - the first-year students of weekend studies, 15,000 - the fourth-year students of full-time studies, 6,000 - the fourth-year students of weekend studies.

Results

Each drawing includes two graphs: the left hand side is dedicated to full-time studies, and the right hand side to weekend studies. The activity of students was divided into work during the lessons and using the e-learning platform at home (outside the university). The criterion for separating the activity was the IP address from which the students performed particular activities.

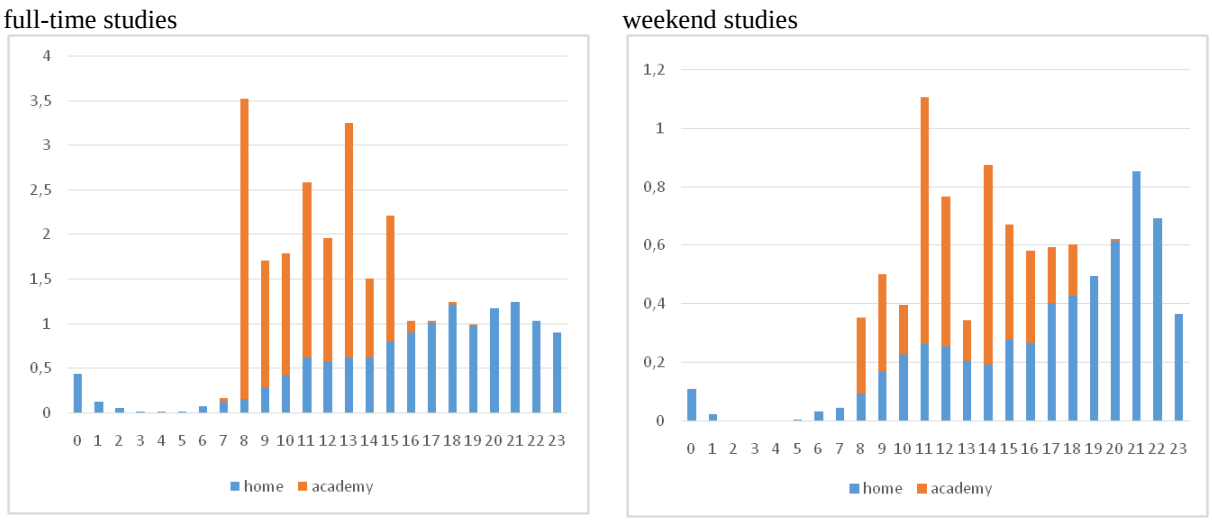


Fig. 1. **The activity of the first-year students on the e-learning platform during all hours of the day**

Fig. 1 shows the daily distribution of engagement of the first-year students on the Moodle platform. At full-time studies, the students started classes at 8 a.m. and some groups finished at 8 p.m.. Therefore, it can be seen that some students

appeared in the computer laboratory before the scheduled beginning of the lesson. Uneven distribution of the activity during the classes results from different lessons in the subsequent years, and different group sizes. The time when students work independently (outside the university) should be stressed as well. It is as much as 48 % of the total activity of the course and takes place from the early morning hours to late night hours. The students work most intensively during the night hours (until midnight), and in many cases they work after coming back home (or to the place of residence) from university. The daily schedule at weekend studies is slightly different. Because of fewer students and active hours, the level of engagement is also lower. In this case, the activity at home gradually increases during the day and reaches its maximum value at 9 p.m.. In the case of weekend studies, the activity outside the university is as much as 60 %. This proves that people at weekend studies dedicate more time to their individual work in order to obtain appropriate knowledge and skills.

Fig. 2 shows the daily activity of the fourth-year students on the e-learning platform. Taking account of different specificity of the subject, the use of the e-learning platform was less intensive. In this case, the students conducted the major part of the project during the exercises, which is manifested by a high proportion of engagement during the lesson and is applicable to both modes of studies. As part of these lessons, 25 % of the students of full-time studies and 16 % of the students of weekend studies were engaged in the activities outside the university. In this case, the activity after the exercises at the university is distributed rather evenly starting from the morning hours to slightly after midnight.

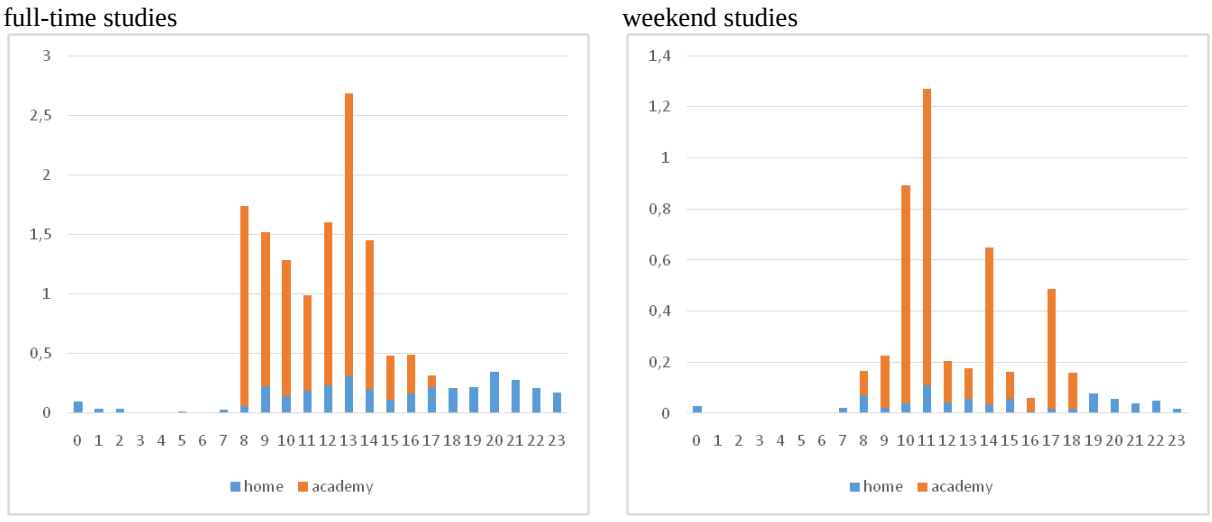


Fig. 2. **The activity of the fourth-year students on the e-learning platform during all hours of the day**

Fig. 3 shows the weekly activity of the first-year students. The graphs clearly show the days, when the classes were conducted in the computer laboratory, i.e. Monday, Tuesday and Thursday at full-time studies, and Saturday and Sunday at part-time studies. In the latter case, one can notice slight engagement on other days of the week, which was a result of additional hours of consultation provided for these students. It is interesting that in the case of the students of weekend studies, their activity covered all days of the week, and its greatest intensity was observed in the middle of the week. The students of full time studies also worked outside the university throughout the week, namely on Sunday and Monday in the most intensive way.

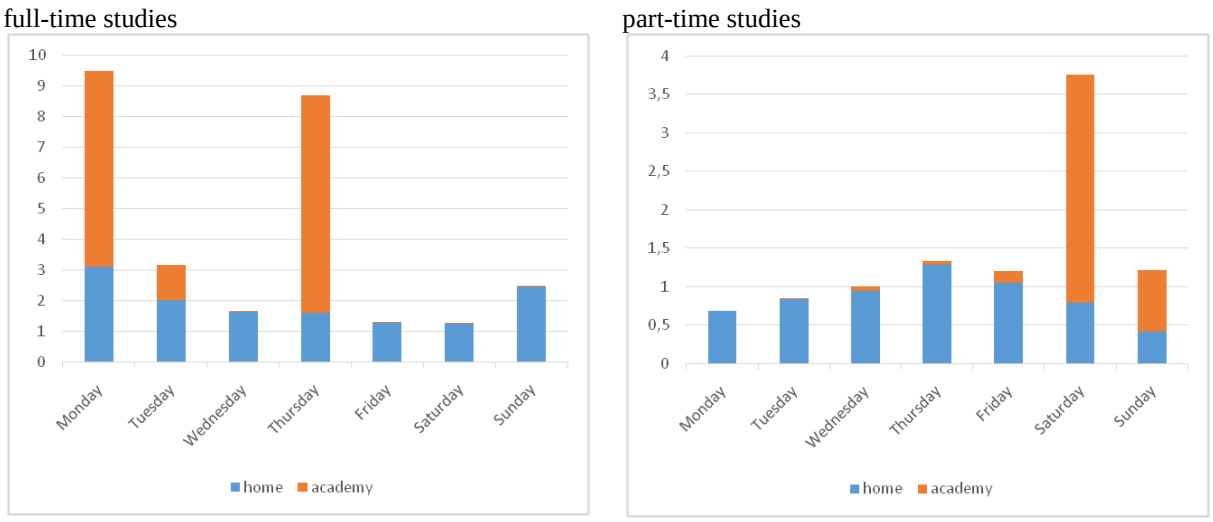


Fig. 3. **The activity of the first-year students on the e-learning platform on weekdays**

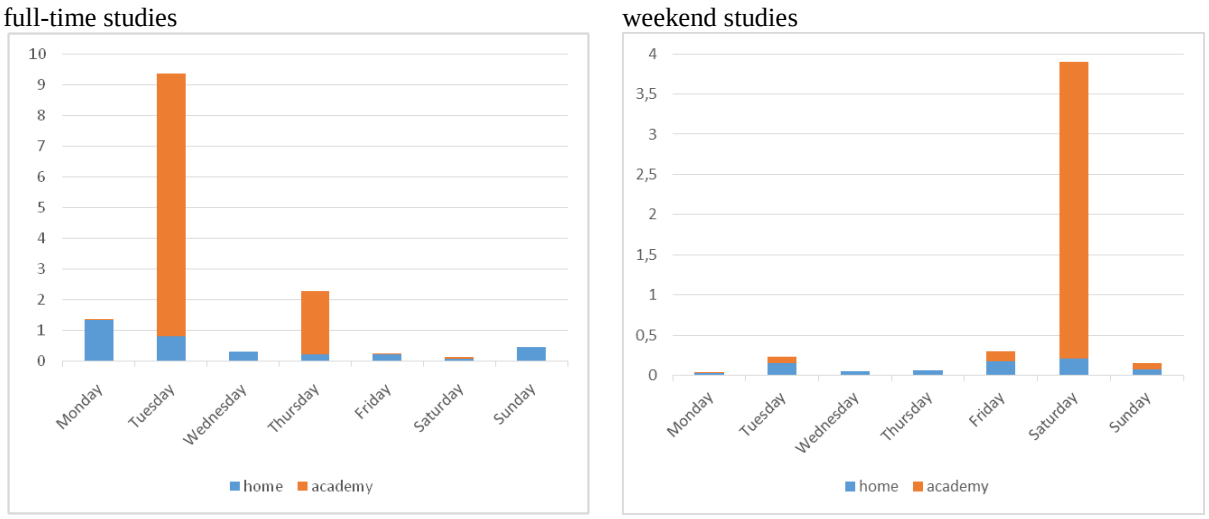


Fig. 4. **The activity of the fourth-year students on the e-learning platform on weekdays**

The distribution of the weekly activity of the fourth-year students is illustrated in Fig. 4. The classes were held on Tuesday and Thursday on full-time studies, and on Saturday on weekend studies. In this case, the students demonstrated the greatest engagement on the days preceding the classes, which might be explained by the preparation for the classes at the university.

Fig. 5 and 6 present the daily activity of the course participants divided into the category of platform users. The relatively high engagement of teachers denies the opinion that in the case of the e-learning platform, the role of the teacher may be marginalized. Their activity (together with the course administrator) in the first year amounted to 20 % of all activities performed at full-time studies and as much as 23 % on weekend studies. In the case of the fourth year, it was 7 % and 16 %, respectively.

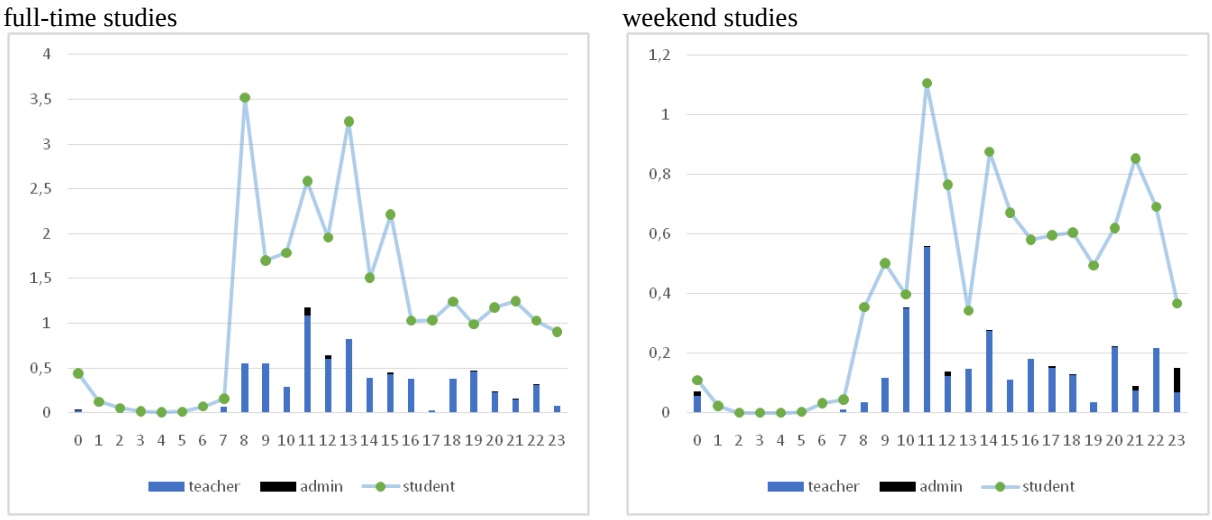


Fig. 5. **The activity of the teachers of the first year on the e-learning platform during all hours of the day**

It seems that despite a smaller number of hours on weekend studies, the participation of teachers is much greater than in the case of full-time studies. It might be confirmed that the working hours of the teacher encompass both the time dedicated to conducting the lesson and the time not recorded in the working hours. On the basis of the analysis of the activity on the e-learning platform, it might be clearly noticed that this time constitutes a great percentage in the working hours of the teacher. Apart from providing the lessons on a regular basis, the teacher prepares didactic materials and makes them available to students, checks the tasks delivered by the students and evaluates them, introducing the grades into the system, and uses the Moodle mechanisms for communication purposes.

Certainly, it is possible to create entirely maintenance-free courses on the e-learning platform. However, the interaction between the teacher and the student

significantly increases effectiveness of teaching, even if it is conducted with the use of remote tools. An additional factor increasing the workload of the teacher is the specificity of the lessons the teacher conducts. The didactic classes subject to analysis contain education content that changes very quickly (as it refers to modern techniques and technologies). As a consequence, it is not possible to create a single course and copy it in the same form in subsequent years.

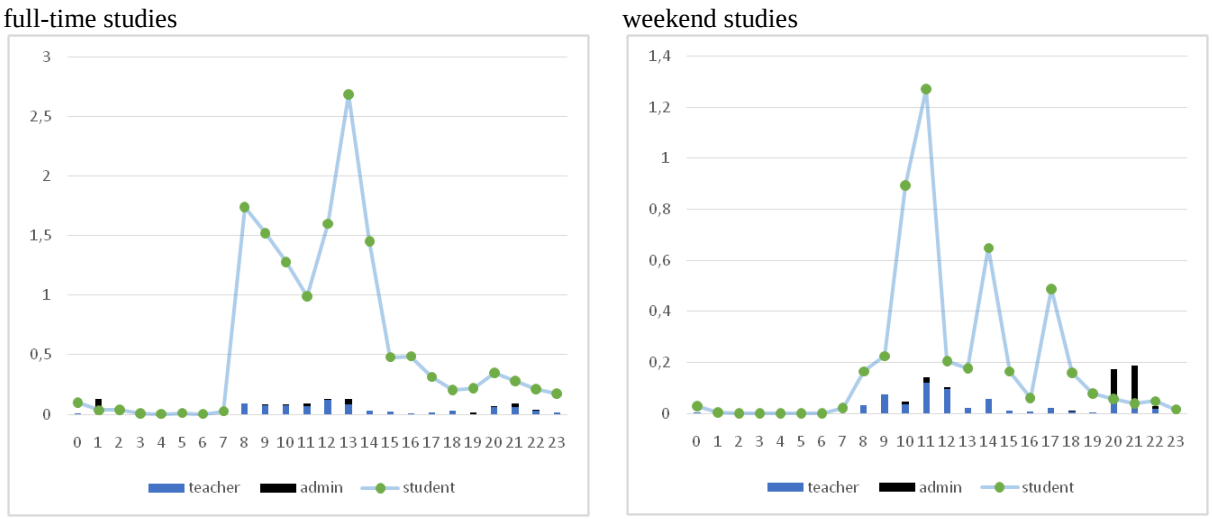


Fig. 6. **The activity of the teachers of the fourth year on the e-learning platform during all hours of the day**

While running the lessons with the use of the Moodle platform in recent years, the following phenomenon was observed. Some students downloaded didactic materials from the platform and subsequently shared them with colleagues via the social networking site - Facebook. As far as the mechanisms of the e-learning platform are concerned, this situation seems unfavorable, as one of the benefits of using this tool is the control over the downloaded content, and transferring documents using other tools is not recommended. However, due to great popularity of Facebook among students (currently 100 % of the surveyed students at the faculty are active users thereof), it is used to support many activities, even if it is not an optimal solution. As a results of the intensification of this phenomenon, distance learning must be taken into account in the short-term future. It should be noted that the Moodle platform applied at the Faculty of Production and Power Engineering is equipped with mechanisms integrating it with selected portals and social websites (e.g. Facebook), and the student accounts used in Moodle are integrated with Google accounts.

Conclusion

The analysis of the activity of the students on the e-learning platform at the Faculty of Production and Power Engineering has demonstrated that the students actively use this tool both during the exercises in the computer laboratory and outside the university. Significant engagement is noticed during the evening and night hours. One can observe the diversity in the activity of the platform users in different years of studies and during various subjects. The list of system logs of the platform demonstrated high activity of teachers conducting classes, which applies to both the teaching hours and the time dedicated by them to provide the courses. It might be concluded that the time saved thanks to the mechanisms that enable automatic verification of quizzes is later dedicated to preparing teaching materials suitable for distance learning. Preparation of such materials is usually more difficult than developing teaching aids in a traditional form.

Distance learning is constantly developing and adapting to modern techniques and technologies. These changes result from the necessity to provide students with knowledge and skills in the best available form. Changes in the mentality and way of life of the recipients of the teaching process necessitate searching for new tools supporting the transfer of knowledge. The best didactic effects are achieved when elements of traditional teaching (interaction with the teacher) are combined with the possibilities of modern e-learning platforms (self-study).

References

Arkorful, V., & Abaidoo, N. (2015). The role of e-learning, advantages and disadvantages of its adoption in higher education. *International Journal of Instructional Technology and Distance Learning, 12 (1)*, 29-42.

Bates, T. (2014). *The Role of Technology in Distance Education* (Routledge Revivals). Routledge.

Cupiał, M., & Szeląg-Sikora, A. (2011). Wykorzystanie technologii informacyjnych w procesie kształcenia na Wydziale Inżynierii Produkcji i Energetyki Uniwersytetu Rolniczego w Krakowie. *Nauka i Gospodarka w dobie destabilizacji*, Biuro Projektu Nauka i Gospodarka.

Cupiał, M., Szeląg-Sikora, A., Sikora, J., Rorat, J., & Niemiec, M. (2017). *The use of IT tools for knowledge management in companies, No. 20.*

Fallon, C., & Brown, S. (2016). *E-learning standards: a guide to purchasing, developing, and deploying standards-conformant e-learning*. CRC Press.

Futa, G., & Gocłowska, B. (2015). Analysis of functionality of distance learning platform moodle. *Annales Universitatis Mariae Curie-Sklodowska, sectio AI–Informatica, 3(1)*, 331-338.

Grooms, L. D. (2018). Distance Teaching and Learning Platforms. In *Encyclopedia of Information Science and Technology, Fourth Edition* (pp. 2455-2465). IGI Global.

Kuboń, M., & Krasnodębski, A. (2010). Logistic cost in competitive strategies of enterprises. *Agricultural Economics*. *56*, 397-402.

Liebowitz, J., & Frank, M. (Eds.). (2016). *Knowledge management and e-learning.* CRC press.

Stevenson, D. (1997). *Information and communications technology in UK schools: An independent inquiry.* London: Independent ICT in Schools Commission, 41.

Uskov, V. L., Howlett, R. J., & Jain, L. C. (Eds.). (2015). *Smart education and smart e-learning, Vol. 41*. Springer.

Wyslocka, E. (2015). E-learning in the management of Polish companies. *Polish Journal of Management Studies, 11,* 188-199.

Zawacki-Richter, O., Müskens, W., Krause, U., Alturki, U., & Aldraiweesh, A. (2015). Student media usage patterns and non-traditional learning in higher education. *The International Review of Research in Open and Distributed Learning, 16(2).*

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 248-259

TEACHING OF COMPUTER AIDED DESIGN SYSTEMS

Janis Dabolins
Riga Technical University, Faculty of Computer Science and Information Technology,
Institute of Applied Computer Systems, Latvia

Abstract. *The objective of this paper is to analyze and describe computer-aided design training and its aspects. A traditional and technology-supported learning process is described with the purpose of analyzing computer-aided design training and provision of knowledge assessment, and identifying problems in the CAD system training. The article analyzes the learning process by defining its objectives, the necessity of student characterization, motivation analysis, the necessity of feedback and other basic components; it analyzes the training methods, provides insight into technology-supported learning process, identifies the provision and types of computer-aided design training and knowledge assessment as well as describes feedback and its role in the training process.*
Elaboration of an intellectual learning system would solve the problems associated with lack of feedback, lack of adaptivity and the emergence of plagiarism (since only the end result of the design is subjected to the test and not the whole process of creating it, it is easy to pass another's work for one's own). A solution to these problems would facilitate the work of the teacher and improve student learning outcomes.
Keywords: *CAD/CAM Systems, IT in Education, Knowledge Assessment, Learning Process.*

Introduction

Computer Aided Design, along with Computer Aided Manufacturing, emerged in the 1950s (Narayan, 2008). A well-known term for Computer Aided Design and Computer Aided Manufacturing Systems is CAD/CAM. Currently, CAD/CAM systems are used in a variety of fields, which include design and manufacturing management processes (Geometric modelling, Machine vision, Flexible manufacturing systems). Using specialized computer software, a created technical drawing, a specialized set of parameters (procedure description) describe the computer-aided designing. Design engineering, technical drawing and drafting combine extensive knowledge of theory and practice. Creation of a design is a very complicated process in itself (Madsen, 2012) (Asperl, 2005). Using computer-aided design makes contribution into designers' work productivity, humanization of working conditions, project quality improvement, communication speed, flexibility and the structuring and expansion of the production data repository. If the result of a computer-aided

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3143

design (a project created in a CAD system) is immediately (without a design draft or printing) given for production (cutting, machining) of a product, it is called computer-aided manufacturing (CAM system software).

Due to the global economy development, CAD/CAM integration takes place in different fields of manufacture (construction, aviation, shipbuilding, computer manufacturing, clothing manufacturing, etc.), at different stages of production (design, product lifecycle management, manufacturing systems management, etc.). In order to meet the need for skilled workforce, CAD/CAM system training is included in the engineering discipline studies in various fields (along with this trend, the drawing skills are gradually reduced).

For acquiring computer-aided design both a teacher-led and independent learning activities are offered, a traditional teaching process is provided, and provision of technology-supported learning process is very limited. The teaching process involves five main tasks:

1. choosing objectives,
2. understanding student characteristics,
3. understanding and using ideas about the nature of learning and motivation,
4. selecting and using ways of teaching (methods, practices),
5. evaluating student achievement (learning) (Gage & Berliner, 1999) (Bloom, 1964).

The objective of the learning process is based on its organization – when a teacher prepares a lecture, he sets the goal of the lecture, also a student can set his/her personal learning goals (Phobun & Vicheanpanya, 2010) (Lai et al., 2016). In order to analyze instruction with the purpose to find out the specifics of the learning process, different learning processes should be considered: traditional and technology-supported.

Traditional learning process

The traditional learning process has three basic components: the teacher, the student and the content (Herbart's Didactic Triangle (Hudson, 2000)). Interaction is occurring between all components; the processes are viewed from the perspective of both participants, that is, the teacher and the student, the interaction of the teacher with the instruction content and the interaction of the student with the learning content. Extending the description of all three components with their characterizing elements, several views on the learning process can be distinguished (Jank & Meyer, 2006):

- Pedagogy – paying particular attention to pedagogical practice, which usually emphasizes the teacher's responsibility/role.

- Instruction – paying particular attention to the development and implementation of tools and content (materials).
- Curriculum – with a particular focus on the content based on the curriculum as an organization's practice.
- Learning – with a particular focus on learning practice, which usually emphasizes the responsibility/role of the student.

Based on such views (understanding), the analysis of the traditional learning process allows us to conclude that the teacher and the student are the active participants of the process, while the content of teaching is the passive one, the role of which depends on the activities of the active participants. In the traditional learning process, the teaching content is usually reflected in the form of presentation material – books, lecture notes, handouts, practical work materials, experiments and experiment substances and auxiliary materials.

Interaction between the teacher and the student includes their reciprocal activities: teaching content presentation, questions and answers, preparation and execution of tasks, assessment of learning achievement and feedback. It is understood that such interaction is reactive – the activity of one participant calls for the activity of the other participant.

The role of the teaching content is characterized by the purpose for which it is prepared and used. The interaction of each active participant with the teaching and learning content can also take place independently of the other active participants involved. The teacher's preparation for the teaching process, improvement of the teaching content, analysis and preparation of tasks are considered to be interacting with the content of the teaching regardless of the student. Such a process can be initialized directly in respect of particular students (as a result of tests, the aspects of the curriculum that need to be emphasized more can be seen, questions asked during the lecture highlight a particular problem); initialisation can also take place under the influence of the external environment (improving the content of teaching through industry and scientific achievements). The interaction of the student’s activities with the content is characterized by independent learning: preparing for tests, doing homework, repeating lecture material, performing individual work. These or some of these activities may be optional.

In the traditional teaching process, the teacher's role is characterized by adaptation to the student. The activity of explaining the learning content is carried out by adapting to the situation when the teacher responds to the student's questions, the necessary knowledge structure, prior knowledge and personal interests (examples of study materials from the area of interest of the student).

Effective learning depends on learning objectives, learning environment, the student's grounding, the student's willingness to learn the specific content, the student's abilities (wit), quality of teaching, and if all of these aspects are in balance, one can expect the learning objectives are achieved (Smith, 2012). If any of these aspects is insufficient, then the teacher must be able to adapt to the specific situation in the particular aspect to provide effective learning. Adaptation needs sufficient resources – the teacher's contact/interaction with the student. Most often the traditional instruction is conducted to a large audience, where individual adaptation cannot take place due to lack of time and human resources.

Adaptation can be provided during tutorials and partly practical classes where the teacher examines the performance of each student individually, receiving an immediate feedback on the work done and the teacher adapting to the particular student's level of knowledge. Providing individual adaptation and feedback requires additional work time from the teacher, thereby increasing the workload. Integration of information and communication technologies into the learning process can solve its problematic aspects (adaptation of the study content, systematic assessment of knowledge and self-assessment, assessment of practical work and analysis of weaknesses).

Technology-supported learning process

Application of technology in the learning process is introduced to enhance the students' learning experiences, expand opportunities and personalize the learning process (Walker et al., 2016). Expanding the learning process possibilities focuses on giving the students choice of pace, place and mode of their learning, and these three aspects can be supported by an appropriate pedagogical approach (practice) and this approach can be technology-supported (Gordon, 2014). Technology-supported learning is most often understood as e-learning that can be used no matter where the student is at home, on campus or at any other place where information technology is available, and there is a very large number of terms that refer to technology-supported learning as well as the technologies involved in supporting training (Yaghmaie & Bahreininejad, 2011).

By analyzing the range of technologies that can be used in learning, several groups of such technologies (subsets) can be distinguished. Computer-based training is where the computer is not connected to the web, the learning content is found in the computer memory, and it does not contain any links to materials outside the training course. Conversely, web-based learning, online learning and online instruction envisage network connection. Thus, two distinct categories can be distinguished: computer-based learning and web-based learning, which includes web-based learning, online-based learning and online learning

(Anohina, 2007). All these options are included in e-learning (also m-learning based on the use of mobile devices/smart-phones) that allows the learning process to be conducted using various e-resources, including e-mail and other forms of communication that enable training in the form of distance learning. As technologies used in the learning process can be varied, their use is part of resource-based training – interpreting resources as a broader concept (not only information technology, but also other training resources of practical and theoretical use).

Technology-based learning can be provided using various tools:

- Mobile (smart phone) applications (m-learning).
- Tablet applications.
- Various information technology-based devices providing augmented reality.
- Open online courses on various information technology devices;
- Webinars (online seminars).
- Special systems for specific learning content training, including intelligent tutoring systems.

Just a part of the learning process can also be technology-enhanced, such as demonstrations, tests, theoretical information. Regardless of how intensively (to what extent) information technologies are used in the instruction process, the process itself retains at least three basic components, yet unlike the traditional teaching process, in which the teacher, the student and the content are involved, these components can be supplemented with an additional component reflecting the learning content and the teacher may be partially or completely replaced by the technology used. The role of the teacher can be reduced depending on the degree of use of the technology, thus facilitating the work of the teacher and reducing the workload, as well as enhancing the adaptation of the learning process to individual needs by providing a technology-driven feedback.

Technology-supported learning process must be organized so that the technology-supported content performing the role of a teacher is at least of the same quality as the teacher in the traditional teaching and learning process. Adaptation and feedback should also be of at least the same quality as a teacher can provide in a traditional learning process. From the aspect of computer-aided design, the analysis of the work process plays a special role, which cannot be ensured by teacher’s presence, but can be provided by technology-enhanced learning when analyzing each student's performance in the CAD/CAM system.

Providing computer-aided design training and knowledge assessment

Computer-aided design training is divided into two inseparable aspects: sector training and computer literacy (Lukač, 2011). The curriculum should

ideally be developed in such a way that graduates' knowledge is in line with today's industry requirements, at the same time not losing universality – adaptability to different companies and their requirements for young professionals, and as well as maintaining the higher education approach – training at the highest level, thus promoting the development of the industry. However, the study content at the university regarding the requirements of the industry quite often is not sufficient. The main reason for this is the dynamic and ever-increasing development of industrial and technological support that cannot be achieved at university level due to limited resources and organization of training (Lukac, 2016).

When a student begins to acquire computer-aided design, it is believed that he already has prior knowledge in the sphere where CAD/CAM systems will be used. In reality, it often appears that knowledge of design and its processes is weak or even very superficial, therefore, the lecturer should devote additional time in classroom to explain the design aspects (Ye et al., 2004). Thus the learning process while mastering computerized design systems depends not only on the three basic components – the student, the teacher and the learning content, but also on the student's background knowledge. Most often, it is students' prior knowledge and ability to perceive the learning content, but sometimes also the teacher's prior knowledge particularly in the field of design may be too weak for successful teaching of computer-aided design system (the most striking example is specialized training executives of different CAD / CAM systems who have mastered the use of system functions, but their lack of knowledge in the field of design interferes with development of appropriate algorithms).

Currently available support for the learning process

The learning content and its representation follows directly from the learning objective – computer-aided design training, where for execution of practical tasks one of the CAD systems is involved (depending on the learning content area and curriculum that includes mastering of the given system). For such specialized training the traditional form of instruction is adapted using technology-based learning tools. Books and lecture notes publishing is limited due to continuous development of systems (CAD/CAM system developers develop and market new, improved versions of the system at least once a year to ensure its speed, ease of use and compliance with the industry). If books are published, most often they are books for training in the universal (less specialized) systems. For example, for learning AutoCAD systems books have been published in Latvian as well, but the most commonly used publications are in Russian or English – a wider audience understands both languages used.

Books with description of CAD systems used for specific industry designing needs are not published at all or it happens very rarely, as for learning of Lectra (application for clothing design, some modules for computer-aided furniture designing, in which 2D stages of the project are implemented: sketches, technical drawings, template drafting, their assembly, layouts, documentation, product lifecycle management, as well as 3D fitting of a completed design for its verification and making of corrections in templates. The system includes a series of interconnected or partially linked modules for automated computation in the particular sector, algorithms and procedures). Only a couple of books have been published for learning (Stott, 2016) (Stott, 2012), the author has no relation to Lectra's representation and only outlines the operating principles of a particular system module (even not the entire system). A very similar situation exists regarding the publication of other specialized system instruction materials such as Gerber Accumark (software similar to CAD/CAM Lectra) (Lininger, 2015). Unfortunately, such books remain up-to-date for a short period; they quickly lose their relevance to usage in the learning process due to the rapid development and changes of CAD/CAM systems (Asperl, 2005).

Content provision most often depends on the teacher - each year, according to changes in specialized CAD systems a teacher makes changes in presentations, lecture materials and notes.

Although computer-aided design system training is most often done in accordance with the traditional teaching process in which a teacher delivers knowledge in the form of lectures and demonstrations, a student perceives the new information, takes it into account and consolidates one's knowledge by carrying out practical tasks, however, given that CAD/CAM systems are taught, based on information technology, majority of them have integrated technology enhanced learning tools. Online help is part of the system that allows the student to get information about system performance in general or on use of a particular function or tool for designing (systems may have integrated both – *help* where the user searches for information and the help that is available upon request for a particular function/tool that is active at that moment). Such help, reasonably used, allows you to choose an appropriate action algorithm to solve your problem.

Currently available knowledge assessment provision

Working with computer-aided design systems, the assessment is the teacher's opinion about the conformity of the created design and/or drawing to the specified requirements, thus assessing the student's level of the acquired knowledge, skills and abilities. This aspect forms part of the student learning motivation, the other part is the motivation to develop their design and/or to

create more sophisticated designs (Asperl, 2005). Since computer-aided design is related to creation of a practical design, students self-evaluate some projects automatically where they understand, if the project can be used at the next stage of the design. If the student fails to make the successive steps then it is clear that in the first stage there are errors that prevent further progress of the project.

The teacher prepares appropriate practical tasks and tests for the course examination. Already within the framework of the course, the basic skills can be evaluated using particular small examples and their completion is no longer evaluated in the exam (the result is taken into account in the overall assessment of the subject in the semester). The student must be able to finish each of these tasks within a very short time by using only a few operations and computer system tools. Thus, it is possible to test the abilities and skills that have been acquired at a given stage of learning. The rating of these examples is immediate – the teacher assigns a task, students finish it, the teacher evaluates the accomplishment.

In final examinations and/or course papers, skills and abilities to complete more complex tasks and make designs are tested by preparing a computer-aided design task that allows the student to demonstrate all one's abilities – not only to perform the learned design procedures but also to apply them creatively to other tasks. Such an assignment must have a variety of possible solutions, which can be used to assess the student's skills within the system and the ability to find the optimal solution. In addition, accuracy and compliance with technical requirements influence the final assessment.

Problems of study process and knowledge assessment

In a study on the preparation of students for the role of future engineers (Ye et al., 2004), a survey was conducted that found that only 8 % of the students (after starting their careers) expressed satisfaction with computer-aided design courses, 18 % felt that too much mathematics, computer science and mechanics were included in the training, while 74 % of the respondents acknowledged that all of these aspects, as well as the system practical application should be included in the curriculum to a greater extent. Also, the respondents acknowledged the need for individualization of the teaching content, especially in terms of complexity and speed of execution of computer-aided design work. The study on teaching CAD at various levels of education (Asperl, 2005) also emphasizes the diversification and adaptation of the content to the individual's desires (choice of task, choice of the degree of difficulty, possibility to return to a simpler project) as one of the main didactic principles to improve training.

Consequently, the adaptation of learning content is considered one of the main problems not only in the traditional learning process (Anohina, 2007) but

also in the teaching of CAD/CAM systems. Adaptive tutoring can be defined as formation of a unique learning experience for each student based on the student's personality traits, interests and activities aimed at improving knowledge, the acquiring rate and quality and increasing the efficiency of the learning process (Limongelli et al., 2008) (Brusilovsky & Henze, 2007). The motivation improves letting students choose from different tasks (Asperl, 2005). This helps to avoid students who are over or under estimated. If the student is over estimated, expecting too high levels of skills, there is a growing threat that the student will quit one's studies without gaining the necessary skills. On the other hand, if the tasks are too simple, there is a growing threat that the students of a better level will be bored.

Teachers, through computer-aided design teaching, give insight into the design process, provide knowledge about the use of CAD system tools and demonstrate which algorithms of operations are to be performed for completion of computer-aided design tasks. Quite often such demonstrations are repeated: the student has completed his work, but this has happened repeating the teacher's presentation, thus the level of procedure mastering has been low. This problem highlights the need for short sample demonstrations – sequential task completion with instructions and screenshots, demonstrating the process of modelling and designing objects. In this way the students can control the rate of their learning progress, and the teacher can offer other similar exercises for execution, thus making sure that the specific task execution procedures and algorithms of operations are understood. Some CAD/CAM system companies offer reels to demonstrate the use of sophisticated software tools or designing of small projects.

If a teacher's knowledge is only theoretical, without real application, then students' interest may be low and there is no motivation to learn computer-based design. Providing realistic computer-aided design examples (besides, these sample models can be both real and virtual) that fit the student's age, level of education and future occupation, allows the student to master CAD/CAM systems. If students are convinced that they can use their CAD skills in working life, get a better paid work, their motivation for learning is growing.

When graphic files are created, the precision and speed of the graphic result is important. The graphical tasks in the CAD/CAM environment have their own specific sequence/order, but the quality of the tasks performed (accuracy, speed, etc.) is influenced directly by the drawer's knowledge and skills of using the system. Assessment of such designs includes evaluation of the final result and documentation, but there is no uniform approach to checking the knowledge working with CAD/CAM systems; it is not possible to check the work sequence, its progress, the procedures performed and the design development process.

Conclusions and discussion

Main conclusions:

- The components of learning process can be defined as: identification and understanding of learning objectives; learning student characteristics and personal objectives; the idea and motivation of learning that are relevant to the goals; teaching and learning methods, their effective application; feedback for motivating achievement of learning objectives and assessment of learning outcomes, as well as setting new learning objectives.
- In order to learn, students must understand the learning objectives, identify their current knowledge in relation to the learning objectives, and carry out learning activities to improve their knowledge. Therefore, feedback can be the basis for further cognition and student motivation to learn.
- Computerized design system training cannot exist without impact of manufacture – commercial CAD/CAM systems are designed to automate design and manufacturing processes. Industrial applications are the basis for the development of CAD technologies and CAD systems, with industry changing the computerized design systems are adapted and developed, thus the training process must be adapted to changes regularly.
- CAD/CAM learning is very complicated: the range of skills includes good knowledge of the production sphere, 2D and 3D design, mathematical and IT skills, object and product visualization, drawing skills and other complex knowledge. In the learning process there still is unknown interaction between the student and the content of learning. By studying how knowledge is acquired and what kind of learning support contributes to learner education and motivation, it is possible to improve computer-aided design training.
- The result of teaching is traditionally evaluated according to the change in students' behaviour/actions after the training process. Analyzing the methods of computer-aided design training process for assessment of the outcomes, it is concluded that there are no opportunities to assess the process / execution of tasks, but only the final result and the knowledge acquired by students. This highlights the need for a new approach.
- Introducing an intellectual/computerized system into the training process, it is possible to achieve greater training effectiveness, provide learning which is not influenced by time (students learn when they choose) and place (students learn where they choose), and provide

both feedback to students and information on students' activities and the time devoted to designing that would allow to make an appropriate assessment of the work performed.

References

Anohina, A. (2007). *Adaptīvas apmācības un zināšanu vērtēšanas intelektuāla atbalsta sistēmas izstrādāšana.* Datorzinātnes un informācijas tehnoloģijas fakultāte, Lietišķo datorsistēmu institūts. Rīga: Rīgas Tehniskā universitāte.

Asperl, A. (2005). *How to teach CAD. Computer-Aided Design and Applications, 2(1-4),* 459-468.

Bloom, B. S. (1964). *Taxonomy of Educational Objectives*. David McKay Company Inc.

Brusilovsky, P., & Henze, N. (2007). *Open Corpus Adaptive Educational Hypermedia. The Adaptive Web, Vol. 4321*, 671-696.

Gage, N. L., & Berliner, D. C. (1999). *Pedagoģiskā psiholoģija / Educational psychology* Zvaigzne. Riga, Latvia: Zvaigzne ABC.

Gordon, N. (2014). *Flexible Pedagogies: technology-enhanced learning.* The Higher Education Academy.

Hudson, B. (2000). *Seeking connections and searching for meaning: teaching as reflective practice.* European Conference on Educational Research, Edinburgh, 20-23 September 2000. Education-line database.

Jank, W., & Meyer, H. (2006). *Didaktiske modeller*.

Lai, C., Yeung, Y., & Hu, J. (2016). *University student and teacher perceptions of teacher roles in promoting autonomous language learning. Computer Assisted Language Learning, 29(4)*, 703-723. doi:10.1080/09588221.2015.1016441

Limongelli, C., Sciarrone, F., Temperini, M., & Vaste, G. (2008). Lecomps5: *A Framework for the Automatic Building of Personalized Learning Sequences. Emerging Technologies and Information Systems for the Knowledge Society, Vol. 5288*, 296-303.

Lininger, M. (2015). *Patternmaking and Grading Using Gerber's Accumark Pattern Design Software*. Pearson.

Lukac, D. (2016). *Higher education according to industrial requirements — ecs as a successful example.*1st International Conference on Multidisciplinary Engineering Design Optimization (14-16 Sept.). IEEE. doi:10.1109/MEDO.2016.7746547

Lukac, D. (2011). *New dimensions in the CAE/CAD standardisation and certification process in the industrial and the educational sector.* International Journal of Knowledge and Learning, *7(1-2)*, 145-155. doi:10.1504/IJKL.2011.043897

Madsen, D. A. (2012*). Engineering Drawing and Design*. Clifton Park, NY, USA: Delmar.

Narayan, K. L. (2008). *Computer Aided Design and Manufacturing*. New Delhi: Prentice Hall of India.

Phobun, P., & Vicheanpanya, J. (2010). Adaptive intelligent tutoring systems for e-learning systems. *Social and Behavioral Sciences, 2 (2)*, 4064-4069.

Smith, N. C. (2012). *Choosing How to Teach & Teaching How to Choose: Using the 3Cs to Improve Learning*.

Stott, M. (2016). *Digital Pattern Cutting Workbook: 1: A Step-by-Step Guide to Lectra Modaris.*

Stott., M. (2012). *Pattern Cutting for Clothing Using CAD: How to Use Lectra Modaris Pattern Cutting Software*. Woodhead Publishing.

Walker, R., Voce, J., Swift, E., Ahmed, J., Jenkins, M., & Vincent, P. (2016*). 2016 Survey of Technology Enhanced Learning for higher education in the UK*. Universities and Colleges Informations Systems Association.

Yaghmaie, M., & Bahreininejad, A. (2011*). A context-aware adaptive learning system using agents. Expert Systems with Applications, 38(4),* 3280-3286.

Ye, X., Peng, W., Chena, Z., & Cai, Y. (2004). *Today's students, tomorrow's engineers: an industrial perspective on CAD education*. Computer-Aided Design, *36(14),* 1451-1460.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 260-271

DATA MINING TEACHING POSSIBILITIES USING MATLAB

Pēteris Grabusts

Aleksejs Zorins
Rezekne Academy of Technologies, Latvia

Abstract. *The teaching experience in the study process shows that students are better at perceiving graphical information rather than analytical relationships. Many training courses run on models that were previously available only in mathematics or physics. The use of Matlab package for the implementation of various algorithms in the Information Technology fields could be a possible solution. Often, the analytical solution is much simpler than the visual Matlab model, but for the purposes of perspective training it gives understanding of the usefulness of using such models. In the previous articles the authors had given examples of how Matlab's possibilities could be used for economic research purposes (optimal tax rate searching and modelling market equilibrium price). Students are very interested in modern data mining methods, such as artificial neural networks. In the research part of the study, the modelling capabilities in data mining studies are demonstrated by neural network examples.*
Keywords: *Data Mining, Matlab, modelling, neural networks, perceptron, teaching.*

Introduction

The purpose of studying various models of simulation is to form students' theoretical knowledge and practical skills in applying simulation modelling methods in research of solving specific problems in modelling of real applications - artificial neural networks (ANN). During the process of studying the course, students get acquainted with the means of simulation modelling in processes of functioning the systems, master the methods of simulation, the typical stages of modelling the processes which form the "chain": building of the conceptual model and its formalization - algorithmization of the model and its computer realization - simulation experiment and interpretation of the results of simulation; master the practical skills of implementing modelling algorithms for studying the characteristics of complex systems of information technologies.

Implementing such capabilities in a universal programming language is a very difficult task. Currently, there are quite a few software products that allow modelling processes. At the same time, there is now a product that can solve these problems very effectively - the MATLAB package, which contains tools for implementing artificial neural networks and fuzzy logic. It should be noted that

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3091

knowing artificial neural networks and fuzzy logic gives students the skills to do the research and stimulates them for scientific work (Kay, 1984; Karel & Tomas, 2015; Karris, 2006; Smith, 2013; Xue & Chen, 2013).

The aim of the article is to show Matlab suitability for the purpose of visualizing simulation models of various Data Mining (DM) disciplines. To reach the aim, the following research tasks have been set: identification of Matlab possibilities for neural network realization; demonstrate visualization models on the basis of examples. Common research methods are used in this research: descriptive research method, statistical method, mathematical modelling, neural network algorithms.

Within the framework of the work, a practical example is presented that will enable students to understand and start learning the modern analysis of large data (Big Data) with the help of neural network.

Neural Networks Concept

Artificial Neural Networks (ANN) is a generalized term for a certain class of algorithms that has a very important property - the ability to learn from examples, obtaining hidden regularities from data, and the data may be incomplete, distorted, and even contradictory (Fausett, 1994; Russel & Norvig, 1995; Bishop, 1995). If there is some connection between the input and output data (even if the traditional methods do not show it), the neural network is able to tune in to it with a certain accuracy. In addition, many neural networks make it possible to evaluate the significance of individual input data, to reduce the amount of data without the loss of relevant data, and make it possible to identify a near-critical situation. In many cases, neural networks allow to find regularities that are virtually impossible to detect by analyzing data manually.

The core element of artificial neural networks is neuron, that unlike a biological neuron, is known as formal, technical or mathematical neuron. The formal neuron (see Figure 1) has the following structure:

1) the neuron has n input channels x_i $(i = 1,\dots,n)$ and one output channel;
2) for each input channel x_i, a number w_i is assigned, called the weight of this channel. The weighting vector is $w = \{w_1, w_2, \dots, w_n\}$;
3) weighted signals of all inputs are summed up:
$$a = \sum_i w_i x_i$$
4) summarized signal is modified by the activation function and fed to the output channel.

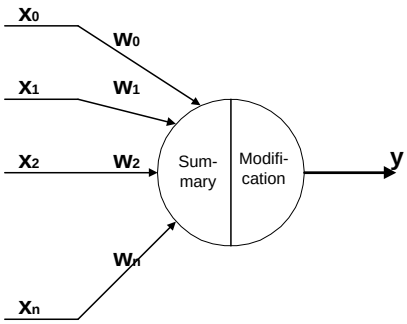


Figure 1. **Formal neuron**

In general, the neural network has the following structure:

1) the network consists of many interconnected neurons;
2) neurons are arranged in levels or layers;
3) the first layer is the input buffer that inputs the signal vector to the network; the last layer is the output buffer that determines the network response to the input signal vector; between the first and last layer there may be one or more hidden layers (interlayers) that perform the aggregator functions of network operation;
4) the interlayer connections may be complete, accidental or by element groups;
5) a network with layers and signal processing functions is called perceptron.

The network training, i.e., the weight adaptation process, building neuronal responses from the input signal vector to the output buffer is essential for the functioning of the neural network. The output buffer signals should match the advisable result. The functioning of the network was improved by applying weight ratios (Rashid, 2016).

Single-layer perceptron - able to train to classify input vectors that are linearly separable. In the training process the perceptron training algorithm is used (Fausett, 1994), which is very suitable for students in acquiring the basics of functioning of neural networks. Because of the limited volume of the article, it is not possible to publish the full Perceptron learning algorithm and students should understand it individually.

Matlab Opportunities for Researching Neural Networks

The Matlab package has several development versions and it has become one of the most powerful universal mathematical systems. It contains its own built-in programming language, powerful graphical visualization tools. Matlab can be

used practically in every field of science and technology and is widely used in mathematical modelling (Esfandiari, 2013; Kiusalaas, 2016).

The popularity of Matlab is largely due to the fact that, in addition to the powerful programming environment, a number of expansion packets have been developed - specific tools (Toolboxes) for various practical applications. The latest Matlab versions feature about 50 different additional tools.

Neural Networks add-on NNTool gives the possibility to create neuron networks, training, modelling, export and import of neural networks and data without interacting with the Matlab team. It can be done by using interface (GUI) capabilities of graphical user. Such types of means are effective working with a package only at an early stage, as there are several limitations in choosing more complex network configurations. So NNTool allows to process only single layer and dual layer networks. All of this makes the Matlab extension pack suitable for initial information acquisition of the neural network and allows to experiment with different types of networks in order to get the best training that allows you to conclude on the quality of network training.

Research part

The configuration of a computer plays an important role in its application- it can be an office computer for working with a text editor, an electronic table, and an Internet connection. Home computer would need a larger hard drive, a good video card and a good monitor. The gaming computer should have a powerful video card, a large hard drive and a good monitor. Of course, such a breakdown is very provisory, over time the criteria have changed several times.

In order to ease the choice for the client, it is proposed to create a training system based on the neural network technology, which, with existing computer configuration data, would be able to identify the type of chosen computer. This would facilitate and speed up the selection of computer configurations. Such a system should be self-trained and based on already introduced examples of computer configurations. In order to complete this task, it is necessary to select an appropriate data structure to be used in future for the training and further testing of the neural network. When looking at different computer configurations (although they are outdated - it does not change the substance of the matter), a simplified data model can be created in the following way (see Table 1).

Computer analysis was performed and, as a result, data was received. For the neural network to use these data in the network entrance for the training process, it is necessary to encode the input data example, or vector. The following criterion has been chosen: if the desired computer component matches the computer configuration parameter, let us encode this parameter with 1, if it does not match -

with 0. Thus, the example computer configuration will be encoded as follows: [1 0 1 0 1 0 1 0 1 0 0 0 1 0].

Table 1 **Possible Computer Configuration Indicators**

N.	Computer component	Possible values
1.	Processor Type	Celeron
		Pentium
2.	Processor Tact Frequency	1.8 to 2.4 Ghz
		higher than 2.4 Ghz
3.	The amount of RAM	2048 to 4096 Mb
		greater than 4 Gb
4.	Hard dick capacity	250 to 500 Gb
		greater than 500 Gb
5.	Video card type	integrated
		256 to 1024 Mb memory
		greater than 1024 Mb
6.	Display size	19” display
		21” display
		greater

Table 2 **Hypothesis data distribution**

N.	Computer Configuration	Computer Type
1.	1 0 1 0 1 0 1 0 1 0 0 1 0 0	Office computer (0)
2.	1 0 1 0 1 0 0 1 1 0 0 0 1 0	
3.	1 0 1 0 1 0 0 1 1 0 0 0 1 0	
4.	1 0 1 0 1 0 0 1 0 1 0 0 1 0	
5.	1 0 1 0 0 1 0 1 0 1 0 0 1 0	
6.	1 0 1 0 1 0 0 1 0 1 0 0 1 0	
7.	1 0 1 0 1 0 0 1 0 1 0 0 1 0	
8.	1 0 1 0 0 1 0 1 0 1 0 0 1 0	
9.	0 1 1 0 0 1 0 1 0 1 0 0 1 0	Gaming computer (1)
10.	0 1 1 0 1 0 0 1 0 1 0 0 1 0	
11.	0 1 1 0 1 0 0 1 0 0 1 0 0 1	
12.	0 1 0 1 1 0 0 1 0 0 1 0 1 0	
13.	0 1 0 1 0 1 0 1 0 0 1 0 0 1	
14.	0 1 0 1 0 1 0 1 0 0 1 0 0 1	

In the planning stage of the experiment, the hypothesis was put forward - computers with numbers from 1 to 8 with the Celeron processor could relate to the same type, which we would conditionally call the *Office Computer* class. Computers with numbers 9 to 14 will be assigned to the *Gaming Computer* class. In this way, we have two types of data or classes, and, as a result of experiment, with a help of neuron networks we should be sure that the neural network is

capable to separate the two-class vectors in the training process. Table 2 shows the appropriate computer breakdown by classes.

NNTool is launched in the Matlab environment (see Figure 2).

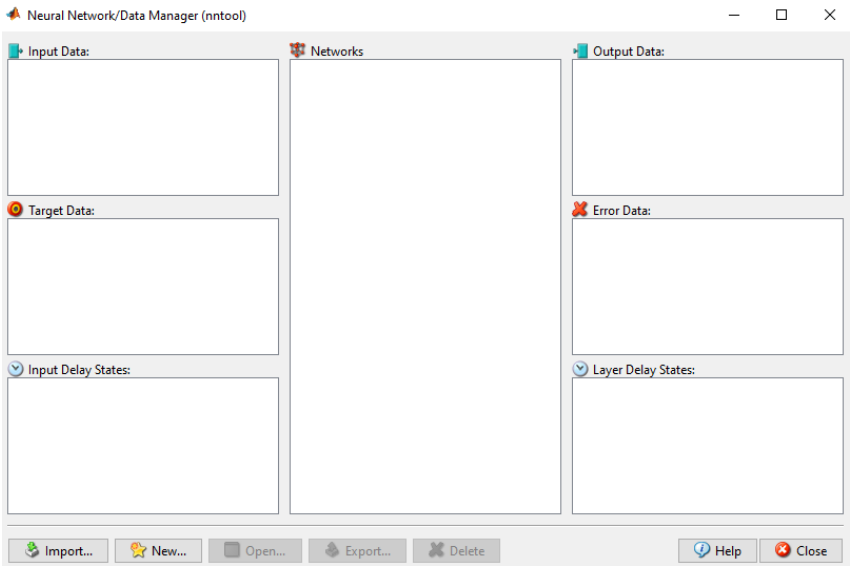


Figure 2. **Matlab NNTools environment window**

Select *NEW/DATA* and enter data and targets for training. Conditionally we name the data from Figure 2 as *data_in* and define them as *Inputs* (see Figure 3) in accordance with Matlab's syntax. At the end we press the button *Create*.

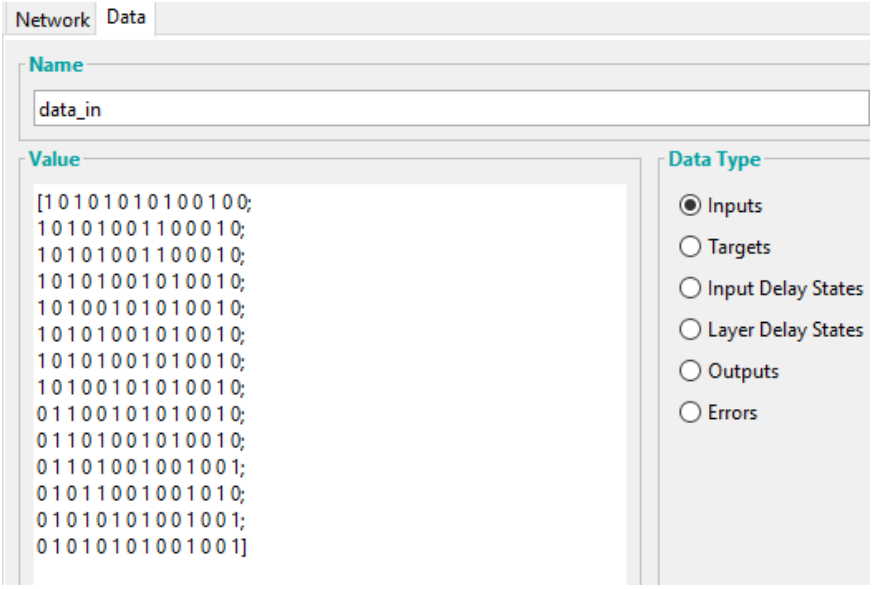


Figure 3. **Experiment input data**

Similarly, we name target data from Figure 2 as *data_target* and define them as *Targets* (see Figure 4).

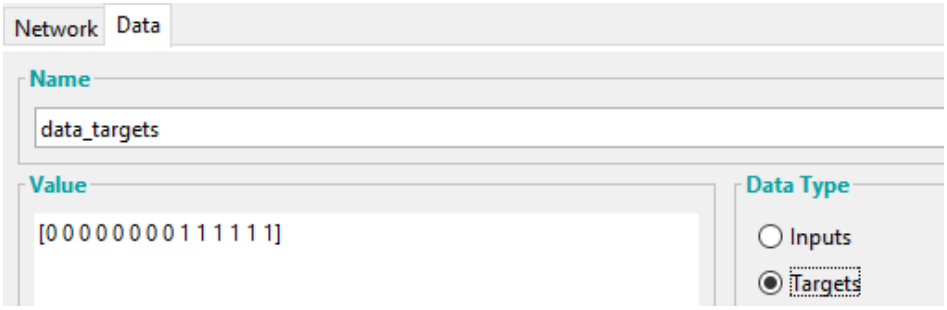


Figure 4. **Experiment target data values**

After clicking the button Create, we return to the neural network design mode *New\Network*. We will call the network *Perceptron*.

Network type select *Perceptron.*

Input data select *data_in.*

Target data select *data_targets* and validate by clicking the button *Create* (see Figure 5).

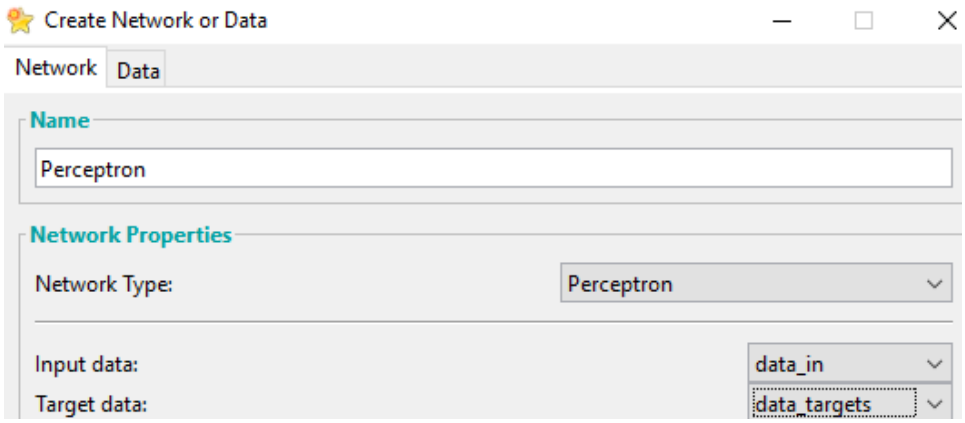


Figure 5. **Network data configuration window**

As a result, a neuron network entitled *Perceptron* was created (see Figure 6).

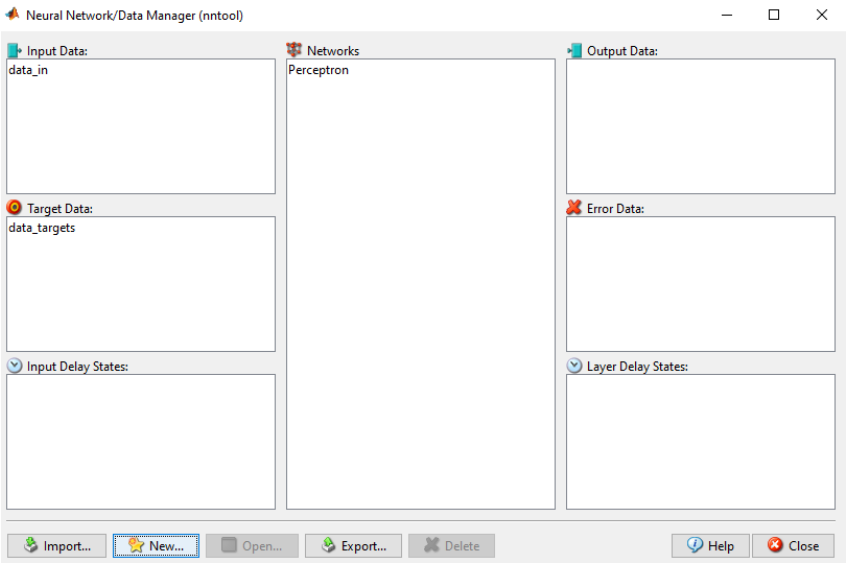


Figure 6. **Created neural network**

By choosing *Perceptron* neural network, its structure is displayed - 14 input vectors, 1 layer and 1 output (see Figure 7).

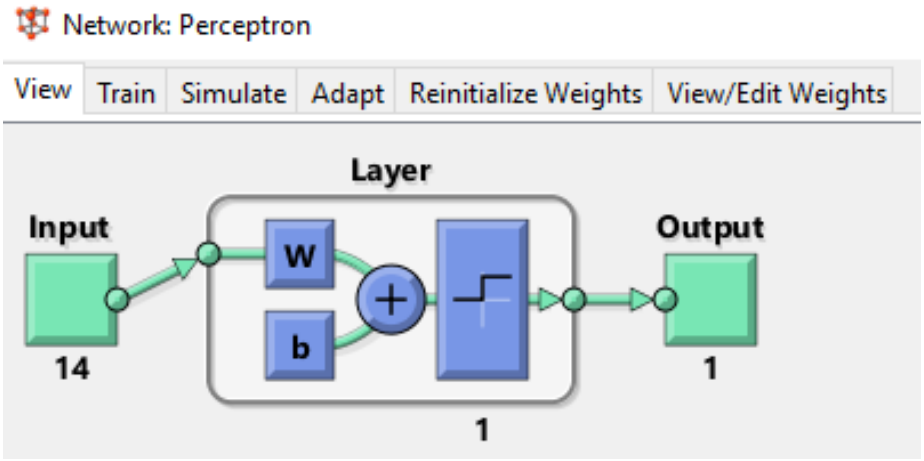


Figure 7. **Neural network structure**

It's time to train the neural network - in the distribution *Train* we set all the initial settings and start network training *Train network* (see Figure 8).

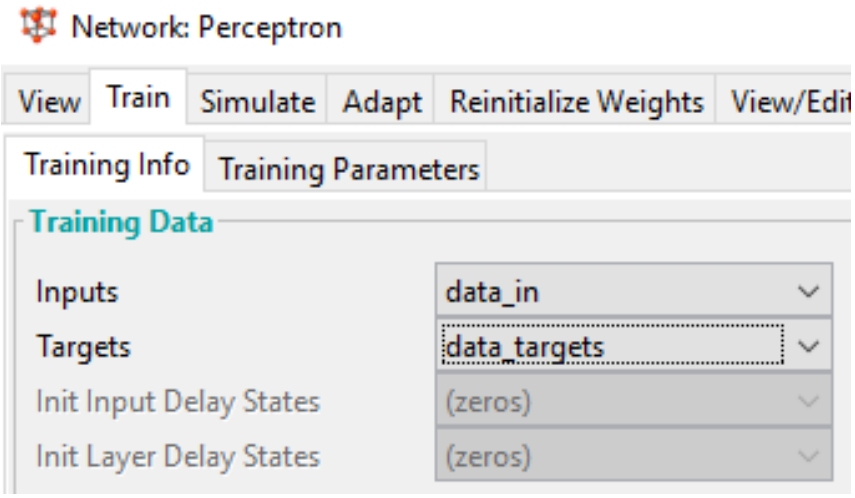


Figure 8. **Network training**

By default, 1000 algorithm iterations are accomplished, the number and training parameters of which can be changed. The following window appears as a result of the training (see Figure 9).

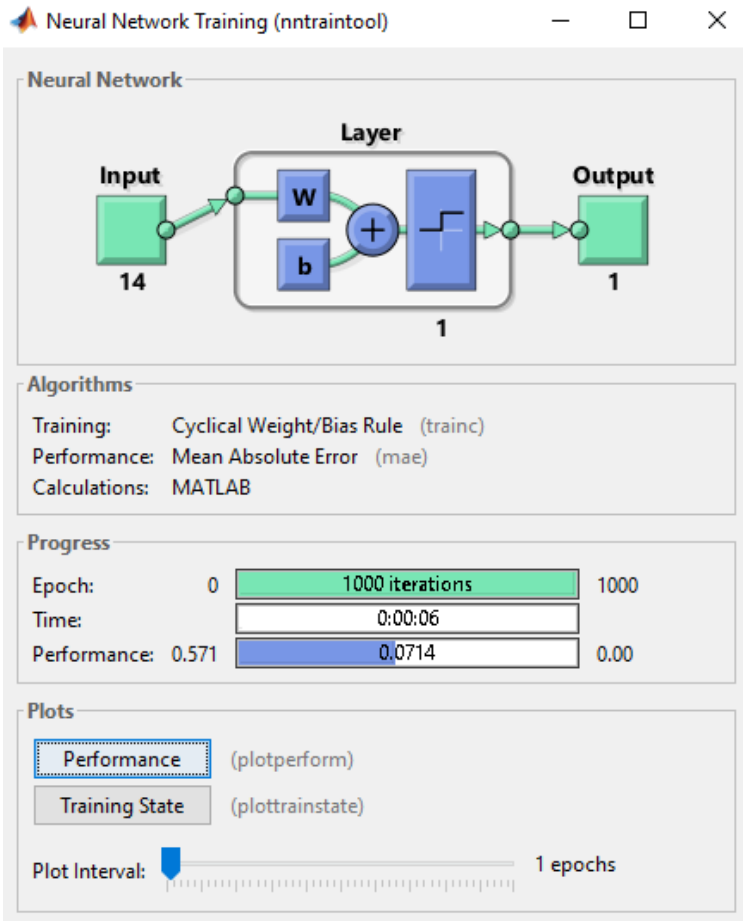


Figure 9. **Neural network training window**

It can be concluded that the neural network has been trained in the 57 iteration of the training algorithm (performance 0,571), which is also shown in the graph *Plots/Performance* (see Figure 10).

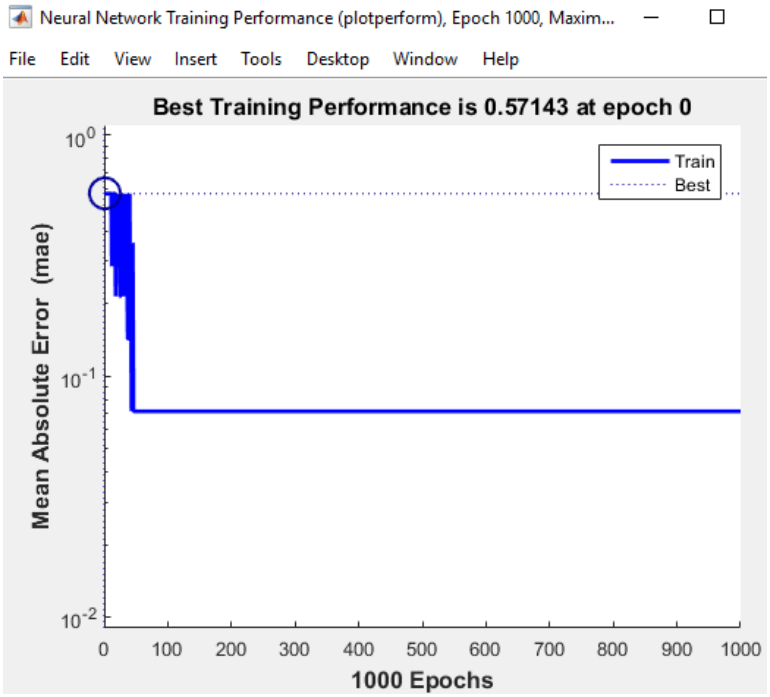


Figure 10. **Best training performance**

It can be concluded that a neural network is capable to recognize the given computer configuration successfully by referring it to the office computer type or to the gaming computer type.

The following steps should be taken to improve network training:

- complement the number of training examples (e.g., by collecting statistics on computers sold over a given period of time);
- introduce new types of computers if needed (e.g., *Server computer* type);
- change the training data structure by adding new configuration parameters (e.g., Cache memory volume), or by detailed description of the component range;
- change the network training parameters.

In this way, an optimal neural network configuration could be obtained, which would help to identify new computer configurations.

Conclusions

This paper justifies the usefulness of the introduction of simulation models in the initial training process, when simulation models can also be introduced for the acquisition of analytical relationships for modelling purposes. It enables to perceive not only the possibilities of using the formulas, but also to visualize various relationships in graphic form.

A single class of artificial neural networks - Perceptron training - was studied in the work. An encoding of information is considered in the form in which it can be used in artificial neural networks. The Perceptron modelling algorithm is described and a numerical example of an algorithm's operation is realized.

In the field of data analysis, the Matlab package NNTool was investigated with the aim of finding out the possibilities of processing the neural networks assigned to solve practical problems. Packages of this type make it easier for the user to work in the decision-making field, increasing the efficiency and quality of decisions. An example of applying a suitable system for the computer configuration task is seen. For demonstration purposes, the systems were trained with a set of 14 examples; each example contained a vector with encoded computer configuration with 14 parameters. It has been experimentally stated that neuron networks are able to train according to the given training algorithm and successfully perform testing, which results in the test data example being assigned to the corresponding computer configuration type or class.

It is concluded that neuron network class tasks can be successfully applied at the beginning of the data analysis. Such systems can show good results in the selection and analysis of information.

Thus, it can be concluded that Matlab neural network modelling tool is a very suitable tool not only for calculations in engineering, but can also serve as a visualization tool of simulation models in various artificial intelligence applications.

References

Bishop, C. M. (1995). Neural networks for pattern recognition. Oxford: Oxford University Press.

Esfandiari, R. S. (2013). *Numerical Methods for Engineers and Scientists Using MATLAB*. Chapman & Hall/CRC.

Fausett, L. (1994). *Fundamentals of Neural Networks: Architectures, Algorithms and Applications*. New York: Prentice Hall International Inc.

Kay, C. (1984). *Mathematics for Computer Programmers*. New Jersey: Prentice Hall.

Karel, P., & Tomas, Z. (2015). Multimedia Teaching Aid for Students of Basics of Control Theory in Matlab and Simulink. *Procedia Engineering, Volume 100*, 150–158.

Karris, S. T. (2006). *Introduction to Simulink ® with Engineering Applications*. Orchard Publications.

Kiusalaas, J. (2016). *Numerical Methods in Engineering with MATLAB, 3e*. Cambridge University Press.

Rashid, T. (2016). *Make Your Own Neural Network.* CreateSpace Independent Publishing Platform.

Russel, S., & Norvig, P. (1995). *Artificial Intelligence: A Modern Approach*. Englewood Cliffs, NJ: Prentice Hall.

Smith, D. (2013). *Engineering Computation with MATLAB, 3e*. Pearson Education Inc.

Xue, D., & Chen, Y. (2013). *System Simulation Techniques with MATLAB and Simulink*. John Wiley & Sons, Inc.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 272-282

EPSS – METHOD AND TOOLS FOR IMPROVING THE COMPETENCE IN THE XXI CENTURY

Zofia Gródek-Szostak
Cracow University of Economics, Poland

Danuta Kajrunajtys
Cracow University of Economics, Poland

Luis Ocha Siguencia
The Jerzy Kukuczka Academy of Physical Education in Katowice, Poland

Agnieszka Chęcińska Zaucha
The Jerzy Kukuczka Academy of Physical Education in Katowice, Poland

Abstract. *The paper discusses the features and usability of Electronic Performance Support Systems (EPSS) in education and improving the competence of adults. It is a serious problem for enterprises to search for employees (definite period, employment of students) for work that requires the use of business software. Learning (training) in the performance of tasks in such environment is an investment (requires time and expense). EPSS have been designed as tools to reduce the number of hours of training involving a trainer (human). These systems are coached - supported by people who use business software in their work on an ongoing basis. In the research we present how to implement them and in which way their popularization can help in hiring people without special pre-preparation, and only with the basic computer skills.*
Keywords: *EPSS, Learning management, Learning-by-doing, Problem based management.*

Introduction

Ensuring the satisfactory competencies of employees in the face of contemporary conditions of competition becomes the key challenge for organizations managements (Kunasz, 2016). Therefore, there are sought the methods and approaches that would allow to shorten the time of employees preparation for fully efficient work in the positions equipped with the office software. It would seem that people with directional education (secondary or academic) and with the experience in computer using should not have any problem with the efficient use of the software. However, it turns out that the more the activities of enterprises depend on the work performed on computer-equipped workstations, the problem of training in the efficient use of the software is more important. According to the study on the relationship between training and work performance of employees, there is a positive correlation between training and

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3153

employee performance (for example, Farooq and Khan based on their research have determined a correlation of r = 0.233 (Farooq & Khan, 2011) and the Sultana, Irum, Ahmed and Mehmood teams (2012), based on their research, estimated that the source of 50.1 % of changes in work efficiency are training programs (their content and manner of conducting Organizations allocate the noticeable budgets for trainings. The problem, however, is that such trainings are expected, thanks to which the employee will be fully prepared to perform the duties and not an increasing number of training hours.

The purpose of the article is to identify a spectrum of possible organizational solutions for training aimed at improving work efficiency at office positions equipped with office software. The starting point for considerations is the idea of providing knowledge necessary to complete the task. This idea is exemplified by Electronic Performance Support System (EPSS) systems. The concept of EPSS systems is not new. Assumptions for EPSS systems were presented already in the 90s by Gloria Gery (Gery, 1989, 1991).

For the purposes of these considerations, it was assumed that the efficiency of job training is understood as the time after which the employee is fully independent, i.e.:

- knows and understands the procedures that apply to him,
- correctly uses business applications supporting his work,
- does not make mistakes when registering data,
- handles transactions at a rate of action acceptable at a given position.

The training is not satisfactorily effective if after its finishing the employee is not able to perform correctly all the procedures in force at his position, looks for information in documentation, asks questions to colleagues (superiors) or there appear the mistakes that result from his actions.

It is worth mentioning that the effectiveness of training is of interest not only to trainers who provide this type of value, but it is also the subject of scientific studies that give guidelines for practicing. An example is the approach known in the literature as the Kirkpatrik model. The approach adopted above to assess the effectiveness of training can be referred to the IV level in the Kirkpatrika model, which suggests assessing the effectiveness of training by measuring the parameters adopted before the training. It is emphasized that the weakness of the Kirkpatrick model is the high costs of obtaining information about the effects of the training, because the effects can be evaluated after a long time (Rae, 2004). As it seems, it is not the model that is the source of this problem but the way of conducting training and the process of acquiring the received knowledge. The employee receives extensive knowledge during the training and the fact of obtaining it is not yet a success at the workplace. It must take time to translate the acquired knowledge into the practice of performing duties at a particular

employee's job position. It is also not accurate to ask in the IV phase of the model the question whether the trainees are using what they had learned at work. The purpose of the training is to prepare employees to perform specific tasks at the position and the training is expected to allow them to undertake these duties in the possible shortest time. Otherwise, it is inefficient from the point of view of the company.

Research on the subject of training effectiveness in the world is conducted systematically, which is reflected in many contemporary publications. The Polish-language literature query helped to identify the use of EPSS class systems in e-learning studies (Dąbrowski, 2008; Różański, 2012) and a chapter devoted to this subject in the publication of Hyla (2007). This means that this term is not popular in Poland. Surprisingly, the Polish tradition is the scientific interest in work efficiency and the search for factors to improve it. Currently, this interest should also include office work supported by IT tools. It is not true that IT tools dedicated to supporting work are excellent and provide a level of support acceptable by managers. In addition, personnel fluctuation means that new employees must be trained in the performance of work in the conditions of a specific company. Both of these factors (software imperfection and the need to gain experience at the workplace) result in unsatisfactory productivity in companies.

This article is an attempt to identify the situation. The article discusses the ideas that are recommended in the literature as remedial actions for the problem of employee position improvement as well as the idea that led to the development of EPSS class information systems.

The paper was financed from the funds allocated to the Faculty of Management at the Cracow University of Economics, as part of a grant to support research capacity.

Improving the efficiency and Learning-by-doing

The starting point for considerations is the concept of efficiency, understood as a measure for the operating activity of the enterprise. Measurement and assessment of work efficiency in management is a measure of effectiveness (Piętowska-Laska, 2012; Wierzbicka, 2013). Efficiency is considered in the literature in technical terms as the ratio of the achieved production results to the inputs used to obtain them and as a measure of progress (socio-economic) achieved through the implementation of projects aimed at improving the efficiency of the organization (Kosieradzka, 2012).

On the basis of comparative studies on labour productivity, Jarmołowicz and Knapińska (2014) state that clearly there is a large difference between the level of unit productivity in Poland and EU-27. This means that it is necessary to ensure the productivity of human resources, for example through education, lifelong

learning, adaptation of modern technologies from countries where this productivity is significantly higher.

The problem of improving productivity concerns employees of enterprises, adults, which usually finished the formal education process. However, such persons must constantly supplement their competences in the organizations where they work. It is necessary to perform efficiently the tasks resulting from the duties assigned to them in the work environment. At the same time, in each organization the working environment (equipping the position in the software) and the duties assigned to the position are different. Adult education is a challenge that should be understood by offering the forms of information providing that improves their work performance. These issues are dealt with by andragogy. The main features that distinguish adults' approach to further education compared to youth education are (Merriam, 2001):

- self-concept: being an independent person after a period called the dependent personality,
- the pool of experience becomes the foundation for further learning (the young only gathers different experiences),
- learning readiness: after the learning stage for learning within adults, there is an orientation on the development tasks of their own social roles,
- change in the perspective of using the knowledge: after the stage of deferred application of knowledge (orientation on the school/academic subject) a stage of direct application of knowledge takes place (problem orientation),
- source of motivation to learning: after a period of external motivation domination (often imposed), mature internal motivation develops.

In the course of research a number of models describing the process of effective adult education were developed. One of them is Kolba model, where the following stages were distinguished: experience, reflection, generalization and application (Kolb & Kolb, 2008). In a slightly more extensive model, Gibbs (1988) distinguished: description of the situation, accompanying emotions and thoughts, consideration of causes and consequences, analysis of positive and negative aspects of the problem, reflexive inference and action plan. Both quoted models of adult education are based on reflection from experience and indicate the direction of learning resulting from the needs of the situation and the action plan.

The concept of learning-by-doing understood as improving the competences through the regular repetition of performed activities appeared in economics in the 60s of last century (Gery, 1991). In the management the researches on learning-by-doing led to the development of a model of experience curve (70s of

the last century). It is used to illustrate the relationship between the amount of time needed to complete a single task and the amount of time resulting from performing all such tasks in the entire history of the company, sector, market, etc. The increase in employee experience is therefore a factor directly affecting the efficiency of management.

The complement to considerations regarding the effectiveness of training is the increasingly accented "knowledge on demand" approach (Od push, 2017). Knowledge on demand - is the use of specific portions of knowledge just before using it in practice. The traditional way of learning - the transfer of large portions of knowledge here and now with the intention that this knowledge will be used in the undefined future - is ineffective. The research shows that within a few weeks we forget up to 90 % of new information. The new generation of people entering the labour market forces a departure from the formalized approach to education and taking the challenge referred to as "street view" (E-learning na nowo, 2017). Its characteristic feature is the "on-demand" attitude, i.e. reaching for knowledge and enriching skills on demand, at the time and place where these competences are necessary and in a form appropriate to the situation. The method and tools of the EPSS type are fully in line with this expectation, allowing to reach for such elements of information that are needed while performing the specific task.

Demand for the position trainings

The work consisting in the implementation of repetitive transactions in positions equipped with a computer requires the efficient use of the software. Business software, regardless of its complexity, is a working tool and the employer expects the work will be carried out efficiently with the help of this software. In the practice of enterprises, depending on the situation, the user uses not one but many applications. The implementation of work processes requires employees to know how to proceed in each case resulting from the characteristics of a given business transaction (e.g. registering a new telephone operator customer service). Making changes in the used software causes the additional necessity to educate not only the new employees but all those who are affected by such a change. As results from the research, the key factors affecting the achievement the values from implementation of the IT system are: effective adaptation of users to changes in the work environment (70 %), organizational changes taking into account the changes in work sequences (16 %), matching processes to conditions and equipment in which they are supported (13 %) and application functionality (1 %) (Achieving Enterprise Software, 2008). The survey also showed that the key factor in improving work efficiency is to ensure the effective use of software in the enterprise.

According to the Meta Group specialists, the current trainings and support programs do not bring the desired effect of productivity growth in the workplace. According to them, 76 % of users have problems with understanding the applications critical to the functioning of the company. This means that three out of four employees do not understand most of the critical mission systems of their employer. The study shows that only 11 % of users can be described as very competent at their job positions. This problem is particularly burdensome for achieving the assumed goals and levels of task implementation in the enterprises where operational activity is carried out only at workplaces equipped with computers with business software. An example are the call center companies, where the rotation of employees is a serious problem for managers. In the American entities of this group, it is at the level of 30-50 % per annum of exchanged employees. This generates not only the high recruitment costs but also training costs. These expenses in accounting terms (and thus directly resulting from source documents) do not take into account the lost productivity of the new employees (Batt et. al., 2005). The following statistics characterize the scale of the Polish call center problem: in about 160 enterprises operating in around 240 locations there are about 22,000 workplaces (Olszynka, 2015). Staff fluctuation in 2008 describes the statement that "45 % of people employed as consultants are novices with less than one year of traineeships" and in 2013, the rotation among the telephone sellers amounted to over 50 % per annum (Wolski & Szymańska, 2013). In other industries (eg insurance) and regardless of the industry in entities operating complex ERP software, the demand for training enabling users to work with software is also a problem. In own research carried out on a group of 1027 respondents, 90.94 % of them declared that they use business software (eg ERP system, CRM, etc.), 87.2 % (Kajrunajtys et al., 2017; Szeląg-Sikora & Cupiał, 2015). In the opinion of IT system users and managers, there is an urgent need to support work efficiency in positions equipped with a computer by providing knowledge necessary to the performed tasks (Lorenowicz et el., 2015). Knowledge should be (see Yakin & Yildirim, 2016):

- delivered in a way that does not distract employees from tasks,
- be associated with the tasks performed here and now,
- be tailored to the diverse capabilities of the recipients,
- given in a way that allows to share the experiences by employees, which is the fastest way to provide specific guidance to a person seeking information how to complete the task.

According to specialists, the overtraining syndrome is currently often observed, i.e. fatigue of participants with too many courses, which results in lower efficiency of acquiring competences. They emphasize that "the number of

trainings depends more on their quality and consistency with the company's goals" (Mrug, 2017).

EPSS - essence, goals and destiny

Works on the idea of the Electronic Performance Support System (EPSS) were initiated in the second half of the last century (Gery, 1995; Gal & Nachmias, 2011). The following three factors contributed to the fact that today we can use EPSS (Bielawski & Metcalf, 2003):

- increasing complexity of work, including the increase of technical information volume necessary to perform complex business tasks,
- pressure to increase the productivity of employees and entire organizations to meet the competition requirements,
- fast IT development: both the productivity of devices and the ability to develop and deliver application software.

Literature provides many definitions of EPSS. The authors generally agree that EPSS is software that directly supports a given employee, improving its performance whenever and wherever it is needed (Hung-Wen & Ching-Hsiang, 2006). Raybould (2000) also indicates that EPSS provides access to integrated information, advice and learning experiences during the work to improve work performance. Van Schaik and team emphasizes that EPSS facilitates the acquisition of skills and knowledge in a given field (van Schaik, Pearson, & Barker, 2002). EPSS is an integrated environment shared with employees. It is organized to provide an immediate (just-in-need) and personalized online access to the full range of information, tips, advice and help to enable to do your work with the minimum support and intervention of others (Clark, 1992).

Gloria Gery (1991) emphasizes that the EPSS system is an integrated electronic environment available to every employee that aims to provide immediate, personalized on-line access to the full range of information, software, advice and assistance, data, images, tools and monitoring systems to enable work with minimal support and intervention of the others. Two opposing approaches can be distinguished in the idea of EPSS (Gal & Nachmias, 2011):

- the provided support reduces the need to learn - EPSS aims to reduce or even eliminate the need to learn, because job skills are acquired through the interaction of the employee with the system, and in particular the initial preparation for work can be very limited,
- the provided help leads to learning at work - the idea of EPSS results directly from the recommendations of adult education, where it refers to methods of education based on a practical context and reflection.

By providing the support to employees, EPSS allows to reduce the total cost of necessary education while increasing employee productivity. Often EPSS

allows the employees to start tasks without or with minimal training or coaching. New employees are able to complete their tasks faster and more accurately. They can also learn a lot about their work (thanks to the built-in social tools), which contributes to the transfer the knowledge and learning of the organization (Bielawski & Metcalf, 2003). More and more companies perceive the EPSS system as an attractive and valuable support for the implementation process for the work of each new person without prior training (Gery, 1995). Managers expect that novice users will be fully productive on the first day they start using the system. They also expect that such a system will gradually lead the trainee to higher performance levels than those achieved by traditional training sessions (Winslow & Bramer, 1994).

The support methods provided by EPSS are very diverse, they can be distinguished among them (Bielawski & Metcalf 2003): mentoring (one-on-one coaching), training in the course of work, on-line help, EPSS database (EPSS repository), built-in context help, group discussion, live chat help online. The results of research conducted by Chang indicate that the greatest value of EPSS systems is the information base and a module oriented to support in solving the work problems (Chang, 2004).

Gery formulated a list of attributes and behaviours of EPSS, which she recognized as distinctive among information delivery tools. These are the following features (Gery, 1995): it creates and works in the context of work, helps in setting the goal, has the structure of the work process, reflects the natural work flow, enables alternative insight into data, information and knowledge, provides contextual information feedback, provides help resources without breaking the task context, embeds knowledge in the interface, provides access to logic and automates the tasks.

Research carried out by the team of Mosher (Mosher, 2010) allowed us to work out a model of the relationship between the achieved level of work efficiency as a function of time and the use (or not) of EPSS tools. In the course of the training lasting about 30 minutes, participants remembered about 58 % of the information they learned, with the passage of time this figure decreased. The use of EPSS tools has resulted in a noticeable increase in the work efficiency of these people.

Every organization must constantly update the knowledge. It is important that users during the learning to share it. To update primary knowledge resources, EPSS can record user knowledge and activity. By immediately registering any input information generated at work, it is possible to increase the organization's ability to effectively use of all collected know-how. Therefore, the organization's knowledge is constantly refreshed and can be shared with others. (McManus & Snyder, 2003).

Summary

Currently, many IT systems are offered on the market, which their creators claim to perform functions resulting from the definition of EPSS. The contextual support offered by the above tools is always available when the user uses a computer. Some of these tools automatically identify in which application and to which fields the user enters the information. In each application, displaying of useful training contents in a given context requires user initiation (no mechanisms allowing for connection between the state of the application and the user's situation). Positional education and operational support for users of application requires providing the substantive content that fits in the supported person's work environment. Summing up, the EPSS class systems can be said to be a solution that:

- it can be used in various client infrastructures,
- radically improves the optimization of human (user) activity, which receives knowledge always current and in the required time,
- affects the ergonomics of use by providing information (training content) exactly in the place and time of user activity - the user does not waste time searching for contextual information,
- ensures IT security through the lack of possibility to interfere in applications and database systems supported on the users' positions.

The idea and implementations of EPSS will evolve. The development of EPSS should provide the practical ways of sharing the knowledge by the best contractors or experts, wherever and whenever this knowledge is registered. Active knowledge management will be able to provide a real competitive advantage for the organization. This approach to knowledge sharing across the organization allows to evaluate and improve processes in the organization, ultimately providing an efficient and effective strategy without duplication of efforts.

Literature studies show that EPSS information systems have a great potential to effectively support the work efficiency of people using business software and thus, a real opportunity to contribute to the improvement of the results of the work of entire organizations. Therefore, there is a need to conduct scientific research aimed at empirical demonstration of the relationship between work efficiency and the use of EPSS systems in real conditions.

References

Achieving enterprise software "Success". Study of buyers and sellers of enterprise software. (2008). San Francisco: SandHill Group.

Batt, R., Doellgast, V., & Kwon, H. (2005). *U.S. call center industry report 2004 national benchmarking report strategy, HR practices & performance* (CAHRS Working Paper # 05-06). Ithaca, NY: Cornell University, School of Industrial and Labor Relations, Center for Advanced Human Resource Studies.

Bielawski, L., & Metcalf, D. S. (2003). *Blended Elearning: Integrating Knowledge, Performance, Support, and Online Learning*. Amherst: HRD Press Inc.

Chang, Ch. (2004). The relationship between the performance and the perceived benefits of using an electronic performance support system (EPSS). *Innovations in Education and Teaching International, 41 (3),* 343-364.

Clark, R. C. (1992). EPSS—look before you leap: Some cautions about applications of electronic performance support systems. *Performance Improvement Quarterly, 31 (5) May/June*, 22–25.

Dąbrowski, M. (2008). Analiza pomiaru efektywności kosztowej procesów e-learningowych. *E-mentor , 5 (27*).

E-learning na nowo. Retrieved from http://www.kadry.abc.com.pl/czytaj/-/artykul/e-learning-na-nowo.

Farooq, M., & Khan, M. A. (2011). Impact of Training and Feedback on Employee Performance. *Far East Journal of Psychology and Business, 5 (1),* 23-33.

Gal, E., & Nachmias, R. (2011). Implementing On-Line Learning and Performance Support Using an EPSS. *Interdisciplinary Journal of E-Learning and Learning Objects Volume 7,* 213-224.

Gery, G. (1995). Attributes and Behaviors of Performance-Centered Systems. *Performance Improvement Quarterly, 8 (1),* 47-93.

Gery, G. (1991). *Electronic Performance Support Systems: How and Why to Remake the Workplace through the Strategic Application of Technology*. Boston: Weingarten Publications.

Gery, G. (1989). Training vs. Performance Support: Inadequate Training is Now Insufficient. *Performance Improvement Quarterly*, 51-71.

Gibbs, G. (1988). *Learning by doing: a guide to teaching and learning methods*. Oxford: Further Education Unit, Oxford Polytechnic.

Hung-Wen, L., & Ching-Hsiang, L. (2006). The Role of Electronic Performance Systems in Improving Learning and Performance. *A Managerial Perspective, International Journal of management (Poole), 23 (2),* 632-639.

Hyla, M. (2007). *Przewodnik po e-learningu*. Kraków: ABC, Wolters Kluwer business.

Jarmołowicz, W., & Knapińska, M. (2014). Koszty i produktywność pracy w Polsce i Unii Europejskiej – elementy analizy porównawczej. *Studia Ekonomiczne UE, 196*, 9-20.

Kajrunajtys, D., Malik, G., & Gródek-Szostak, Z. (2017). Integracja systemów informatycznych – wnioski z badań pilotażowych. *Zeszyt Naukowy WSEI* w Krakowie, *13*, 118-135.

Kolb, A., & Kolb, D. (2008). Experiential Learning Theory: A Dynamic, Holistic Approach to Management Learning, Education and Development (pp. 43). In: Armstrong, S. J. Fukami, C. (Eds.) *Handbook of Management Learning, Education and Development*. London: Sage Publication.

Kosieradzka, A. (2012). *Zarządzanie produktywnością w przedsiębiorstwie*, Warszawa: Wydawnictwo C.H. Beck.

Kunasz, M. (2016). Wielkość przedsiębiorstwa a czynniki determinujące szanse na szkolenie w organizacji. *Organizacja i Kierowanie, 3 (173),* 121-139.

Lorenowicz, E., Koszel, M., Kocira, S., & Uziak, J. (2015). Changes in ICT use by polish students from life sciences university. *Procedia - Social and Behavioral Sciences, 176*, 17 – 123.

Merriam, S. B. (2001). *Qualitative Research and Case Study Applications in Education*. San Francisco: Jossey-Bass Publishers.

Mosher, B. (2010). *Performance Support And Learning at the Moment of need*. Retrieved from https://www.elearningguild.com/showfile.cfm?id=3923

McManus, D. J., & Snyder, Ch. A. (2003). Knowledge Management: The Role of EPSS. *Information Management, Vol. 12, Iss. 2*.

Mrug, M. (2017). *Szkolenie na 100 procent*. Retrieved from http://kadry.infor.pl/kadry/hrm/szkolenia_i_rozwoj/635360,Szkolenie-na-100 procent.html, *Od push do pull learningu* Retrieved from http://edu-trendy.pl/od_push_do_pull_learningu,36,p.html

Olszynka, S. (2015). *Rynek call i contact center w Polsce 2015*. Warszawa: Wydawnictwo PMR.

Piętowska-Laska, R. (2012). Doskonalenie produktywności we współczesnych przedsiębiorstwach, *Economy and Management*, 2.

Rae, L. (2004). *Ocena pracy szkoleniowca*. Kraków: Oficyna Ekonomiczna.

Raybould, B. (2000). Performance Support Engineering: Building Performance-Centered Web-based Systems, Information Systems, and Knowledge Management Systems in the 21st Century. *Performance Improvement, 39 (6).*

Różański, A. (2012). Dobór szkoleń pracowniczych w małych i średnich przedsiębiorstwach - analiza zjawiska. *E-mentor 5 (47).*

van Schaik, P., Pearson, R., & Barker, P. (2002). Designing electronic performance support systems to facilitate learning. *Innovations in Education & Teaching International, 39 (4),* 289-306.

Sultana, A., Irum, S., Ahmed, K., & Mehmood, N. (2012). Impact of training on employee performance: a study of telecommunication sector in Pakistan. *Interdisciplinary Journal of Contemporary Research in Business, 4 (6).*

Szeląg-Sikora, A., & Cupiał, M. (2015). Productivity of Farms in the Aspect of Various Activity Forms. *Agriculture and Agricultural Science Procedia*, *Volume 7*, 94–98.

Yakin, I., & Yildirim, S. (2016). Evaluating an electronic performance support system for crime scene investigation units in Turkey. *Information Development, 32 (4).*

Wolski, K., & Szymańska, M. (2013). *Branże narażone na wysoką fluktuację kadr*. Retrieved from http://www.rynekpracy.pl/artykul.php/typ.1/kategoria_glowna.8/wpis.646.

Wierzbicka, W. (2013). *Produktywność pracy przedsiębiorstw prywatnych w Polsce – ujęcie regionalne*, ZN UPH w Siedlcach, Seria: Administracja i Zarządzanie, nr 97.

Winslow, C. D., & Bramer, W. L. (1994). *FutureWork: Putting knowledge to work in the knowledge economy*. New York: The Free Press.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 283-292

APPLICATION OF SIMULATION MODELS FOR PROGRAMMING OF ROBOTS

Beata Jakubiec
Czestochowa University of Technology, Faculty of Electrical Engineering, Poland

Abstract. *In recent years, there has been an increasing robotization of many areas of life. This requires knowledge of issues related to robots and their programming. Devices of this type, especially large industrial or medical robots, are very expensive, or they may be hardly affordable for educational purposes. Simulation models are helpful in such situation. The aim of the article is to present the possibilities of using simulation models of robots and robotic stations in the educational and research process. Specialized software packages make it easier not only to understand how robots work, but they also allow to test different operating conditions of the designed computer model of the real robotized process.*
Keywords: *programming, robot, simulation model.*

Introduction

In the last several years, a significant increase in robotization can be observed in many areas of life. Robots are used primarily in various branches of industry. Due to the benefits of their implementation in the industrial process, such as precision, repeatability, speed of operation, reliability and the ability to work in difficult conditions, they are being installed in plants not only by large corporations, but more and more often by medium and small manufacturing enterprises. These include, for example, palletizing, welding, assembly, painting and gluing robots. However, the range of robot applications is much wider. We can find them, among others, in medicine (medical telemanipulators, rehabilitation robots), uniformed services (mobile inspection robots, unmanned military vehicles), but also in everyday life as intelligent vacuum cleaners, lawnmowers, or even interactive toys. Such a dynamic development of robotics requires the inclusion of issues related to robots and their programming in the education of students, especially of technical faculties, to a lesser or greater extent, depending on their field of study. In the case of industrial robots, their programming is traditionally carried out using Teach Pendant. It is a device equipped with a screen and buttons connected to the robot controller. With its help, the operator can remotely control robot drives, change parameters and, primarily, program the sequence of robot movements using the appropriate commands (i.e. programming language). In each of these cases, however, it is

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3214

necessary to remove (exclude) the robot from the original process and to pay special attention when programming the robot movement, so as not to enter incorrect settings that could result in a malfunction of the robot. Moreover, devices of this type, especially large industrial or medical robots, are quite expensive or their availability for educational purposes is limited. This is where the simulation programs, in which the actual robotized system can be modeled, are helpful (Figure 1).

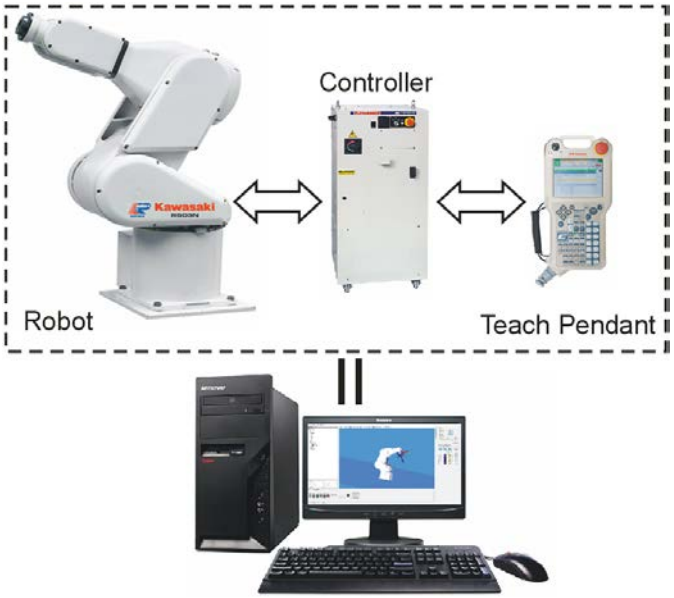


Fig. 1. **Robot workstation and computer with simulation software**

The aim of the article is presenting the purpose of using simulation models of robots and robotic stations in the design, teaching and research process. Specialized software packages make it not only easier to understand how robots work. They allow to prepare off-line control program for the analyzed robotized station, as well as to test various working conditions of the designed model of the actual process. In most cases, on-line feedback between the software and the robot is also possible. The usefulness of computer modeling and simulation, has already been confirmed in the teaching and research process in other engineering fields, and not just, as presented in publications, e.g. (Anderson, 2014; Grabust, 2017; Olesiak, 2017; Prauzner, 2016; Ptak, 2017).

Proprietary software of robot manufacturers

Currently, virtually every industrial robot supplier offers the possibility of programming and testing their robots off-line (i.e., outside of the production environment). Dedicated computer programs are used for this purpose. The offered environments are designed to create virtual 3D models of robotic stations

and to simulate their operation. Virtual robot programming environments are a great engineering tool used to modernize or design new robotic stations, including planning the robot motion trajectory, creating control programs using programming languages compatible with programming languages of real robots (also using virtual Teach Pendant), as well as optimizing the production process. Engineering staff as well as learners of robotics have the ability to quickly create a robotic station model on a PC and analyze its operation. Three-dimensional models of production cells are built using the included libraries with models of robots and their equipment (e.g. grippers, paint nozzles), and objects surrounding the robot (e.g. conveyors, tables, platforms, fences). Components of a robotic station can also be designed by the user himself/herself or imported from CAD environments. A list of selected manufacturers of robots, programming languages and programming and simulation environments is presented in Table 1.

Table 1 **Selected robot manufacturers, off-line programming softwares and robot programming languages**

Robot Brands	**Software**	**Programming Language**
Comau	RoboSim Pro	PDL2
Fanuc	RoboGuide	TP/Karel
Yaskawa-Motoman	MotoSim	Inform
ABB	ABB RobotStudio	RAPID
Kawasaki	K-Roset	AS
Nachi Fujikoshi	FD On Desk	Slim
Denso	WINCAPS III	PAC
Kuka	Kuka.Sim Pro	KRL
Mitsubishi	MELFA WORKS	MELFA BASIC

From the point of view of people learning how to use, program and create robotic production cells, access to libraries with sample workstation models, offered in some simulation packages, is helpful in the education. Figures 2 and 3 show examples of virtual robotic stations made using Kawasaki and Kuka software. A useful function offered in the software is also visualizing the displacement of the effector by drawing a trajectory of motion in the form of points or lines (Figure 2 and Figure 4).

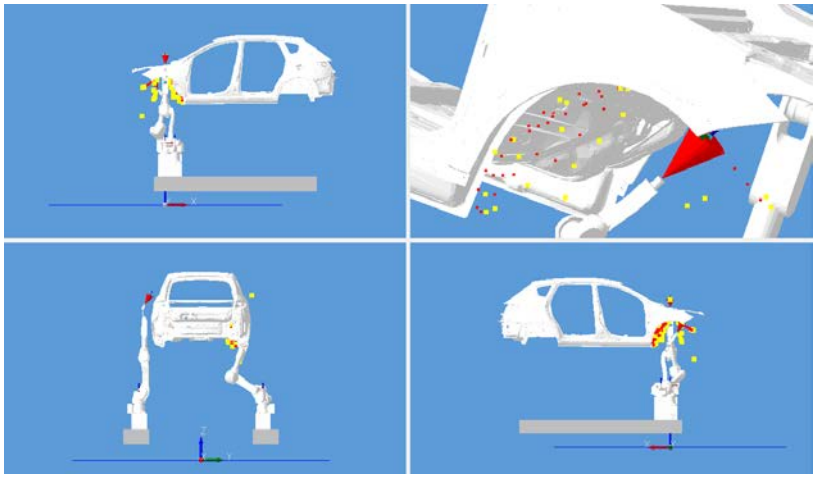


Fig. 2. **Virtual model of workstation realized in K-Roset** (Kawasaki, 2014)

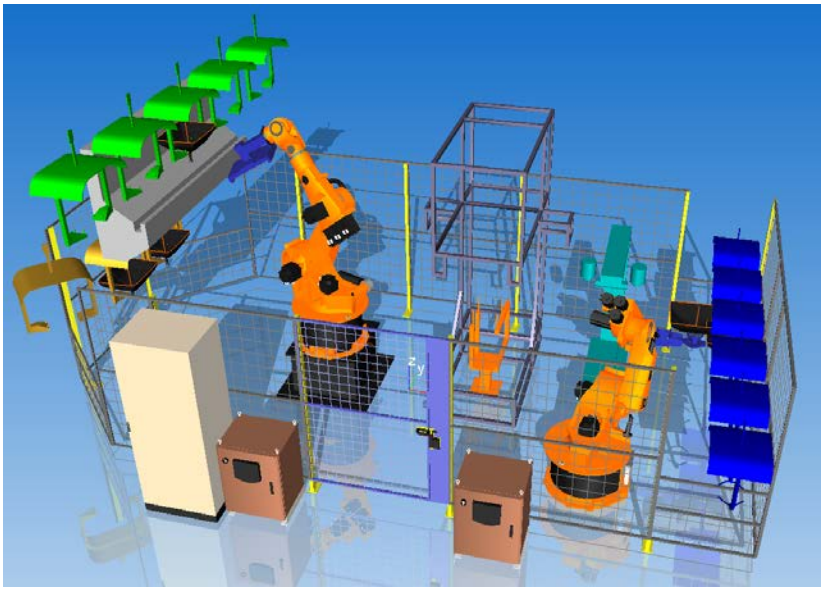


Fig. 3. **Virtual model of workstation realized in Kuka. Sim Pro** (KUKA, 2015)

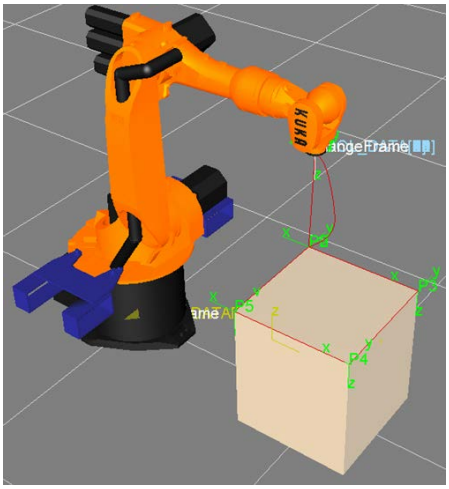


Fig. 4. **Visualization of trajectory in KUKA. Sim Pro**

Simulation programs have functions, either built-in or obtained by installing additional packages, thanks to which it is possible to reproduce the actual robotic manufacturing station, e.g. [Comau, 2018; Kawasaki, 2014; KUKA, 2015; Fanuc, 2016]:

- measurement of work cycles corresponding to the actual controller (controller emulator),
- collision detection,
- reproduction of the actual kinematics and dynamics of the robot,
- robot limit zones,
- tracking of conveyors and sensors,
- robot load identification.

Simulation tests of the analyzed system can be carried out not only virtually but also in real time. Thanks to this, after a robot program corresponding to the user's requirements is designed, it can be transferred to a physical robot controller, with the certainty of working properly in real production conditions. Figure 5 presents an example of a program for a virtual robot written in the K-Roset environment.

Program

	Program Name
1	pg1()

Step		Language
1	SPEED 50 always	AS language
2	ACCURACY 5 always	AS language
3	JMOVE #p001	AS language
4	LMOVE #p002	AS language
5	LMOVE #p003	AS language
6	LMOVE #p004	AS language
7	LMOVE #p005	AS language
8	LMOVE #p006	AS language
9	LMOVE #p007	AS language

	Program Name
2	pg2()
3	pg3()
4	pg4()
5	test()

Joint Value

	Name	JT1	JT2	JT3	JT4	JT5	JT6
1	#p001	0,000	1,557	-93,153	0,000	94,710	0,000
2	#p002	-48,036	49,452	-29,043	0,000	78,495	-48,036
3	#p003	-87,940	10,825	-83,079	0,000	93,905	-87,940
4	#p004	-0,011	-88,462	-133,914	0,000	45,453	-0,011
5	#p005	87,940	10,825	-83,078	0,000	93,904	87,940
6	#p006	48,036	49,452	-29,045	0,000	78,497	48,036
7	#p007	0,000	1,557	-93,153	0,000	94,711	0,000

Fig. 5. **Robot program written in AS Language developed with K-Roset**

Universal robot simulation and off-line programming environments

The second group of software are universal programs for modeling, simulating and analyzing the behavior of robots. Table 2 presents a list of several of them. Their advantage is that the user can build and test virtual models with robots of different manufacturers in the same environment. Some programs have libraries, which include not only industrial manipulators, but also driving, walking or flying robots – Figure 6. Ponadto z programów CAD mogą być importowane autorskie modele i komponenty. In addition, proprietary models and components can be imported from CAD programs. Unlike dedicated simulators, the virtual model is controlled using a script written in one of the languages, e.g. C/C++, LUA, Matlab, Octave, Python, depending on the environment. For programming industrial robots, prepared off-line programs, thanks to post processors implemented in virtual environments, are compiled to the basic robot programming languages. Thus, they are output into the form that is ready to be uploaded, thanks to the right drivers, to the controllers of real robots (Coppelia, 2016; Corke, 2016; Cyberbotics, 2018; MathWorks, 2017; RoboDK, 2017).

Table 2 **Exemplary of robot simulation and offline programming softwares**

Developers	**Software**	**Programming Language**
Coppelia Robotics	V-Rep	LUA
Cyberbotics	Webots	C++
MathWorks/ Peter Corke	Robotic Systems Toolbox/ Robotics Toolbox	MATLAB scripting language/ Octave GNU
OpenRAVE Community	OpenRAVE	C++, Python
Open Source Robotics Foundation	Gazebo	C++
RoboDK	RoboDK	Python

An interesting proposal is RoboDK, a software for off-line programming and simulation of industrial robots that is free to use for educational purposes. Its advantage is a large number of models of robots from various brands (currently over 200), detection of singularities and collisions, as well as being able to observe the position and orientation values of the tool and manipulator units during the simulation – Figures 7.

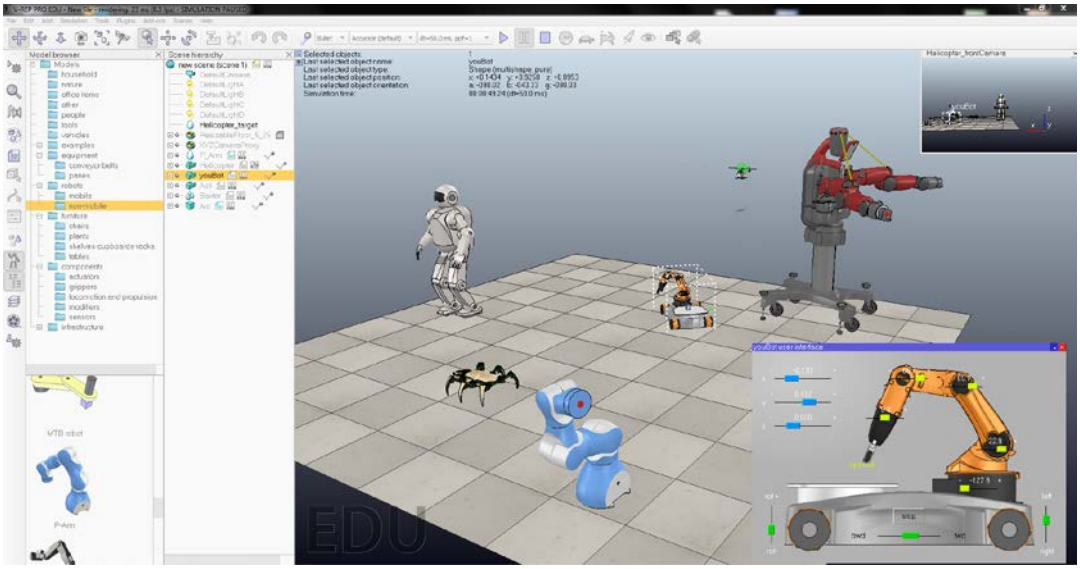


Fig. 6. **Simulation of robots in V-Rep software** (Coppelia, 2016)

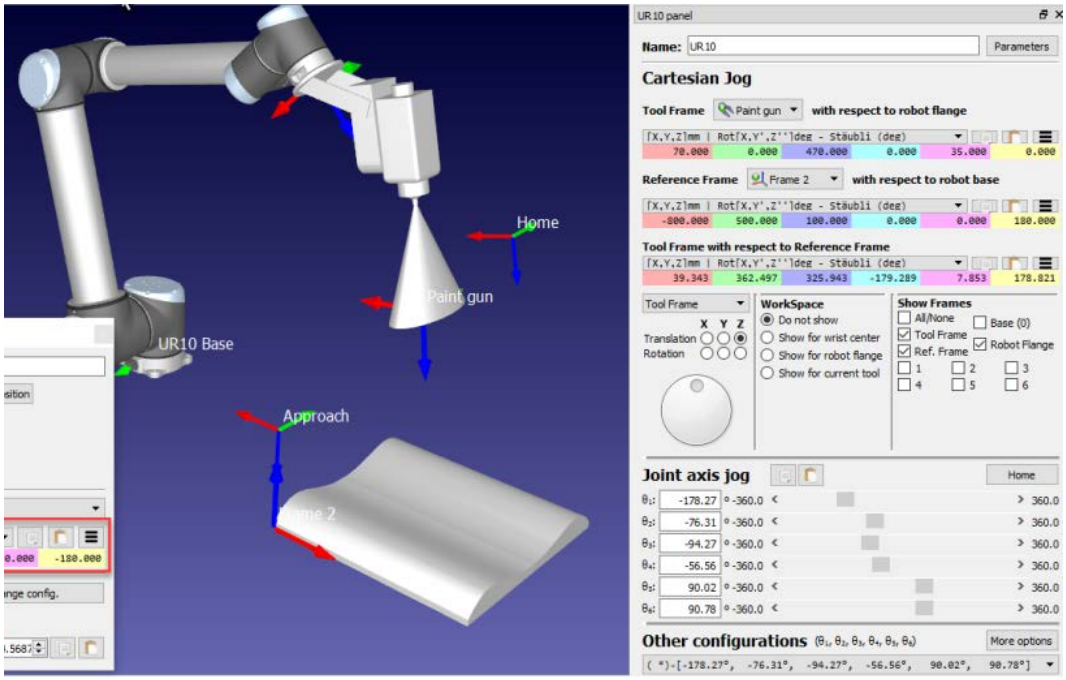


Fig. 7. **Simulation of industrial robot in RoboDK software** (RoboDK, 2017)

An interesting program, more in terms of research and science, is the Matlab software with two robotics toolboxes. The proprietary Robotic Systems Toolbox contains, among others, functions that enable conversion between various forms of rotation and translation, path planning algorithms, path tracking, map representations. It is designed for creating applications of autonomous robotic ground vehicles. It features communication interfaces for Matlab/Simulink and robots that support ROS or process visualization in graphic robot simulators, e.g. Gazebo (MathWorks, 2017). Robotics Toolbox developed by Peter Corke is a tool

with functions that show the mathematical foundations of robotics in the field of kinematics, dynamics and trajectory generation, including different versions of Denavit-Hartenberg parameters, reverse kinematics, motion equations, creation of trajectories in Cartesian space (Corke, 2016).

Educational robotics

Students, teenagers and children can also get in touch with the problems of robotics through play and entertainment. LEGO Mindstorm and VEX Robotics sets are perfect for this. These are sets of so-called smart bricks, which are an excellent tool for modern education in STEM disciplines (Science, Technology, Engineering, Mathematics). It allows building didactic robots, e.g. driving or walking robots, or programmable automatic machines. An interesting opportunity for learning how to create robotic systems using LEGO bricks is the Virtual Robotics Toolkit for LEGO Mindstorms simulation software (Cogmation, 2018). An example of a physical robot and a computer LEGO model is presented in Figure 8. This environment allows designing a robot thanks to the 3D model import, e.g. from LEGO Digital Designer, and then its programming and simulation. Thanks to the simulation, you can check the operation of the model, and possibly improve the functionality of the robot-toy before it is physically built. What is important is that programming of the virtual robot, that is its virtual intelligent brick, is done in the same language as the LEGO Mindstorm (NXT-G, EV3, LabVIEW for LEGO).

a) b)

Fig. 8. **LEGO Robot: a) real construct RAC3 Truck** (LEGO, 2017), **b) virtual model realized in Virtual Robotics Toolkit** (Cogmation, 2018)

Another example of a simulation environment created for educational sets is Robot Virtual Worlds. This software enables building, programming and testing virtual robots, not only LEGO, but also VEX – Figure 9. The programming of

models is done in the ROBOTC language. It is a C-based programming language with a real-time debugger. It is interesting because it allows the young user, in an accessible and pleasant way, to gain the ability to use programming language, as used in professional programming tools or for programming industrial devices by IT professionals and engineers. Robot Virtual Worlds also offers the possibility of computer programming of LEGO models in their own languages (Robomatter, 2017).

a) b)

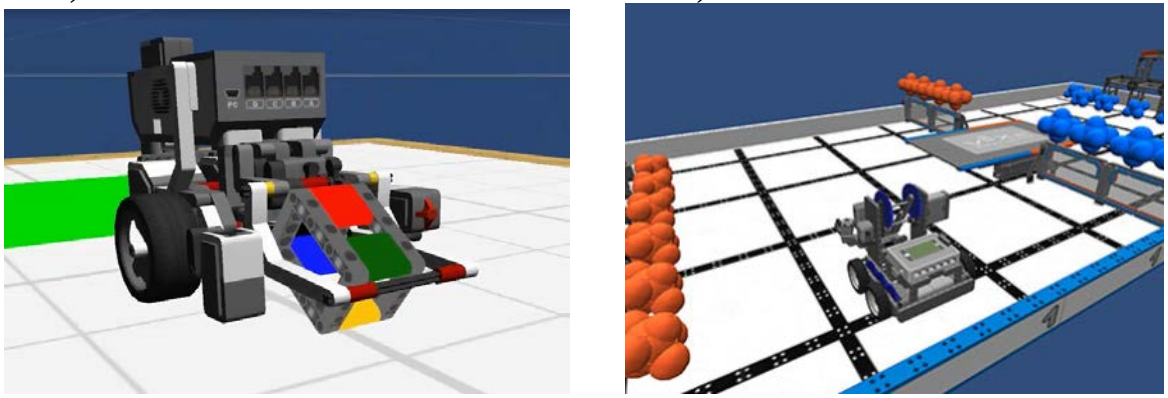


Fig. 9. **Robot Virtual Worlds software: a) LEGO robot virtual model**, **b) VEX robot virtual model** (Robomatter, 2017)

Conclusions

The high dynamics of robotics development affects the need to educate a larger number of students and specialists in this field. The use of virtual environments for programming of robots and simulation of their operation is ideal in the teaching and research process. It provides a safe way for conducting training on robot programming, learning the principles of designing robotic systems, even for inexperienced persons. Off-line programming, i.e. programming outside the production environment, eliminates the production downtime caused by the robot being taken out from the process. The functionality of the simulators allows for quick development of the production station model, optimization of the solution and enables to eliminate most errors occurring at the design stage and in practical implementation. The wide range of simulation environments also includes programs that enable conducting advanced scientific research, modeling and testing of complex robot control algorithms. An early technical education for children and adolescents through their contact with software for designing and simulating toy-robots is certainly a very good stimulus for logical thinking and it encourages further development of interests in this direction.

References

Anderson, K. (2014). *Design Energy Simulation for Architects: Guide to 3D Graphics*. Routledge.

Cogmation (2018). *Virtual Robotics Toolkit for LEGO Mindstorms* Retrieved from https://www.virtualroboticstoolkit.com

Comau (2018). *RoboSim Pro software* Retrieved from www.comau.com

Coppelia (2016). *V-REP PRO EDU* Retrieved from www.coppeliarobotics.com

Corke, P. (2016). *Robotics Toolbox* Retrieved from petercorke.com/wordpress/

Cyberbotics (2018). *Webots software* Retrieved from https://www.cyberbotics.com

Fanuc (2016). *ROBOGUIDE software* Retrieved from www.fanuc.eu

Grabusts, P. (2017). Simulation modelling possibilities in teaching economic processes. *Society, Integration, Education, Proceedings of the International Scientific Conference. Volume III, May 26th-27th 2017*, 463-471.

Robomatter (2017). *Robot Virtual Worlds software* Retrieved from www.robotvirtual worlds.com

Kawasaki (2014). *K-ROSET software* Retrieved from https://robotics.kawasaki.com

KUKA (2015). *KUKA.Sim Pro software* Retrieved from https://www.kuka.com

LEGO (2017). Retrieved from https://www.lego.com

MathWorks (2017). *Robotic Systems Toolbox* Retrieved from https://www.mathworks.com

Olesiak, K. (2017). Application of fuzzy logic toolbox for modelling fuzzy logic controllers. *Society, Integration, Education, Proceedings of the International Scientific Conference. Volume III, May 26th-27th 2017*, 539-546.

Prauzner, T. (2016). Interactive computer simulation as a response to contemporary problems of technical education. *Society. Integration. Education, Proceedings of the International Scientific Conference. Volume II, May 27th – 28th 201*6, 579-588.

Ptak, P. (2017). Application of computer programmes in research projects and teaching. *Society, Integration, Education, Proceedings of the International Scientific Conference. Volume III, May 26th-27th 2017*, 565-574.

Robo, D. K. (2017). *RoboDK software* Retrieved from https://robodk.com

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 293-303

COMPARISON OF THE NATIONAL DIAGNOSTIC PAPER-BASED AND ONLINE TESTS IN NATURAL SCIENCE

Loreta Juškaite
Riga Technical University, Latvia

Abstract. *In 2016/2017 Latvian schools were offered the opportunity to choose how to organize the diagnostic test – paper-based or Online. Online tests modernize and facilitate the assessment and analysis process, as well as ensure sustainable elaboration of diagnostic tests and their customization to the new STEM model requirements. The analysis of the results enables the search for new approaches and methods, for new information systems and technologies in order to enhance certain skills, abilities and attitudes. What is the difference between the results obtained fulfilling tasks in paper-based and online tests? Are there any differences among different ages when conducting paper-based and online tests? The natural science test was conducted among pupils of the 6th grade (11-13 years old). The aim to examine whether the traditional paper-based tests are applicable in a different environment (in an e-environment Online test), whilst maintaining its theoretical and technical specific features and is to focus on the sustainable development of activities in order to improve the quality of education in STEM subjects, which includes using innovative methods in the Latvian educational context.*
Keywords: *Cognitive activity level, Skills, National Diagnostic Test, Online test, Information Communication Technologies (ICT).*

Introduction

A National diagnostic (ND) test is one of the diagnostics tools used to ascertain students' basic skills acquisition on finishing a certain level of education according to the national education standards and the subject curriculum requirements. (Requirements of the Cabinet of Ministers Regulations Nr. 468, 2014) In order to get valid and reliable data the participation of educational institutions from all regions of the country and all types of educational institutions as well is necessary. Should ND tests proceed the traditional way or are there major changes needed? The aim of ND and standardized tests is to find out students' basic skills acquisition on finishing a certain level of education according to the national education standards and the subject curriculum requirements, as well as to enable local authorities, schools, teachers and students to independently and objectively evaluate learning achievements, obtaining detailed feedback in order to evaluate the results and to improve the learning

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3438

process. Is this process worth implementation in an era when computer and e-environment became a familiar source of information for many young people and should National diagnostic tests be conducted only in an e-environment? (Kapenieks et al., 2003)

In 2016/2017 Latvian schools were offered the opportunity to choose how to organize the diagnostic test – paper-based or Online. In order to obtain valid and reliable data it was important to involve educational institutions if possible from all regions of the country, as well as all types of educational institutions. The technical support of the online diagnostic tests provided the portal uzdevumi.lv. This made it possible to research whether traditional Paper-based diagnostic tests can be conducted in a digital form Online, thus promoting the use of innovative ICT to examine students' knowledge. According to the collected data, different types of educational institutions from virtually all regions of the country were represented. In the analysis diagnostic tests performances of 16305 students were used (VISC statistika, 2017).

The research problem – if a diagnostic tool created in a traditional way for the Paper-based environment is applicable in a different environment (in Online), whilst maintaining its theoretical and technical specific features and ensuring consistent and comparable measurement of results.

The research objectives– to justify the adaptation of diagnostic tools created in a traditional environment in the Latvian educational context.

Research methods:

1) analysis of scientific literature;
2) descriptive statistics and dependency analysis were used to process the data.

The analysis of the research data was carried out using Classical Test Theory (CTT) and Test Analysis Program ITEMAN™ for Windows Version 3.50. The charts and tables were created using MS Excel.

The situation in the Latvian Education System and Education Development Guidelines

A global education survey of the OECD PISA1 2006, 2009, 2012 and 2107 results show that in Latvia there are a relatively small proportion of students with high achievements in reading, mathematics and science, and that number continues to decline. This should be viewed as a negative factor for the further development of the economy. In the information report of the Ministry of Education and Science "The planned courses of action and measures for improvement of learning and teaching quality in mathematics, sciences and engineering and for increasing the amount of trained specialists" it is stated that the most important aspect is the improvement of students' reading literacy,

mathematics and science competencies, ensuring the achievement of the goals declared in the Latvian National Development Plan 2014 – 020 (lowest level of reading literacy in 2017 – 15 %, in 2020 – 13 %). (Requirements of the Cabinet of Ministers Regulations Nr. 281, 2013) Education Development Guidelines for 2014 - 2020 specify the percentage increase in reading literacy, mathematics and science from 4.2 %, 8 % and 4 % in 2012 to 7 %, 8 % and 8 % in 2020 among the students with high educational achievements (OECD PISA Level 5 and Level 6). (Eurydice ziņojums, 2014) According to the OECD PISA scale in science for 2015, students who have reached the competence level 6 in science are able to use content, procedural and epistemic knowledge to consistently provide explanations, evaluate and design scientific enquiries and interpret data in a variety of complex life situations that require a high level of cognitive demand (LR Saeima, 2010). They can draw appropriate inferences from a range of different complex data sources, in a variety of contexts and provide explanations of multi-step causal relationships (Geske & Grīnfelds, 2006). They can consistently distinguish scientific and non-scientific questions, explain the purposes of enquiry, and control relevant variables in a given scientific enquiry or any experimental design of their own. They can transform data representations, interpret complex data and demonstrate an ability to make appropriate judgments about the reliability and accuracy of any scientific claims. At this level students consistently demonstrate advanced scientific thinking and reasoning requiring the use of models and abstract ideas and use such reasoning in unfamiliar and complex situations. They can develop arguments to critique and evaluate explanations, models, interpretations of data and proposed experimental designs in a range of personal, local and global contexts. (Geske, Grīnfelds, Kangro, & Kiseļova, 2016)

Materials and methods

Classical Test Theory

For data analysis a classical measurement procedure was used, which is based on the Classical Test Theory (CTT). Classical Test (CT) analysis is a tool to measuring individual differences. CTT introduces three basic measurement concepts (Attali & Tamar, 2000):

- Test score or observed score;
- True score;
- Error score.

CT analysis postulates linking the observed test score (X) to the sum of the true score (latent unobservable score) and error score: X = T + E. The following assumptions underlie CTT (Ballantyne, 2000):

- True scores and error scores are uncorrelated;

- The average error score in the population of examinees is zero;
- Error scores on parallel tests are uncorrelated.

Test Analysis Program

Results were obtained analysing the diagnostic tests with ITEMAN Test Analysis Program ITEMAN™ for Windows Version 3.50. The ITEMAN software program analyses multiple-choice questions and can also compute and record test scores. The offers four statistical measures:

- Ease Index (called —Proportion Correct”);
- Discrimination Index;
- Biserial;
- Point Biserial Correlation Coefficients.

ITEMAN requires that the input data file be formatted in ASCII (text-only) files. Most data files produced by optical scanning devices are very close to the format that ITEMAN requires, with the exception of the four lines that must be added at the beginning. 5 These lines contain the control line, the key, number of alternatives, etc. The program can process up to a 750-item test with unlimited number of students (Kehoe, 2005).

The user can also manually generate a data file using the edit menu in ITEMAN, which is similar to Windows’ Notepad program. ITEMAN‘s controls are few in number and very simple to use. ITEMAN produces an output file, score file (if desired) and statistics file (if desired). The output file contains the statistical measures, and displays them not only for each question, but for each alternative as well. ITEMAN is a very user-friendly program partly because it has so few controls and only one output file. The ITEMAN program is specifically designed for item analysis only. ITEMAN is easier and faster to use (ITEMAN Online Manual, 2005).

Description of the diagnostic test

Diagnostic tests contain tasks to examine knowledge and skills, the acquisition of which is required for the successful continuation of education. The paper based test is composed of two variants. Online diagnostic test’s tasks are mixed. The testing time of both formats – 40 minutes (VISC, 2017).

The ND test is composed of one variant and consists of 24 multiple-choice tasks and 6 open questions. Students have to choose one correct answer from four options (1- 24 tasks). Should answer the question in writing (25- 30) Task content is selected according to a certain level of the mandatory learning content in natural science. In order to assess students’ achievements, the test contains tasks with different difficulty and cognitive levels, the content of which relatively covers all aspects contained in the education curriculum in natural science (s. Table 1) (VISC uzdevumi, 2017).

First-level cognitive activity tasks correspond to one step of the operation or procedure. For example, the student remembers the concepts, definitions, units, interconnections or principles, recognizes characteristics, devices or processes. Second-level cognitive activity tasks focus on phenomena and understanding of processes usage. Whereas third-level cognitive activity tasks make it possible to examine students' ability to analyse the application of natural science knowledge in non-standard situations. Task content is selected according to real-life situations which they might face in everyday life and would be able to deal with them successfully.

Table 1 **The proportion of topics in diagnostic test**

Curriculum topics	**Cognitive levels %**			***Total***
	Memorization and understanding	***Usage of knowledge and skills***	***Analysis and productive activity***	
Organisms and life processes.	11	12	3	26
Earth and its place in the Universe.	5	6	3	14
Substances and materials.	10	11	4	25
Physical processes.	7	13	3	23
Environment.	6	4	2	12
Total %	39	46	15	100

Research analyses and findings

The amount of participants in total was large enough (s. Table2)

Table 2 **The table captions should be placed above the table**

	The number of students	***Percentage***
Online tests	5794	35,5 %
Paper-based tests	10511	64 %
Total	16305	

The following factors that have impact upon the quality of Online tests be grouped into three essential groups:

- First-level cognitive activity tasks;
- Second-level cognitive activity tasks;
- Third-level cognitive activity tasks.

This research analyses the achievements of students on the basis of their skills and cognitive level. After compiling and processing results it was analysed.

A diagram (s. Fig. 1 and Fig. 2) clearly shows none of the students could fulfil all the tasks correctly. The average task performance in the country was about 64.91 %. Analysis of students' achievements based on their cognitive activity levels (s. Table 1) shows that the students have managed tasks better in general, which require the ability to apply knowledge and skills in various familiar situations.

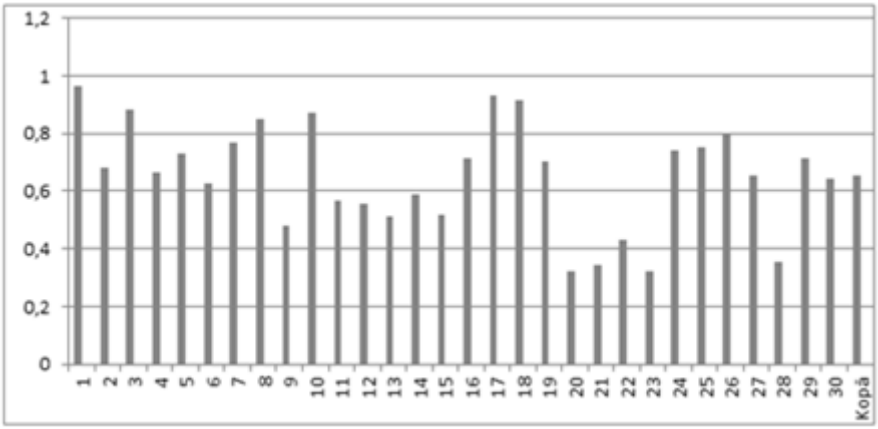


Figure 1. **The results (Paper- based tests)**

The range of task results Online tests test is slightly higher than the Paper-based tests (s. Fig. 1 and Fig. 2).

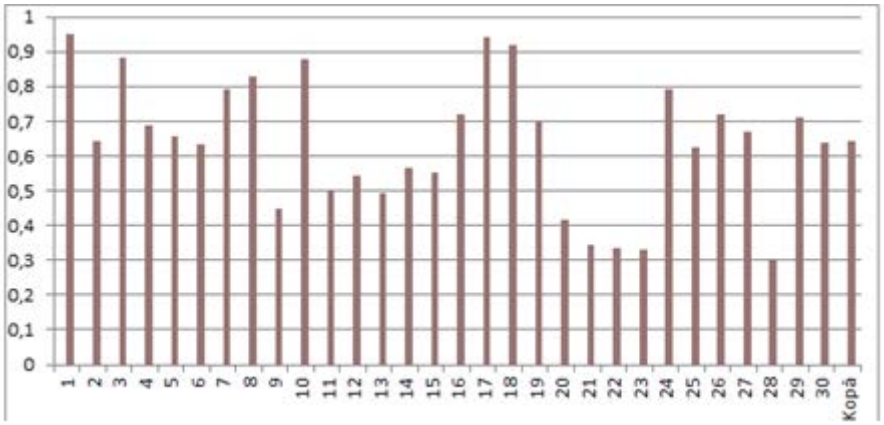


Figure 2. **The results (Online tests)**

ND test results do not show convincing correlation to speak about the insufficient acquirement of a particular skill or particular curriculum aspect. In each curriculum aspect the average task performance score is 40-60 % which is higher than the average score in the whole diagnostic test (s. Fig. 3). It means that the proportion of relatively easy and difficult tasks in the (Online and Paper - based) ND test was about the same. At least 70 % of students provided correct answers to the relatively easy six tasks 1, 3, 8, 9, 17 and 18 which is 17 % of all

tasks in the test. Students' performance in four tasks 9, 21, 23 and 28 or in 11 % of all tasks was lower than 20 %, while the three tasks 16, 26 and 29 were successfully managed by 30 – 40 % of students. This shows that students cope quite successfully with standard/typical tasks, but have difficulties with tasks which require high thinking skills and logical reasoning. 22 tasks or nearly 63 % of all diagnostic test tasks are classified as tasks at medium difficulty level because 40 – 70 % of students managed them successfully.

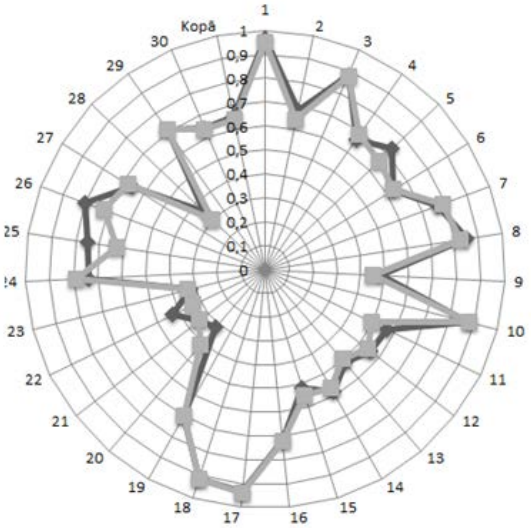


Figure 3. **The average results**

For comparison: in Paper-based test there were 8 tasks which were answered correctly by more than 70 % of students; there were 2 tasks which were fulfilled correctly by less than 20 % of students. At the same time, 18 tasks were classified as medium difficult tasks, because 40-70 % of students answered them correctly (s. Fig. 3).

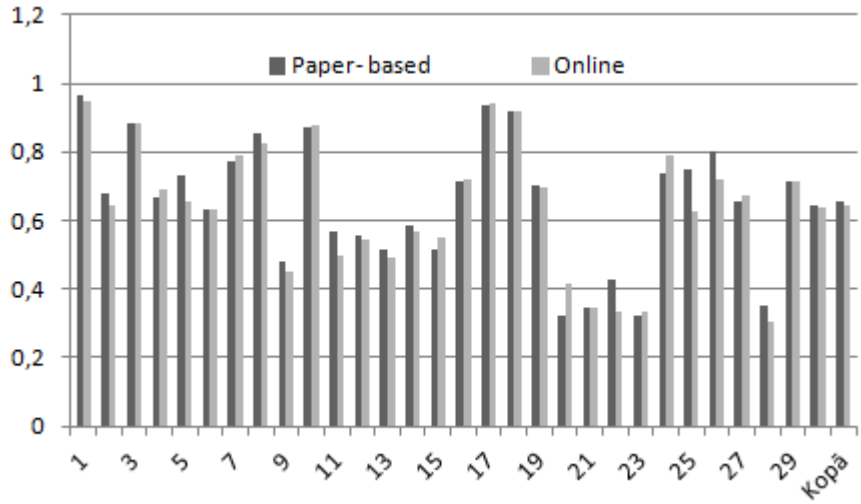


Figure 4. **Comparison of the data collected assessing Paper- based tests and Online tests**

This allows us to conclude that the proportion of easy, medium and difficult tasks in Online and Paper-based was similar. The result of level 2 cognitive activity tasks – 54 %. This result indicates that almost half of the 6th grade students have insufficient knowledge in the basic education course in natural science. Students are not used to struggling with problems and devising a solution, as well as analysing and coming to the correct answer. Students who conducted the diagnostic test online needed around 32 minutes, although the available test performance time is 40 minutes. Data analysis showed that 1 % of students did not mark any option or marked more than one option in one of eight level 1 cognitive tasks and in twelve out of 2 and 3 level tasks. This suggests that these students were not were confident in their responses, and/or upon completion of the test, forgot to return to the unfinished tasks (in online test). The result of conducting level 1 cognitive activity task compared to the Paper-based test on average decreased by 10 %. Many students were not able to recall and recognize acquired natural science language elements - concepts and units, or to recognize their symbols etc., or they had misconceptions about them. On formal evaluation it is clear that there was an improvement in the results of level 3 cognitive tasks when students had to deal with an unfamiliar situation, analyse it and provide an answer to the question formulated in the task. Author need to admit that using multiple-choice tasks makes it impossible to objectively evaluate students' creative action skills. In addition, responding to 3 from 4 tasks of cognitive level 3 tasks, 1 % of students had not marked any option or in contrast marked several options (in Paper-based test).

A large proportion of students relied on their own everyday-life experience when conducting some tasks, which led them to wrong conclusions. It is also possible that many students did not read the task instructions attentively enough and did not properly analyse every option in the multiple-choice tasks. It should be emphasized that a number of researchers (Geske et al., 2016) admit that the main difficulties in teaching natural science, and particularly physics, lies in a conceptual change of students' perception and understanding of the world, meaning, to promote a scientific vision of the world, which is often different from students' daily-life experience or naive perceptions. In this connection, teachers are recommended to try out some unconventional methodological techniques. For example, education researcher Brown (Geske et al., 2016) recommends using examples that are closer to students' perception and understanding in the learning process, so that by analysing such examples students will come to new and more general conclusions, which will replace their misconceptions. (Muhammad Anwar, 2013*)* The researcher points to the need, when analysing a new situation, to encourage students to find similarities with the known and familiar "transfer" this knowledge to the new situation and to create visual models. It should be especially noted that in the performances of a number of tasks it is apparent that

the choice of wrong answer differs less than 2 times. This indicates that a large proportion of students did not properly analyse the task. This tendency was observed in tasks which examined students' scientific enquiry skills to use models and interpret natural science processes. Evaluating the six tasks' performance which contained unusual situations for students which they had to analyse in order to relate the data in the task with the acquired knowledge in natural science – synthesize – and choose the most appropriate option, author can conclude that these higher level thinking skills are possessed by less than 45 % of students. Choosing one of the three incorrect multiple-choice options (distractors), a higher percentage of students often chose answer A or B. It is clearly discernible in 28 task, or 80 % of incorrect option choices and it shows that a large proportion of students, mostly with low achievements level, conducted the tasks without having read them properly and did not analyse all the options offered in the tasks.

Conclusion

Research and analysis carried out for the purposes justify the claim is topical for the general public and useful for knowledge sharing and promotion of trilateral cooperation (National Centre for Education, Latvian Secondary Schools, and Teachers). Since the schools volunteered to conduct the National diagnostic tests, the results only partially reflect 6th grade students' achievements in natural science. ND Online/Computer- based tests innovative IT to examine students' knowledge in the Latvian educational context.

The amount of participants in total was large enough (N = 16305) to draw objective conclusions about students' knowledge and skills, as well as about their weak and strong sides on standard requirements acquisition in natural science at a basic education level. That also shows that there is no significant difference between the results gained from Online test and Paper-based National diagnostic tests. After analysis of the results it can be concluded that students have acquired the most important concepts in natural science - units, research enquiry steps and the ability to reproduce them. There is no significant difference between level 1 cognitive activity task performances Online test and in the traditional Paper-based form.

The main difficulties for students occur in understanding natural science processes, and in analysing and synthesizing a variety of topics using acquired knowledge and skills; this means solving tasks which require the use of acquired knowledge in real life situations and performing higher cognitive activities - analysis and synthesis. There are significant differences in the results comparing Online performances and traditional paper-based performances of the tasks 6, 7, 11, 20, 22 and 24 - on average 8 %. The author can assume that this is due to the students' attitude and the lack of motivation to read the text carefully. In an e-

environment the students had better results in the tasks which included graphical information. Although the tasks' performances in an Online no compelling correlations were observed which would prove that examining a particular skill or curriculum aspect would have had essentially different results. Assessing students' achievements on their cognitive activity level or any other criteria there is no statistically significant difference.

Recommendations:

That implementation and development of Online testing technologies and pursuit of their quality cannot be an end in itself. (Juškaite, 2017)

Using a blended strategy of national diagnostic development creates more possibilities to avoid mistakes, waste time and material resources and achieve better measuring students' learning achievements results. Automatic test assessment and data transfer to the National Centre for Education. Saving of time and school resources. At the same time Online tests modernize and facilitate the assessment and analysis process, as well as ensure sustainable elaboration of diagnostic tests and their customization to the new STEM model requirements.

References

Attali, Y., & Tamar, F. (2000). *The Point-Biserial as a Discrimination Index for Distractors in Multiple-Choice Items: Deficiencies in Usage and an Alternative. Journal of Educational Measurement, 37*, 77-86.

Ballantyne, C. (2000). *Multiple-Choice Tests: Test Scoring and Analysis* Retrieved from http://cleo.murdoch.edu.au/evaluations/pubs/mcq/scpre.html

Cābelis, A. (2016). *Metodiskais materiāls.* R., Valsts izglītības satura centrs.

Eurydice ziņojums (2014). *Galveno kompetenču pilnveide Eiropas skolās: rīcībpolitikas uzdevumi un iespējas*. Retrieved from http://www.viaa.gov.lv/files/news/13703/viaa_galveno_kompetenchu_pilveide_13_10_2014_fin.pdf

European Commission. ziņojums *Europe 2020*. (2017). Retrieved from http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/targets/index_lv.htm, 2013

Geske, A., & Grīnfelds, A (2006). *Izglītības pētniecība.* Rīga, LU Akadēmiskais apgād.

Geske, A., Grīnfelds, A., Kangro, A., & Kiseļova, R, (2016). *Latvija OECD Starptautiskajā skolēnu novērtēšanas programmā 2016 – pirmie rezultāti un secinājumi.* Rīga, LU Pedagoģijas, psiholoģijas un mākslas fakultātes Izglītības pētniecības institūts.

Juškaite, L. (2017). Analysis of the National diagnostic paper-based and online tests in Physic. *ICCMIT 2017, Warsava conference materials*, 61- 62.

Kapenieks, A., Zuga, B., Slaidins, I., Vanaga, I., Tomsons, Dz., Kukuka, A., Ulmane-Ozoliņa, A., Rozenbergs, V., & Škute, A. (2003). University Cooperation in Knowledge Society: Modelling in Latvia. *Ventspils: proceedings of international IT conference*, 7- 8.

Kehoe, J. (2005). *ITEMAN Online Manual. Assessment Systems Corporation. Basic Item Analysis for Multiple-Choice Tests.* Retrieved from http://www.assess.com.

Latvijas Republikas tiesību akti. Retrieved from http://likumi.lv/doc.php?id=20243; http://likumi.lv/ta/id/282340-grozijumi-izglitibas-likuma;

LR Saeima (2010). *Ilgtspējīgas attīstības stratēģija līdz 2030. gadam*. Retrieved from http://likumi.lv/doc.php?id=257229#piel27&pd=1

Muhammad, A., Rehman, P., & Shaheen, P. (2013). Missing Elements of Computer Science Curricula. *Global Journal of Computer Science and Technology Cloud & Distributed, 12 (11)*.

Requirements of the Cabinet of Ministers Regulations Nr. 468 "Regulations on the national education curriculum, education subject curriculum and education subject programs" of the 12 August 2014 (Annex 8) Retrieved from https://likumi.lv/doc.php?id=268342

VISC, eksāmeni, info 2017 (2017.01.17.) Retrieved from http://visc.gov.lv/vispizglitiba/eksameni/info_old.shtml

VISC, eksāmeni, statistika 2017 Internetā (2017.01.08.) Retrieved from http://visc.gov.lv/vispizglitiba/eksameni/statistika/2017/dokumenti/06kl.

Uzdevumi.lv (2017). *Informacija medijiem, 2017. g. 15. marts* Retrieved from http://www.uzdevumi.lv

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 304-314

COMMON FACETS OF MUSEUM VIRTUAL SELF-PRESENTATION: EXPERIMENTING WITH INTERACTIVE IMAGE AND TEXT

Judita Kasperiuniene

Odeta Norkute
Vytautas Magnus University, Lithuania

Abstract. *In the modern world, all the museums, especially science and technology centers, seek transforming from storages of valuable historical objects to the knowledge exchange and construction places. This study aims to research official sites and social media channels of twenty European science and technology museums in order to understand how the virtual museum self-presentation is done. Using thematic analysis five common facets of the science and technology museum official site were coded: i) site interoperability; ii) home page; iii) first ten news; iv) science and education activities; v) information "about us". All the data were anonymized. The study showed two contradicted science and technology museum virtual self-presentation behavior styles: orientation "Museum as a storage" and orientation "Visitor as a creator". Researching how science and technology museums experimented with interactive image and text in their official web pages, museum social media site follower responses and museum ratings in social media, we expanded The Museum Visitor Experience Model with insights how the virtual self-presentation could help attracting museum visitors.*
Keywords: *museum website, science and technology museum, thematic analysis, virtual museum self-presentation, visitors experience.*

Introduction

Any museum can be described as a repository of history, art or science collections, some of which are publicly available. The science museum presents historical and contemporary scholar facts and phenomena in its collections. Although it was not always true, most museums exist in order to attract and serve visitors (Falk, 2016). Because of this, most of the museums advertise themselves and their collections online. The most common museum advertisement is self-presentation through the main internet page. Contemporary museums also present themselves through the social media: *Facebook*, *Youtube*, *Instagram* and other channels.

Museum visual challenges for the online provision of modern and contemporary art collections in US, Germany and Great Britain were studied by Neumann (2016). In her qualitative research of museum visitors and selected

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3141

webpages of the online collections, Neumann (2016) found the primary new visual challenges of art presentation. New visual challenges were in particular influenced by the internet and social media technological capabilities. Functions of the physical museum with slight adjustments could be applicable to the online museum space. Text and image is still important in virtual representation of the museum, but online presentment of information could be done using multi and hyper medium WWW and internet. Rather not all museum collections can be displayed on a virtual basis. Some specific works, especially art pieces or music production, need specific installation, room environment or layout. The multi-layered structure of multimedia allows continuous change, improvement and interlinking structures of online collections, information and resources. It requires constant renewal of the museum's virtual exhibits and the provision of information support to museum visitors. Virtual museum visitors need to feel that they are welcomed to see collections (Neumann, 2016).

A contemporary museum can be studied from three perspectives: i) the exploded museum's environments; ii) visitors' interaction and learning with mobile technologies; iii) design of mobile digital experiences (Atkins, 2009). Researching the exploded museum environments Samis (2008) found that in a contemporary world, museum activities start then person begins to think about it before the visit and continues in its visitors' imagination even after the end of physical museum walls.

Falk & Dierking (2008) in their study of different museum visitor groups experiences found that the museum is attractive to the person when it presents materials differently to different age groups; allows visitors to be able to personally connect and interact with the objects, ideas and experiences provided by museum; these experiences need to be shared with peers; new media and technology used. The museum presents itself as process and product in overlapping personal, sociocultural and physical contexts. Personal context include museum visitor motivations, expectations, prior knowledge and experience; choices and control mechanisms. Sociocultural context cover cultural background; within and outside group social mediation. Physical context embody physical space, place, design, as well as technology, events and experiences inside and outside the museum (Falk & Dierking, 2008). These three overlapping contexts represent the museum learning and personal knowledge construction complexity.

In their further research Falk & Dierking (2016) expanded the contextual model of learning in a museum with the visitor's profile and the individual's identity-related museum visit motivations. Mobile digital experiences help support knowledge creation in encounters with museum artefacts and stories (Charitonos et al., 2012). Museums could use internet, social media and mobile

technologies to virtually present its activities end expositions. These virtual expositions could be seen before the live museum visit.

This study aims at: i) finding common facets of museum self-presentation in internet and social media channels; ii) investigating how science and technology museum attracts its visitors through virtual presentations of its collections, exhibitions, events and learning activities; iii) researching how museum self-presentation influence future visits.

Methods. We used the *Museum Visitor Experience model* (Falk, 2016) as theoretical background and thematic analysis (Boyatzis, 1998) for empirical research. Scientists agree that facilitating the visitor's knowledge construction is key to introducing new technologies in museums (Charitonos et al., 2012; Kaptelinin, 2011). In this study, researching the museum virtual self-presentation, we examined one of the components of contextual model of learning in a museum (Falk & Dierking, 2016) – the component called "before the visit". We looked to the museum from the outside perspective and explored it from the point of a potential visitor (adult learner and family member).

Data collection. We studied webpages and *Facebook* pages of 20 science and technology museums. Territorially, museums have been scattered across Europe. We researched one huge (more than 1 million *Facebook* page followers) museum, national country museums (from 10.000 to 200.000 followers) and regional museums (approximately 3.000-4.000 followers). We dropped out the museums that did not created the museum *Facebook* page.

Data analysis. We used thematic analysis as data analysis method. Firstly, we qualitatively coded the information from five parts of science and technology museum official website: i) site interoperability; ii) home page; iii) first ten news; iv) science and education activities; v) information "about us".

Secondly, we developed codes and themes from museum social media (*Facebook*): i) we collected *Facebook* social network data about the museum social media page followers, reviews, likes, and social media site ratings; ii) we collected 1 year review texts. All these data were freely available online without the password protection.

The research data were anonymized and the abbreviations created.

We applied the constructivism paradigm which stated what knowledge is socially constructed and may change in different situations and depending on different circumstances. To support the rigor of data analysis we used secondary analysis of social media and qualitative data performed by another researcher and wrote thematic analysis memos (Morse et al., 2002). For the research credibility we discussed the question how congruent the findings are (Shenton, 2004).

Findings: museum self-presentation in internet and social media

Findings showed how the European science and technology museum presents itself online. Firstly we examined the museum home page and found that most museums uploaded information to social media sites. The most popular social media site where museum operated was *Facebook*. Therefore, we analyzed not only websites but also the provision of information on social networks.

Interoperability of any internet page is typically defined as the ability of systems or components to exchange and use information. Explaining the ideas of interoperability, Miller (2000) defined that to be interoperable,

> … *One should actively be engaged in the ongoing process of ensuring that the systems, procedures and culture of an organization are managed in such a way as to maximize opportunities for exchange and re-use of information, whether internally or externally.*

We found that almost all the science and technology museum websites (except one) meet the interoperability requirements. It showed that museum websites are up-to-date and technically adapted to various devices (including smart phones). It can be assumed that the interoperability solutions of museum websites contributed to the attraction of the museum visitors, since it was possible to easily view website information. For information viewing, a stationary workplace (computer) becomes unnecessary.

The science and technology museum home page provided information in national language (few sentences or paragraphs to catch the visitor) with short summary in English. Only a few museums based in non-English speaking countries provided sufficient details in English on the home page and on deeper pages. This let us guess that science and technology museums were oriented towards a national visitor. The information and texts of the first page of the museum were adapted for an adult visitors (for parents, family, and teachers). This suggested that museums expected information from their site to be most often read by adults who make decisions about visiting museums. Not all museums used multimedia solutions for self- presentation. We found museums' websites with lack of interactive information. In some websites only texts and photos were provided, there were no additional references, video materials, interactivity elements. Such disadvantages have been noted in several museums. Inclusion of these elements to the portal would indicate that the science and technology museum is modern. Most of the museums on their first pages featured hot museum video news, 360 panoramic exhibitions, and promoted interactive workshops.

Our findings showed that museum in many cases did not payed attention to news in their portal. The "*first ten news*" section of the portal is not often updated. Here the information on exhibitions, short and long-term events was provided. Hot museum information moved to social media.

In contrast to the news section, the information "*about us*" on all of the museums' websites was detailed. Here we found addresses, maps, links and texts how to find museums, and the museum's working times. We found, that each museum considered "*about us*" part of the portal to be an essential part of museum's self-presentation.

Table 1 **Comparison of science and technology museum social media followers and ratings (n=20)**

No	*mu-seum*	*fol-lowers*	*Ratio (stars)*					*Re-views*	*% of all fol-lowers*	*% of 5 star reviews*	*ratio*
			5	*4*	*3*	*2*	*1*				
1	SCA	24850	2000	336	141	32	22	2500	10,06	13,44	4,7
2	MMN	2351	89	17	5	1	0	112	4,76	15,18	4,7
3	BML	**1387649**	42000	6300	1300	519	2700	53000	3,82	11,89	4,6
4	TSC	5799	201	47	24	15	4	291	5,02	16,15	4,5
5	CAC	73357	6100	1500	639	185	237	8700	11,86	17,24	4,5
6	SML	**189575**	12000	3700	1700	674	579	19000	10,02	19,47	4,4
7	DES	13864	805	219	131	35	38	1200	8,66	18,25	4,4
8	NEM	20280	1800	839	321	71	54	3100	15,29	27,06	4,4
9	CSC	**149507**	2700	699	298	88	162	3900	2,61	17,92	4,4
10	NMS	32631	730	352	168	43	32	1300	3,98	27,08	4,3
11	ABE	34423	4500	1700	1100	242	178	7800	22,66	21,79	4,3
12	TTS	12143	750	311	161	61	40	1300	10,71	23,92	4,3
13	EXD	21968	797	487	229	76	54	1600	7,28	**30,44**	4,2
14	HMS	6554	141	67	43	11	8	270	4,12	24,81	4,2
15	CSI	73797	1900	944	494	171	165	3600	4,88	26,22	4,2
16	MST	13444	603	403	165	35	37	1200	8,93	**33,58**	4,2
17	ECM	4725	137	70	28	13	14	262	5,54	26,72	4,2
18	TBE	24648	430	289	133	40	30	922	3,74	**31,34**	4,1
19	HFI	21321	870	618	404	82	58	2000	9,38	**30,90**	4,1
20	OKA	12867	469	226	151	39	46	931	7,24	24,27	4,1

While the use of *WhatsApp* is already ahead of *Facebook* in nowadays (Newman et al, 2017), the survey, conducted August 2017, found that 67 percent of U.S. adults get news from social media (Shearer & Gottfried, 2017). Our findings showed that all the researched museums had their social media sites in *Facebook* and *Youtube*. Additionally, some museums had links to *Snapchat* or *Linkedin* and even *TripAdvisor*. Researching 20 the most visited museum *Facebook* pages we found, that locally operating museums have more than 2000 and nationally – more than 1300 social network followers, mostly of them – adult persons. One huge national museum had more than 1.3 million followers. From the posts it is possible to guess that museums were rated after the live visit. 20 to

30 percent of persons who rated the museum exhibitions and events gave the highest ratings (5 stars). All the researched museums were rated higher than 4 stars. Museum virtual page reviews was done by approximately 5 to 22 percent of museum followers. These numbers could predict the interest in virtual museum activities (Table 1).

Our research has shown that many museums (but not all) were engaged in education activities. Museums had exhibitions that are adapted to different age groups (young and pre-school children, school-age children, teenagers, young people, adults) and organized various learning and experimenting actions. Gaming and gamification techniques were used. It was possible to play online games and download mobile gaming applications from the museum portal. Teachers and school-children can find curriculum-based resources for use in the classroom or learning at home. Some museums had mobile exhibitions that can be delivered to the desired location. One of the museums (which had high rates in *Facebook*) had the special initiative for teachers to become Museum Learning Advisers. This museum invited visitors to actively engage themselves in the development of contemporary *STEAM* educational content. Museum reviewers responded in *Facebook* page of the museum:

> *Absolutely brilliant place to take children. We took our 5, 10 and 13 year olds and they all loved it - which is a feat in itself. There was something for all of them - and us. It is just so well done, entertaining and interactive. <...> we really cannot recommend it more highly. A super day out for the family especially if the weather isn't that great. (SM)*
>
> *Fabulous place for kids and for grown-ups too. My 4 year old son enjoyed all the simulators and several interactive science displays. This is a good place to start the STEM idea and the value of imagination through building things on their own. (CJ)*

The strength of the museum was that museum linked live exhibitions and educational activities with events important and attractive for the young adults. For example, then we researched the museum home page, many people had been waiting for the very popular "*Star Wars Saga"* to continue. The museum adapted the science and technology exposition, providing scientific information related to the film. Such activities are high rated by the museum visitors. Similar case was with *Pink Floyds* music. After the visit museum visitors shared experiences in museum *Facebook* page:

> *(I) went for "The dark side of the moon" showing... Just amazing! With the hectic pace of life. It's hard to remember how long it's been since I last took the time to listen to an album start to finish uninterrupted and as my only focus. Thanks for reminding me how glorious that experience can be. <…> incredible! (LW)*

The museums had their *Youtube* channels, and even organized *TedxMuseum* educational events. Some museums opened their world-class collections and special archives for scientists and researchers. In these scholar museum pages scientists can learn out about current and past research, find out about researching in partnership with the Museum and discover resources to help with their own studies:

I like this place because I'm in to science and like finding out about Earth and related (SS)

All these and many other examples showed that many museums let its visitors to become creators of the stories. From these *Facebook* social network data and followers and reviewers responses, we developed the museum virtual self-presentation behavior style orientation *"Visitor as a creator"*.

The comparison of science and technology museum ratings (Table 1) showed, that not all the museums were rated only in high marks. Museum visitors wanted to see, touch and feel the latest innovations in the science and technology museum. In addition, visitors strived to be not only silent observers, but active participants in the development of new innovations. Visitors want the museum emerge them to the learning activities:

Sorry, Science museum, but I have to admit I was very disappointed. I have visited many times over the years and I am afraid you don't seem to have moved on. The aero planes and the space ships are what we came to see, but you need to involve us. I feel there needs to be more to interest children and young people. There is very little to encourage and stimulate children which is very disappointing. <…> please, wake up Science museum and breathe some fresh life into your galleries. (PB)

<…> A video of the steam trains running through the countryside, showing how coal was added to the fire or water tanks were refilled with a commentary alongside would have brought the old trains to life. How many 9 year olds or younger will read the texts about the history of the railways in place? <...> Although some of the exhibits about computers were interesting, they were also quite outdated. We enjoyed the robots provided by Jaguar but it dated from 1980s, the canal boat going though a lock, was fun and kept my godson busy for a bit, but why not a video showing the real thing and upgrade the very simplistic "button pressing"? <…> We thought the TT (the museum) was impressive, however, youngsters 7 years upwards are switched on to technology, hungry to learn and smart to follow computer instructions. The resources were limited, I thought the future was a bit stuck in the past. (CT)

Another respondent added that it is important to visit the science museum, but from other side - museum visitors lack active educational activities in some museums.

When you come to A (the city), you have to visit ABE (the science museum)! We didn't want to miss the experience of going inside and the price for the tickets is

reasonable. But the exhibition was kind of careless and a little boring. It would be much more interesting, if the XXX (the topic) was taken further inside the B (the science museum). I imagine the employees in costumes or the restaurant as a diner, for example. There is nothing to "do" in the whole exhibition. They have a lot of nice exhibits, but nothing to touch, watch or listen to. Maybe we just overlooked something... <...> We were very disappointed by the audioguide! Save your money and read the signs yourself, because that's what the guide basically does! (KP)

As the mission of the science and technology museum is to stimulate people's interest in science and technology and to increase their awareness of methods and results within science and technology, the museum itself need to be modern. As it is seen from the examples provided, that modernity was not observed in all the museums. The second virtual self-presentation behavior style orientation that we developed from *Facebook* social network followers and reviewers responses was *"Museum as a storage"* (Figure 1).

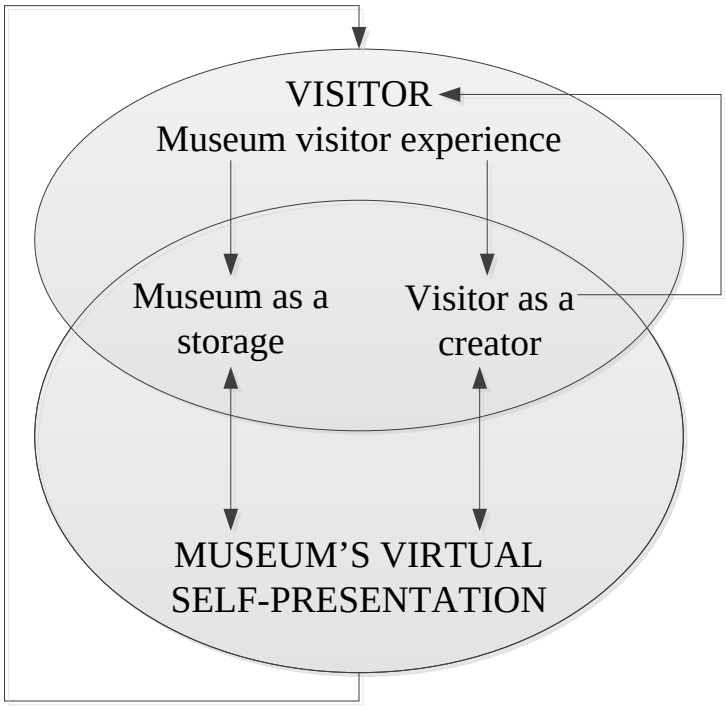


Figure 1. **The museum virtual self-presentation and the visitor experience: the reasons to return to the contemporary science museum**

Two themes: *"Museum as a storage"* and *"Visitor as a creator"* explained how the museum treated its visitors. The arrows in the museum virtual self-presentation and the visitor experience model (Figure 1) explained the visitor reasons why they go to the museum for the first time. Before the visit, the visitor got acquainted with the museum on the internet and social media sites: surfs the *museum's virtual self-presentation* and acquires the first ideas of what he or she will find when visits the museum - gets first *museum visitors experiences* from

museum's virtual self-presentation and from other visitors responses. During the live visit *museum visitor experiences* strengthens. Some visitors value *museum as a storage*. They saw many valuable artifacts, expositions and other information, but had less possibility to interactively "communicate" with these expositions. Another group of the visitors felt like creators (*visitor as a creator*). Visitors returned to the science and technology museum for the second time only then museum was interactive and they (visitors) were treated as creators.

Discussion

We researched official sites and social media channels of twenty big nationally and internationally operating European science and technology museums in order to understand how the virtual museum self-presentation is done and how it influenced visitors. In our research we adapted Falk (2016) *Museum Visitor Experience Model*, theoretically explaining and empirically clarifying how visitors value the museums and what kind of museum behavior attracted visitors return. Falk (2016) categorized identity-related museum visitor motivations to five groups: explorer, facilitator, experience seeker, professional/hobbyist and recharger. Oppositely to Falk (2016) we researched museum self- presentation to its visitors and found two different museum motivations: guardian of values ("museum as a storage") and visitor creativity promoter ("visitor as a creator"). We did not studied all the visit motivation contexts and payed attention only to personal context.

In our webpage analysis we were inspired by Neumann (2016) analysis of museum online collections. Neumann (2016) analyzed museum's online collection structures with regard to its content structure, but we payed attention to the museum webpage interoperability, home page structure, first ten news (how they appeared and how fresh the information is), science and education activities and their online representation, museum addresses and other direct information in section "about us". Neumann (2016) researched mind maps of museum online collections and artwork's pages as the extended data. We decided to research museums *Facebook* site to receive more information about the museum.

Our findings were fully in line with Samis (2008) theoretical ideas about the exploded museum. Our research confirmed that the museum's visit begins before the person arrives at the museum. Visiting the museum begins when a person reads reviews and comments from other museum visitors and checks the museum's evaluation and ratings in social media. Media ratings affect visitors' choices. In this research we did not studied how museums facilitate its visitor content creation and publishing. We only stressed that for a visitor becoming a creator is very important and museums need not to forget this.

This research is just a starting point. We researched only one of three contexts - personal context. We found that social media data is very important to adults: teachers, parents, family. The physical and socio-cultural context of science and technology museum self-presentation and its representation in the museum's social media accounts must be further explored taking into account different visitor age groups.

One of the limitations of our research is small number of European science and technology museums researched. We did no comparison and did not researched similarities and differences of science and technology and any other type museum self-presentation. Science and technology museum as educational center's self-presentation is another challenge that need further research.

Funding

This research was funded by a grant (No. 01.2.2-LMT-K-718-01-0084/232) from the Research Council of Lithuania.

References

Atkins, L. J. (2009). Digital technologies and the museum experience: Handheld guides and other media. *Science Education, 93* (6), 1149-1151.

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. Sage.

Charitonos, K., Blake, C., Scanlon, E., & Jones, A. (2012). Museum learning via social and mobile technologies: (How) can online interactions enhance the visitor experience? *British Journal of Educational Technology, 43* (5), 802-819.

Falk, J. H. (2016). *Identity and the museum visitor experience*. Routledge.

Falk, J. H., & Dierking, L. D. (2008). Enhancing visitor interaction and learning with mobile technologies. *Digital technologies and the museum experience: Handheld guides and other media*, 19-33.

Falk, J. H., & Dierking, L. D. (2016). *The museum experience revisited*. Routledge.

Kaptelinin, V. (2011, January). Designing technological support for meaning making in museum learning: an activity-theoretical framework. In *System Sciences (HICSS), 2011 44th Hawaii International Conference on* (pp. 1-10). IEEE.

Miller, P. (2000). Interoperability: What is it and why should I want it? *Ariadne, (24)*. Retrieved on March 5, 2018 from http://www.ariadne.ac.uk/issue24/interoperability

Morse, J. M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International journal of qualitative methods, 1* (2), 13-22.

Neumann, S. (2016). *Art Museums online-New visual challenges of Modern and Contemporary Art Collections* (Doctoral dissertation, Bremen, Jacobs Univ., Diss., 2015).

Newman, N., Fletcher, R., Kalogeropoulos, A., Levy, D. A., & Nielsen, R. K. (2017). *Reuters institute digital news report 2017*.

Samis, P. (2008). The exploded museum. *Digital technologies and the museum experience: Handheld guides and other media*, 3-17.

Shearer, E., & Gottfried, J. (2017). *News Use Across Social Media Platforms 2017*. Pew Res Cent.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information*, *22* (2), 63-75.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 315-326

KNOWLEDGE WORKER AS A USER OF INTELLIGENT COLLABORATIVE EDUCATIONAL SYSTEM

Sabina Katalnikova
Riga Technical University, Latvia

Abstract. *Education is integral part of every knowledge worker's activity during their whole life. While talking about lifelong education of knowledge workers, it is important to provide a possibility to study following an individual programme and, keeping into mind their own particular study aim, to test their newly acquired knowledge practically, to collaborate and learn from colleagues. In this regard development and application of intelligent collaborative educational systems gain great importance. This article has a threefold purpose: 1) to analyse the notion of knowledge worker, 2) to highlight its main traits and characteristics, 3) to offer a model of knowledge worker from the standpoint of a user of intelligent collaborative educational system. This theoretical study was based on an analysis of available literature sources and a summarizing of information. In order to illustrate the proposed model, extended semantic networks were applied and their brief description was given.*
Keywords: *collaborative education, extended semantic networks, intelligent collaborative educational system, knowledge worker.*

Introduction

In relation to scientific and technological revolution, contemporary priority is transition from manufacture of goods to manufacture of services. Currently there is a particular demand for information and knowledge; scientific achievements have become the basis for economics. Thus, for a society that wishes to develop efficiently, it is of utmost importance to promote forming of knowledge workers as the creativity, knowledge and skills of such workers are regarded as a chance for organisations to survive in an ever more competitive and rapidly changing environment. There are many definitions of knowledge workers, but all the authors agree that knowledge workers are a significant and ever growing worker group.

Integral part of every knowledge worker's activity during their whole life is education. During the educational process one should not limit oneself with acquiring and mastering information only from the tutor. Experiments of psychologist Hermann Ebbinghaus (Germany) already in 1885 indicate that mechanic memorization of information is not a successful learning strategy

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3193

(Ebbinghaus, 1885). If any problems arise, students must be able to acquire new information by combining it with the existing knowledge with the intention to solve a particular issue. Moreover, tuition must be carried out in collaboration; students must learn to collaborate among themselves. Contemporary society comprises people that collaborate globally, therefore, students must be encouraged to work together, unite them (Nichols, 2017).

On the other hand, information and communication technology opportunities and capacity are constantly increasing, leading to a continuous increase in the volume and variety of service activity in any area, including education. Therefore, the concept of collaborative educational system has appeared in the modern society and is becoming increasingly important (Katalnikova & Novickis, 2017).

Similar problems are described in many articles: development of web-based collaborative e-learning systems (Novickis & Rikure, 2005), development of agent based intelligent tutoring systems (Lavendelis & Grundspenkis, 2010), classification of collaborative systems and key concepts of collaborative educational systems (Ivan et al., 2010), development of intelligent tutoring system based on knowledge workers personal knowledge management systems (Grundspenkis, 2011), studying the influence of collaborative self- and peer-assessment methods on the quality of students' structural knowledge (Anohina-Naumeca, 2017), implementation of interactive tutor robot to enhance collaborative e-learning system for science and technology education field (Tojo et al., 2018).

However, it should be noted that the problem of development of directly collaborative educational systems for knowledge workers considering a set of their attributes has not been paid attention it deserves in the scientific community (Katalnikova et al., 2016).

The purpose of this work is to investigate the notion of knowledge worker, to identify and classify its basic traits and characteristics, and to create an initial proposal for a model of knowledge worker as a user of intelligent collaborative educational system. This analysis will be used in author's future work for creating user model of this system that most fully reflects features of the knowledge worker and properties of the adult student. To achieve the goal of the work an analysis of available scientific literature was made and a summarizing of information was fulfilled.

Knowledge Workers

The term "knowledge workers" was introduced by Peter Ferdinand Drucker – a scientist, economist, pedagogue (USA), - in 1959 (Drucker, 1959) to characterize an ever growing number of workers who work mostly with information or apply knowledge. There are many definitions of knowledge

workers. In 2000 P. F. Drucker defined knowledge workers in the following way – they are persons who add value to company's products and services by using their knowledge (Drucker, 2000). Another definition is provided (Davenport, 2005): knowledge workers are workers with a high level of knowledge, education or experience, the main aim of their work is creating, distributing or adjusting knowledge. In the paper (Kappes & Thomas, 1993) it is declared: knowledge worker is such a worker who summarizes data/information from any source, increases the value of information, distributes products with added value to others; ibidem: knowledge worker complies with process that requires knowledge both from internal and external sources to create product that stands out with its content of specific information.

Knowledge workers can create and improve their technological knowledge or supervise their colleagues' technological knowledge (Toffler, 1991). Knowledge worker is the one who applies information technologies in fulfilling everyday tasks and who directly influences efficiency and productivity of work and work process (Awad, 1996). For knowledge workers intellectual work is more significant than physical effort during the action process (Flood et al., 2001). Workers who usually do not follow strictly set work fulfilment procedure, but apply their own creativity, knowledge and skills for business development (Miller, 2002).

The main peculiarities of a knowledge worker is the existence of general and special knowledge, capability to search, evaluate and process information, the ability to collaborate with other people that is reflected in knowledge exchange, the ability to formulate problems and search for solutions, widely understandable flexibility, the ability to organise their work and work of other workers, the ability to analyse and control the acquired results, readiness and motivation to learn (Figurska, 2010).

The new skills of a knowledge worker are not hand labour working skills. Mainly they are intellectual skills, as well as social skills including work organisation in a group.

P. F. Drucker indicated in (Drucker, 2006) that education is a highly significant source that can give society and economics the advantages of competitiveness and that can make knowledge worker productive. Such worker becomes the main investment and education – the most expensive investment. In the paper (Drucker, 1969) P. F. Drucker declares the necessity for new access to education – education must form universal skills that include application and systematic acquiring of knowledge as basis for efficiency, qualification and achievements. If there is knowledge applied during the work, life-long learning is necessary. Person must learn how to study and perform it independently, apply knowledge for acquiring skills, apply knowledge in practice. Educational system

must provide requalification of knowledge through the whole life (continuous education) and, thus, also workforce mobility.

The main characteristic that separates knowledge labour from other traditional types of labour is the fact that the basic task of knowledge labour is thinking. Although all the types of labour are related to blend of physical, social and mental labour, continuous processing of non-standard problems is carried out and it requires non-linear and creative thinking and also characterizes knowledge labour (Reinhardt et al., 2011).

Work organisation, analytical skills, motivation to learn, stress endurance, experience and teamwork are the most significant competences of creative knowledge workers that define their ability to perform creative work (Sokol & Figurska, 2017). Knowledge worker is a person who is usually strongly motivated to work well (Drucker, 1959) (Davenport, 2005). Research shows that the majority of knowledge workers are ready for self-governance, self-organisation and self-control (Mladkova, 2015).

Another difference of the work of the knowledge worker is the fact that it is not easy to assess the results or the productivity of the work as their work result is rarely particular or immediate, the results of knowledge work can differ from the standpoint of short-term and long-term perspective. Productivity of knowledge work cannot be measured in a way of manufactured units, it should be more regarded as quality of the result (Drucker, 1999). Knowledge work inheres unclear aims, processes or results, uncertain tasks (Spath, 2009), insufficient familiarization with methods that are necessary for attaining the aim or an unclear link between the method and the work results (Willke, 1998).

Knowledge workers frequently work in a team. Team members have mutually dependant tasks as they must share information or knowledge to obtain the necessary result or production (Van der Vegt et al., 2001).

To summarize the aforementioned definitions:

- the work of a knowledge worker is related to a large amount of information and ability to process and analyse it;
- the work of a knowledge worker requires continued education;
- knowledge workers are motivated to learn throughout their lives;
- the major part of the work to be fulfilled is intellectual work where knowledge is applied and created;
- the knowledge worker must inhere creative skills, ability to create new knowledge, fulfil unclear aims;
- knowledge worker produces nonmaterial product that is hard to evaluate;

- knowledge workers organise and supervise their own work, their work requires problem solving skills, great self-motivation and readiness for self-control;
- knowledge worker can work in a team, collaborate with colleagues, share knowledge, fulfil mutually dependant tasks.

Adult Education and Collaborative Educational Systems

American pedagogue Malcolm Knowles formulated six assumptions that separate an adult student to be (Knowles, 1990):

- self-appraisal – an adult strives for self-implementation, independence, self-governance, can create the studying environment themselves;
- experience – an adult has huge life experience that could be used as an ever greater resource for studies;
- the necessity to know – adults need to know why they require this knowledge before the studies begin; they do not study only to accumulate knowledge;
- the readiness to learn – the readiness of an adult for studies becomes more oriented to the tasks of social role development;
- motivation to learn – an adult's greatest motivation is internal: better quality of life, recognition, self-confidence;
- orientation to studies – an adult focuses one's attention to the particular aim and applies everything that has been acquired to achieve it, therefore, theoretical knowledge of an adult during the education process must be strongly related to actual practical activities.

Thus, when speaking about adult life-long learning it is important to provide the possibility to study following an individual programme keeping in mind their own study aim; practically test the newly acquired knowledge; collaborate and learn from colleagues.

It can be specially attributed to knowledge workers who have a big role in contemporary society, which must be creative, responsible, dynamic and communicable. Thus collaborative education becomes more and more significant.

Collaborative education can be defined as teaching environment where the students get involved with an intention to solve problems together (Teasley & Roschelle, 1993); situation when two or more people learn or try to learn something together (Dillenbourg, 1999); student common action method in a small group against the same aim (Prince, 2004).

The an idea of group work in education is rooted in the works of psychologist L. S. Vygotsky whose research on causal relationship between social interaction and individual learning created basis for social constructivism theory (Vygotsky,

1982) that defends application of collaboration instruments with an argument that cognitive development is a result of social interaction (Vygotsky, 1982) (Underwood, 2016). There is also research how this theory is available for application in educational technologies in contemporary digital age (Goldie, 2016) (Mattar, 2010). Research of many authors proved that education is more efficient if people collaborate and share ideas by solving the task as a group not as individuals, that knowledge formation in groups prevail individual learning (Johnson & Johnson 1989) (Bindley et al., 2009) (Muuro et al., 2014).

Collaborative education has fixed advantages as students actively collaborate with partners, use the acquired information for synthesis of new knowledge, works with several opinions of various people, learn to formulate and defend their opinion, find a substantiation for their judgement (Smith & MacGregor, 1992).

Collaborative educational systems, especially contemporary quickly developable intelligent collaborative educational systems (where artificial intelligence methods are applied for reflecting information, knowledge, decisions), are very good for tuition of knowledge workers particularly. As it was already mentioned, knowledge workers must continuously learn innovative knowledge to be competitive. It makes continuous tuition of workers one of the priorities of personal management functions in contemporary organisations. In this field a great problem is related to global virtual organisations the workers of which are spread all over the world and in this regard the tuition of knowledge workers takes place mainly as independent education.

Collaborative educational systems ensure also the strong link with industries that is so important nowadays. Preparation process of competent specialists cannot be separated from economical activities where such qualified specialists are necessary. And exactly collaborative educational systems provide such link as, on one hand, operation of such system is based on knowledge, promotes creation of new knowledge, acquisition of new competences, including social competences, and, on the other hand, does not require extended absence from the work place.

Model of User of Intelligent Collaborative Educational System

From the standpoint of intelligent collaborative educational system a knowledge worker can be viewed in three aspects:

- knowledge worker as basis – intelligent collaborative educational system is created by taking into account peculiarities and characterizations of these workers;

- knowledge worker as a process – the basis for operation of intelligent collaborative educational system – creation/improvement of knowledge worker;
- knowledge worker as a result – the aim and main result of operating an intelligent collaborative educational system – increase of knowledge worker's competence.

The basis of intelligent collaborative educational system – self-dependent work of students, which is the leading type of tuition process organisation (see Figure 1).

Collaborative educational systems possess the following characteristics (Katalnikova & Novickis, 2017):

- the aim of the system is to provide students with adequate support in the process of problem solving as an instructor-human would have done;
- any system of collaborative education is based on a user (student) model, taking into account the set of characteristics of the adults as well as the current level of professional competence and knowledge;
- at the basis of studies, there is the underlying study programme based on the student characteristics and needs, the purpose of education and the required range of competencies;
- education is geared to the needs of employers;
- during studies, there are developed skills for the user to apply knowledge for specific practical tasks;
- self-motivation is of great importance in such systems;
- education takes place in collaboration, promoting equal partnership.
- The student's model in educational systems consists of two types of characterizations of students:
- static data that does not change during tuition;
- dynamic data that changes constantly.

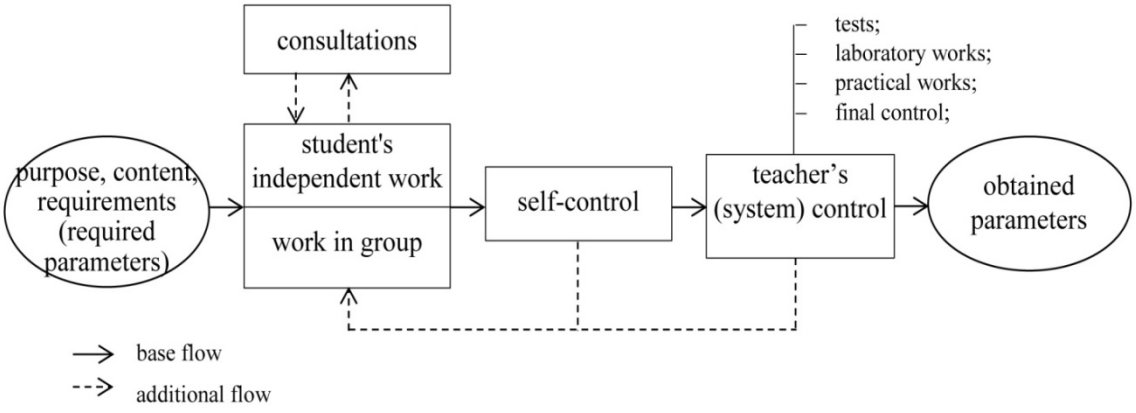


Figure 1. **Chart of independent work within collaborative educational system**

The basic data of student's model for intelligent collaborative educational systems, intended for tuition of knowledge workers, must be complemented with adult and especially knowledge workers characterizations. Thus, the data for student's model could be the following:

- static data, namely, common information, personal data, previous education, previous experience in the learnable field, preferences, interests, the purpose of the training, the planned tuition time, student's psychological characterizations, including knowledge worker's characteristic traits;
- dynamic data (student's development level), namely, the student's level of competency (knowledge on the learnable field), acquired study courses, student's evaluation during tuition, final evaluation.

For creation of knowledge worker's model for intelligent collaborative educational system (see Figure 2) extended semantic networks were applied that were offered in works of I. Kuznetsov (Russia) as improvement on semantic networks (Kuznetsov, 1986) (Kuznetsov, 2006). These networks can be applied for reflection of complex objects, logical, general information, several demands, dependences etc. In extended semantic networks the nodes correspond not only to objects or concepts, but also relations, logical components of information (facts of truth or untruth), complex objects etc. Everything that could be regarded as an independent unit must correspond to a separate node.

In such networks instead of edges of usual semantic networks, the so-called, link nodes are used. This node does not correspond to any object or relation, it is used only for indicating the link and provides equal relevance for nodes that correspond to separate components or units of information. As a result, a fragment is formed that corresponds to an elementary situation. The networks are constructed from such fragments.

This model makes the basis for operation of intelligent collaborative educational system that starts from the analysis of this model. In compliance with statistical data of this model and the knowledge (competence) level of the student, training groups are formed. Relation with industry is provided based on knowledge worker's previous experience and compliance with employer's requirements. Results of intelligent collaborative educational system operation, namely, the acquired competences that are confirmed with issued certificates, are evaluated based on dynamic data analysis of the student model.

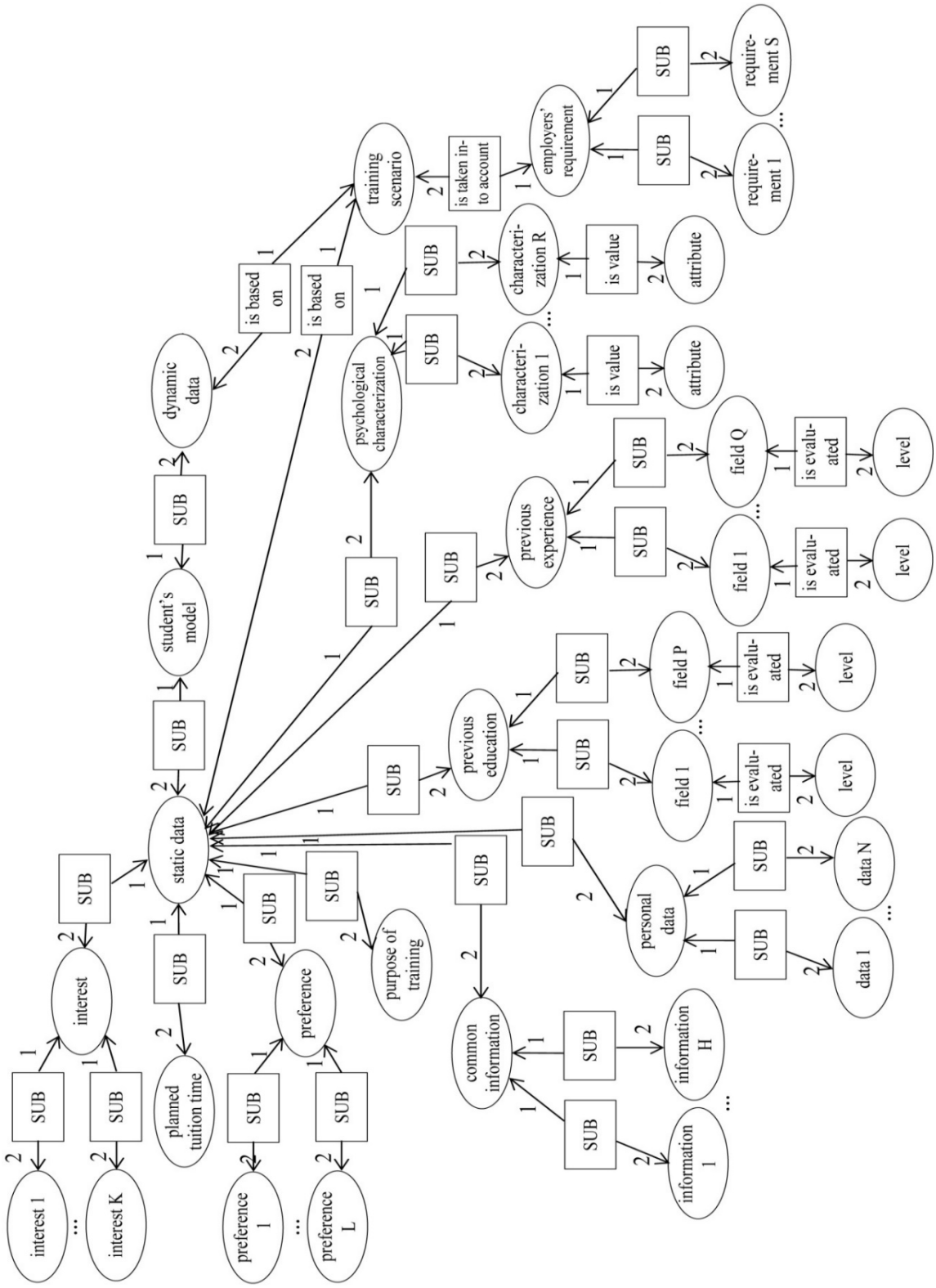


Figure 2. **Fragment of model of a knowledge worker for intelligent collaborative educational system**

Conclusion

In the offered paper the author tried to comprehensibly analyse the notion of knowledge worker and highlight the characteristic traits and peculiarities of the worker group with an intention to form a knowledge worker model for application in intelligent collaborative educational system. For the formation of the model extended semantic networks, which are improvement of semantic networks in logical and calculation aspects, were applied.

In the work particular characteristics of adult education and education in collaboration which play a huge role in contemporary dynamic, open and mobile information society were described.

References

Anohina-Naumeca, A. (2017). Studying the Influence of Collaborative Self- and Peer-Assessment Methods on the Quality of Students' Structural Knowledge. *Proceedings of the 10th International Conference of Education, Research and Innovation*, 5979-5989.

Awad, E. M. (1996). *Expert Systems*. Minneapolis, MN: West Publishing Co.

Brindley, J., Blaschke, L. M., & Walti, C. (2009). Creating effective collaborative learning groups in an online environment. *The International Review of Research in Open and Distance Learning, 10 (3*). Retrieved from: http://www.irrodl.org/index.php/irrodl/article/view/675/1271

Davenport, T. H. (2005). *Thinking for a Living: How to Get Better Performance and Results from Knowledge Workers*. Boston: Harvard Business School Press.

Dillenbourg, P. (1999). What do you mean by 'collaborative learning?' In P. Dillenbourg (Ed.), *Collaborative-learning: Cognitive and Computational Approaches* (1-19). Oxford: Elsevier

Drucker, P. F. (1959). *Landmarks of tomorrow*. USA: Harper Business.

Drucker, P. F. (1999). Knowledge-worker productivity: The biggest challenge. *California Management Review, 41 (2)*, 79-94.

Drucker, P. F. (2000). Managing knowledge means managing oneself. *Leader to Leader, 16*, 8–10

Drucker, P. F. (1969). *The Age of Discontinuity: Guidelines to our Changing Society*. London: Heinemann

Drucker, P. F. (2006). *The Effective Executive: The Definitive Guide to Getting the Right Things Done*. N.Y.: HarperCollins

Ebbinghaus, H. (1885). *Memory: A Contribution to Experimental Psychology.* Leipzig: Duncker & Humblot. Retrieved from: http://psychclassics.yorku.ca/Ebbinghaus/index.htm

Figurska, I. (2010). Selected aspects of managing knowledge workers. *Human Resources Management & Ergonomics*, *4* (2), 18-30.

Flood, P. C., Turne, T., Ramamoorthy, N., & Pearson, J. (2001). Causes and Consequences of Psychological Contracts Among Knowledge Workers in the High Technology and Financial Services Industries. *The International Journal of Human Resource Management, 12* (7), 1152-1165. https://doi.org/10.1080/09585190110068368

Goldie, J. G. (2016). Connectivism: A knowledge learning theory for the digital age? *Med Teach 38 (10),* 1064-1069. Retrived from: https://www.ncbi.nlm.nih.gov/pubmed/27128290

Grundspenkis, J. (2011). The Conceptual Framework for Integration of Multiagent Based Intelligent Tutoring and Personal Knowledge Management Systems in Educational Settings. *Workshops on Business Informatics Research: International Workshops and Doctoral Consortium*, 143-157.

Ivan, I., Ciurea, C., & Milodin, D. (2010). Collaborative Educational System Analysis and Assessment. *Third International Conferences on Advances in Computer-Human Interactions*, 160-165. doi: 10.1109/ACHI.2010.13

Johnson, D. W., & Johnson, R. T. (1989). Cooperation and competition: Theory and research. *Edina, MN: Interaction Book Company*. Retrieved from: http://www.co-operation.org/books-and-materials/.

Kappes, S., & Thomas, B. A. Model for knowledge worker information support. *Knowledge Worker Information Management*, 1-4.

Katalnikova, S., & Novickis, L. (2017). Conceptual Model of Intelligent Collaborative Educational System: Possible Solutions. *International Journal of Computer Science and Information Security, 15 (11),* 123-128.

Kataļņikova, S., Novickis, L., & Prokofjeva, N. (2016) Knowledge Representation in Intelligent Collaborative Educational Systems. *CEUR Online Workshop Proceedings, 1684*, 1-10. Retrieved from: http://ceur-ws.org/Vol-1684/.

Knowles, M. (1990). *The adult learner. A neglected species, 4th Edition*. Houston: Gulf Publishing Co.

Kuznetsov, I. P. (1986). *Semantic Representation*. Nauka, Mockow (In Russian).

Kuznetsov, I. P., & Matskevich, A. G. (2006). *Semantic-oriented Systems Based on Knowledge Bases*. Moscow: MTUSI (In Russian).

Lavendelis, E., & Grundspenkis, J. (2010) MIPITS - An Agent based Intelligent Tutoring System. *Proceedings of 2nd International Conference on Agents and Artificial Intelligence*, 5-13.

Mattar, J. A. (1982). Constructivism and connectivism in education technology: Active, situated, authentic, experiential, and anchored learning. *Technology*, 1-16.

Miller, R. (2002). Motivating and Managing Knowledge Workers. *Knowledge Management Review, 5 (1),* 16-20.

Mládková, L. (2015). Knowledge Workers and the Principle of 3S (Self-management, Selforganization, Self-control). *Procedia Social and Behavioral Sciences, 181,* 178-184. https://doi.org/10.1016/j.sbspro.2015.04.879

Muuro, M. E., Wagacha, W. P., Kihoro, J., & Oboko, R. (2014). Students' perceived challenges in an online collaborative learning environment: A case of higher learning institutions in Nairobi, Kenya. *The International Review of Research in Open and Distributed Learning, 15 (6),* 132-161. doi: http://dx.doi.org/10.19173/irrodl.v15i6.1768

Nichols, J. R. (2017). 4 Essential Rules Of 21st Century Learning. Retrieved from: https://www.teachthought.com/learning/4-essential-rules-of-21st-century-learning/.

Novickis, L., & Rikure, T. (2005). Intelligent Tutoring Systems. *Proceedings of IST4Balt International Workshop "IST 6th Framework Programme – Great Opportunity for Cooperation & Collaboration"*, 35-40.

Prince, M. (2004). Does active learning work? A review of the research. J*ournal of Engineering Education, 93 (3),* 223–231.

Reinhardt, W., Schmidt, B., Sloep, P. B., & Drachsler, H. (2011). Knowledge Worker Roles and Actions - Results of Two Empirical Studies. *Knowledge and Process Management, 18* (3), 150–174. doi: 10.1002/kpm.378

Smith, B. L., & MacGregor, J. T. (1992). What is collaborative learning? In Goodsell, A., Maher, M., Tinto, V., Smith, B. L., & MacGregor J. T. (Eds.), *Collaborative Learning: A Sourcebook for Higher Education* (9-22). USA: Pennsylvania State University, National center on postsecondary teaching, learning, and assessment publishing.

Sokol, A., & Figurska, I. (2017). Creativity as One of the Core Competencies of Studying Knowledge Workers. *The International Journal Entrepreneurship and Sustainability Issues, 5 (1),* 23-35. http://jssidoi.org/jesi/http://doi.org/10.9770/jesi.2017.5.1(2)

Spath, D., & Hofmann, J. (2009). The Knowledge Worker as a Resource – Productivity Potential of the 21st Century. In: *Gestaltungsfeld Arbeit und Innovation* (333-363). München: Rudolf Haufe Verlag [In German].

Teasley, S. D., & Roschelle, J. (1993). Constructing a Joint Problem Space: The computer as a tool for sharing knowledge. In Lajoie, SP and Derry, SJ (eds), *The Computer as a Cognitive Tool* (229–258). Hillsdale, NJ, USA: Erlbaum.

Toffler, A. (1991). *Powershift: Knowledge, Wealth, and Violence at the Edge of the 21st Century*. Bantam.

Tojo, T., Ono, O., Noh, N. B. M., & Yusof, R. (2018). Interactive Tutor Robot for Collaborative e-Learning System. *Electrical Engineering in Japan., 203(3),* 22-29. doi**:** 10.1002/eej.23073

Underwood, Z. (2016). Connectivism: A Learning Theory for Today's Academic Advising. *Academic Advising Today, 52.* Retrieved from: http://www.nacada.ksu.edu/ Resources/Academic-Advising-Today.aspx.

Van der Vegt, G. S., Emans, B. J. M., & Van de Vliert, E. (2001). Patterns of Interdependence in Work Teams: a Two-level Investigation of the Relations with Job and Team Satisfaction. *Personnel Psychology, 5(1),* 51–69. doi: 10.1111/j.1744-6570. 2001.tb00085.x

Vygotsky, L. (1982). *The Collected Works: Questions of Theory and History of Psychology*. M.: Pedagogika (In Russian).

Willke, H. (1998). Organized Knowledge Work. *Zeitschrift für Soziologie, 27 (3),* 161–177. https://doi.org/10.1515/zfsoz-1998-0301 (In German)

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 327-337

BORDER CHECK TRAINING IN FINLAND - COMPARISON OF E-LEARNING TOOLS FOR PRACTICAL AND LEGAL STUDIES

Sari Lindblom-Häkkinen

Saila Heinikoski

Maisa Anttila
The Finnish Border and Coast Guard Academy, Finland

Abstract. *The paper discusses the possibilities and challenges in applying e-learning tools in border check training, comparing the training of legal issues and border check practices. The main research question of the paper is how e-learning is utilised in and comport with border guard training. In pedagogical discussion, one of the most popular strands in the e-learning context is the method called "flipped classroom". In a flipped classroom, part of so-called blended learning, students study e-learning material before they start practicing their skills in simulated situations. We examine in which situations related to border checks flipped learning could be appropriate and beneficial and what sort of skills can best be learned through them. Practical skills are of course crucial, and after classroom learning in border guard training, working practice periods are obligatory for students. With the above-mentioned pedagogical concepts in mind, we first utilise content analysis based on the Community of Inquiry (CoI) framework, analysing how the online platform supports practical skills. Secondly, we bring the training period into conversation highlighting its importance as a learning method. The empirical material of the paper consists of educational documents, e-learning material used in border check and legal training as well as interviews and observation with trainers and teachers at the Finnish Border and Coast Guard Academy. The paper illustrates that e-learning tools are particularly useful in rehearsing to apply theoretical knowledge in practical situations. Still, the training period cannot be replaced with any methods. However, basing on the tentative analysis of empirical data before training period, flipped learning method seems to be very effective learning method.*
Keywords: *border guard training; Community of Inquiry; constructive alignment; e-learning; flipped learning, mixed method, training period, blended learning.*

Introduction

This paper deals with the use of online education methods in border guard training. More specifically, it analyses the use of online learning in border check and legal training from the perspective of best practices for border guard training. Our study is informed by specific pedagogical concepts focused on e-learning.

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3174

According to the teacher's guide of the Finnish Border and Coast Guard Academy, teaching at the academy is based on *constructive alignment*, whereby all aspects of teaching should be aligned: objective, target group, implementation, learning method, assessment and feedback (Border and Coast Guard Academy, 2018). In constructive alignment, the target skills determine e.g. how the course contents are taught and how learning is assessed (Biggs & Tang, 2011). For example, in accordance with constructive alignment, practical border check issues should not be taught with lectures only, but teaching should aim at improving the practical border checking skills of the students and to assess students based on their practical activities. In border check training, the most important part is the obligatory internship period of six months, the significance of which is also emphasised in pedagogical studies (Vesterinen, 2002).

According to the pedagogical strategy of the Border and Coast Guard Academy, *blended learning* is applied in teaching; different study environments and methods are combined (Border and Coast Guard Academy, 2017). E-learning environments and methods are an essential part of blended learning. Often, blended learning is defined as learning where a part of the learning takes place within school premises and another part online, in which case the student may influence the time, place and/or pace of studying (Hew & Cheng, 2014).

Flipped classroom is a form of *blended learning* where students study online material before classes, in turn discussing what they learned online (Bergmann & Sams, 2014). This paper also discusses in which situations and for learning which skills flipped learning could be used in border check training.

The Finnish border guard studies consist of a six-month learning period at the Finnish Border and Coast Guard Academy, after which the students complete a six-month training period in their future workplaces while simultaneously conducting independent online studies. We analyse border guard training in the online environment from the perspectives of the above-mentioned pedagogical concepts. Considering the best practices of these debates, we focus on online environment from the teacher's perspective, with particular emphasis on the so-called teaching presence, part of the pedagogical Community of Inquiry framework (Garrison et al., 2010). In other words, we examine the role of the teacher in the online material vis-á-vis student engagement in independent learning, which is combined with practical exercises and an internship period.

Plenty of online material has been developed for border check training, such as online tests and serious games for practicing border check activities. The tools help to apply legal knowledge in practical situations. In border check training, online learning seems to be used for testing and rehearsing existing knowledge and the use of online resources is often voluntary. In legal training, in contrast, teaching relies strongly on online learning and the online resources provide new information not covered during lectures. The paper aims at analysing in which

situations e-learning is suitable for border guard training. More specific research questions include:

1. How flipped learning and blended learning is applied in the courses?
2. How constructively aligned are the tools in terms of e-learning?
3. How does teaching presence materialise in the courses?

The main empirical material consists of the contents in the online platform of the border guard course that began in January 2018. Furthermore, we have interviewed two trainers at the Border and Coast Guard Academy, which will also be taken into account in the analysis, along with educational documents of the academy. Together, this material provides a diversified view on online learning in border check training. The research project is in progress, and the results of this study will be later on complemented with student surveys and comparison with flipped learning experiences at the Finnish Emergency Services College.

The analysis relies on content analysis, which is an appropriate method for qualitatively comparing, contrasting and classifying issues, and it has also been used in the Community of Inquiry framework that serves as the analytical framework of the paper (Tiuraniemi, 2012). We have adopted a deductive approach to content analysis, i.e. our analysis is concept-driven, starting from the concepts in pedagogical discussion (Graneheim et al., 2017). Hence, we do not utilise the traditional quantitative methods of the CoI model nor do we analyse the online platform through a student survey. Instead, our interest lies in how the e-learning tools are constructed in light of teaching presence. The model maintains that a community is necessary for successful learning, in order for students to become reflective learners. We thus analyse qualitatively how the contents of the online material supports the aims of a Community of Inquiry in terms of teaching presence; how do teaching activities contribute to supporting students in the online environment? The actual method relies on systematically examining, classifying and contrasting the observed issues in the online material and interviews.

Teaching presence refers to the manners in which the teacher takes part in the online activities. The components of teaching presence include design and organisation, facilitating discourse and direct instruction (Garrison, 2017). Whereas design is the work that occurs before the course, organisation refers to the activities of the teacher during the course (ibid). The tasks may include setting curriculum, designing methods, establishing time parameters, utilizing medium effectively, establishing netiquette and making macro-level comments about course content (ibid). Facilitation and direct instruction, in turn, refer to the management of student discussion. Since the students are not supposed to discuss with each other online in the observed courses, only direct instruction is under consideration here in terms of how the teachers directly communicate with the students in the online platform. In terms of design and organisation, the model

analyses how the curriculum is established, how resources are identified; how expectations and goals are identified; how technological concerns are identified; how activities are structured; how time frames are set and how assessment processes and instruments are devised (ibid). This contributes to revealing how teaching presence is intended to materialise in the online environment.

Pedagogical concepts informing the present study

E-learning is a popular topic in pedagogical discussion and we are not able to review all literature related to e-learning in this short paper. Instead, we focus on the main pedagogical studies that have inspired this paper. We concentrate on the teacher's perspective during an actual course rather than on the overall curriculum and course design. It is important to keep in mind that not all studies consider that e-learning is always positive and should be applied in all possible situations. Some authors argue that it should be always predetermined how and why e-learning should be used before starting to apply it in actual teaching (Kirkwood, 2009). For example, practical skills cannot be practiced only online, if we aim at constructive alignment. Constructive alignment pursues deeper learning among students, which means that students should receive feedback from their learning and their learning should be assessed based on the skills they should acquire, not necessarily based on what they can learn by heart (McCann, 2017). Constructive alignment may include both traditional lectures, which have a separate assessment method, and practical exercises, which are assessed based on performance (Wass, 2011; Vesterinen, 2002).

With constructive alignment as the usual framework, flipped learning is a popular concept in e-learning studies. Flipped learning can be considered a form of blended learning, where classroom teaching is combined with e-learning material. However, flipped learning may not be very easy to organise in large groups; it is hard to involve students in discussion in one single lecture room. Nevertheless, even in a study with a group of 80 students, the flipped approach was deemed positive since it actively engaged students to take responsibility for their own learning (Graham et al., 2017). Although flipped learning has been developed in the past fifteen years, it is to be noted that prior reading and interactive classrooms have been used for decades; technology has just made flipped learning easier (Ent, 2016). Flipped learning is part of blended learning, but it can also be considered complementary to blended learning, when teacher-centred studying is combined with student-centred learning (Zhang et al., 2016). Flipped learning has spurred positive experience particularly with case-oriented studying, where students watch online lectures before classroom activities (Slomanson, 2014).

Although all reviewed studies acknowledged the positive aspects of e-learning tools, none of them considered that e-learning tools would substitute contact teaching. Instead, in accordance with constructive alignment, learning methods should always be considered case-specifically. Blended learning, including flipped learning, provides tools to employ a variety of methods.

In order to study the effectiveness of blended and online learning, many studies relying on constructive alignment utilise the Community of Inquiry (CoI) model, which focuses on teaching presence, cognitive presence and social presence in classroom and online learning (Garrison et al., 2010). Social presence refers to the ability of the students to identify themselves with the community, communicate and develop interpersonal relationships; whereas cognitive presence refers to collaborative knowledge construction (Arbaugh et al., 2008). In the present paper, we will critically assess whether such presence is necessary in a digital learning environment. For example, some authors have questioned whether learning actually requires being in a social contact as the CoI model maintains (Cooper & Scriven, 2017).

Analysis of the online environment

The online material used at the border guard courses is located in a single online platform, where all the material of the one-year course is found. Different topics have their own sections, such as border check and legal studies.

In the border check course, the first issue that students need to learn is how to search information from different systems with their laptops. Most of the learning at the border check course takes place in the classrooms, and the material online is mainly for practicing the learned information with tests and revising the issues for the final exam. Furthermore, all the presentations of the contact teaching are available online. Since the students are supposed to have their laptops with them in the lecture hall, e-learning methods such as information search and exercises can also be utilised in the classroom. Furthermore, video material is watched during lectures and the links are provided together with the lecture slides. Online exercises are also available in the online platform to be completed outside classes, where the students are supposed to search information online or practice what was learned during the classes, e.g. by identifying passport images and measures to be taken.

In contrast to the border check course, in the legal course, there are no lecture-type classes in the first part but the lectures are substituted by online reading. Material from introductory legal studies is utilised, and there are often quizzes with multiple choice and true/false questions connected to readings. The first part of the course is completely organised online, but students are also supposed to study issues in small groups, which may contact the teacher through

video connection during predetermined times. Video lectures are available on fundamental and human rights issues with the best experts in the field, and similar multiple choice exercises are attached to the videos. In addition to the material drafted by legal experts, the teacher has also prepared lectures specific for border guard students, with pictures from legal databases and boxes and arrows indicating what is intended by which part, with quizzes in between. There is also a message board available in the online platform, and students can contact the teacher through an online chat when the teacher is available. However, this option is not utilised.

As outlined above, we have two different types of topics and two different types of learning methods. The first part of the practice-oriented border check course is organised in the form of traditional lectures and online homework, therefore complying with the blended learning framework. In contrast, legal issues are learned in a flipped manner; students study the issues independently either by reading or watching online lectures and thereafter study together in small groups with possible video contact with the teacher. In both courses, practice-oriented classes and exercises are started only once the first theoretical part of the course is completed. Analysed from the teacher presence perspective, we can observe that the teacher's online role in both courses is mainly related to organisation and design, and direct instruction is provided for individuals or small groups when they so request. In the border check course, students provide written answers that are checked later on in classroom.

In the two courses, the only interactive online resource is a discussion board at the legal studies platform, where students may present questions to the teacher, visible to all. The role of the teacher is thus directly instructing the students in case of inquiries, and even the possibility for small groups to have a video connection with the teacher is called “question hour”. In the border check course, feedback is only provided during lectures for written answers to a test.

Not all material is immediately available in the online platform but new activities are opened as the course progresses. This can also be considered a sign of teaching presence in the sense that the teacher holds responsibility for the organisation of the course. In the legal course, there was more material available already at the outset, since the students are expected to study independently. Even though social and cognitive presence of students is not apparent in the online environment, social presence is ensured with independent studies in small groups. Furthermore, the students study the same issues and live in the same premises for the first six months and social presence thus takes place “offline”.

When considered from the perspective of constructive alignment, the chosen methods seem to comply with the skills the students are supposed to acquire. In the legal course, students should learn the relevant legislation and therefore questions testing the ability to apply the legal information are reasonable with an

online multiple choice and true/false exam. Even in the second part of the legal course with practical classes, the evaluation is based on an online exam. In the border check course, in contrast, theoretical knowledge is assessed based on an exam, but there are proficiency tests for evaluating practical skills.

Blended learning, including flipped learning, seems to be utilised in border guard training, though in a larger scale. In the legal course, the course is flipped in the sense that first part of the course consists of independent online studies and the second part of practical classes. One could of course ask whether it would be more efficient to organise the theoretical and practical classes simultaneously and discuss each topic together as soon as the students have introduced themselves with the material online. In the border check course, online and classroom learning is blended throughout the duration, but instead of flipped learning, online material mainly tests what was learned during lectures (traditional homework type).

Border check training as an example of blended learning

Two border check trainers at the Border and Coast Guard Academy were interviewed in 2016 as part of BODEGA project. The interviews were carried out with the interview guide for trainers designed in the BODEGA project as a basis.

Border checks at international border crossing point constitutes the key skill that all students learn and border guard basic training is based on. Skills important for students to learn include how to perform border check in practice, legislation, customer service and social skills, technical, language and problem-solving skills.

Different learning environments and methods are combined to train border check skills. Border guards work on the field individually and also in groups and thus in the training, group and self-directed work is combined. Practical border check skills are learned in small groups ensuring that trainers have time to give personal guidance. Sometimes half of the group performs the activities and half have a role of customers or other target of the action. This kind of method contributes to customer service and social skills; border guards-to-be learn to see the situations from travellers´ perspective. At the beginning of the training, the focus is on personal skills, for example students perform e-learning courses by themselves. The training of tools that will be used on the field individually is self-directed, for example training of registers and document scanners.

Learning by doing is the basic method of border check training. Lectures are provided at the beginning of the training but used as little as possible in further training. E-learning courses go along with the other training. Thanks to e-learning online platform, real life cases chosen by the trainers have been included in training; the cases stimulate students´ own thinking and applying knowledge into practice. All these are skills required from a border guard. When working with the

cases students also understand how various situations they may encounter in their future work.

Videos as part of e-learning courses bring the benefit of rehearsing multiple skills at the same time. For example, a foreign traveller asks a question on the video and the student has to answer and react correctly to the question. In a flipped learning, videos have a typical role of introducing basics of the content to be learned (e.g. Slomanson, 2014) but as shown by the border check training, videos are useful to test and improve multiple skills at the same time.

In the e-learning courses trainers may provide feedback for the students via the e-learning platform. Furthermore, the e-learning courses are addressed later in the face-to-face training with the trainer. The social presence regarded as important for learning in the CoI framework (e.g. Garrison et al., 2009) is thus brought to the training not only in online environment but on top of that. The content of the e-learning course is aligned to other training with the help of trainers.

Videos are not only part of e-learning but in use also when customer service and cultural communication skills are trained. An ideal situation can be demonstrated with the help of videos. Written material ranging from legislation to other learning material also constitutes an essential part of the learning. However, because of fast development on the field, it is not possible to write a book on how to perform border checks. The use of such textbook in the training could also hinder students and border guards´ own thinking, one key skill for a border guard.

Borders (sea, air, land) are different in the sense that the skills required from border guards working at different Finnish border crossing points are not equal. Therefore on-the-job training at the workplace-to-be is crucial. As part of the border guard basic training, border guards have on-the-job training phase when they go for practical training to the same workplace they will be working after graduation.

Performance assessment methods in use are, inter alia, (theory) exams, tasks related to e-learning courses and proficiency tests. Tests organised via e-learning platform may include real-life cases when students have to combine knowledge and skills they have learned. For example, refusal of entry and document inspection skills are trained and assessed by proficiency tests, in line with constructive alignment framework.

Based on the trainer interviews, we can conclude that in border check training blended learning is applied by using different methods, learning and social environments. All courses and methods have the intended learning outcomes plus other skills are learned at the same time. Using e-learning methods in the training contribute to the changing operational environment. More and more

technical tools are utilised in border check work. When part of the training is online, border guards learn how to operate in that environment.

Conclusion

We have demonstrated in this paper that e-learning tools are widely used in border guard training in different manners. Legal training relies mostly on online material, consisting of writings from legal experts and video lectures made in the governmental Human Rights Centre as well as material and exercises prepared by the teacher. There is an online test at the end of the course, and the materials are also organised on the basis of what is asked in the exam. The title of the material for the first exam states that this will be asked in the exam, sometimes added with the note that certain material will not be asked in the exam, but students can acquaint themselves with them if they so wish. Although it was emphasised in the first lecture that issues are not learned because of the exam but because the border guards need to know the issues at work, learning is very exam-oriented. The exercises also state that similar questions will be asked in the final exam. What can be considered positive is that the exam is online and it requires application of the learned issues, not just learning by heart. Furthermore, having border guard - specific issues as the first material in the course introduces the students in why these issues are important in their work. Since it is a question of a large group of students, having a multiple-choice online exam is probably the optimal solution.

In contrast, the border check course is brought forward with contact teaching and online tools only complement the lectures. The lecture slides are saved in the online platform and quizzes are also available. There is an exam in the end of the course, and the learning is thus exam-oriented, but the contents are more practical and students know they will start practicing what they learned in the second part of the course. The same is true also for the legal course, but the practice is less “practical”, and there is an online exam also for the second part of the legal course. Teaching presence thus materialised mainly in terms of design and organisation, with the potential of direct instruction if need be.

Both courses make use of blended learning and the legal one could also be considered a type of flipped learning, where theoretical issues are studied independently online before contact learning. This suggests that flipped learning could be more suitable for theoretical issues, while blended learning is a natural part of any modern course. In accordance with constructive alignment, if the target is to achieve “knowledge”, flipped learning could be more appropriate. Instead, if one should learn “skills”, blended learning may be more suitable if there is no theoretical information to be learned before such skills.

To conclude, e-learning tools seem to be particularly suitable for theoretical (such as legal) courses, whereas practice-oriented courses may utilise online tools

to complement classroom activities. An ideal environment for e-learning is a course, where learning takes place through reading, watching videos and rehearsing with exercises that test the ability to apply knowledge. In contrast, practice-oriented courses are more justified to be organised at least partly in classroom. For example, the border check course is less suitable to be organised completely online, but the online environment is useful in storing lecture material as well as for online exercises where students can practice what was learned during the lectures. Overall, flipped learning could be useful in organising courses partly online and partly in classroom so that students would have an idea of what is going to be discussed in the class. However, further research is needed to determine in which situations and which contents could be flipped in order to ensure that all skills are properly learned before training period at the field and work of border guards.

Acknowledgment

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 653676. This article reflects only the authors´ view and the Commission is not responsible for any use that may be made of the information it contains.

References

Arbaugh, J. et al. (2008). Developing a community of inquiry instrument: Testing a measure of the Community of Inquiry framework using a multi-institutional sample. *Internet and Higher Education, 11*, 133-136.

Bergmann, J., & Sams, A. (2014). *Flipped Learning: Gateway to Student Engagement*. Eugene: International Society for Technology in Education.

Biggs, J. B., & Tang, C. (2011). *Teaching for Quality Learning At University.* Maidenhead: Open University Press.

Border and Coast Guard Academy. (2018). *Teacher's guide*. Imatra: Raja- ja merivartiokoulu.

Border and Coast Guard Academy. (2017). *Pedagogical strategy*. Imatra: Raja- ja merivartiokoulu.

Cooper, T., & Scriven, T. (2017). Communities of inquiry in curriculum approach to online learning: Strengths and limitations in context. *Australasian Journal of Educational Technology, 33 (4),* 22-37.

Ent, V. (2016). Is Flipped Learning Really New to Academia? *TechTrends, 60,* 204-206.

Garrison, D. R. et al. (2010). The First Decade of the Community of Inquiry Framework: A Retrospective. *Internet and Higher Education, 13 (1-2),* 5-9.

Garrison, D. R. (2017). *E-learning in the 21st century: A community of inquiry framework for research and practice* (Third edition.). New York, NY: Routledge, Taylor & Francis Group.

Graham, M. et al. (2017). Flipping and still learning: experiences of a flipped classroom approach for a third-year undergraduate human geography course. *Journal of Geography in Higher Education, 41 (3),* 403-417.

Graneheim, U. H.; Lindgren, B. M., & Lundman, B. (2017). Methodological challenges in qualitative content analysis: A discussion paper. *Nurse Education Today, 56,* 29-34.

Hew, K. F., & Cheng, W. S. (2014). *Using Blended Learning: Evidence-Based Practices.* Singapore: SpringerBriefs in Education.

Kirkwood, A. (2009). E-learning. You don't always get what you hope for. *Technology, Pedagogy and Education, 18 (2),* 107-121.

McCann, M. (2017). Constructive alignment in economics teaching: a reflection on effective implementation. *Teaching in Higher Education, 22 (3*), 336-348.

Slomanson, W. (2014). Blended Learning: A Flipped Classroom Experiment. *Journal of Legal Education, 64 (1),* 93-102.

Wass, H. (2011). Konstruktiivisesti linjakkaan opetuksen malli kurssin suunnittelussa: esimerkkinä kvantitatiivisten menetelmien opintojakso. *Politiikka, 53 (4),* 285-294.

Vesterinen, M.-L. (2002). *Ammatillinen harjoittelu osana asiantuntijuuden kehittymistä ammattikorkeakoulussa*. Jyväskylä: University of Jyväskylä, Jyväskylä Studies in Education, Psychology and Social Research.

Zhang, Y. et al. (2016). A Large-Scale Blended and Flipped Class: Class Design and Investigation of Factors Influencing Students' Intention to Learn. *IIEE Transactions on Education, 59 (4),* 263-273.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 338-347

EDUCATING FOR FUTURE JOBS

Joanna Lizut
Janusz Korczak Pedagogical University in Warsaw, Poland

Gilberto Marzano
Rezekne Academy of Technologies, Latvia

Miroslaw Grewinski
Janusz Korczak Pedagogical University in Warsaw, Poland

Abstract*. In a relatively short time, information and communication technology (ICT) has spread worldwide, from defense to space to large industrial applications, and to the commercial, healthcare, entertainment, and educational sectors. As a consequence, experts argue that it is urgent and critical to prepare educational programs in order to re-train the current workforce. However, there are some key questions that are very relevant, since they concern crucial and challenging issues: 1) Which jobs have a future in the digital era? 2) How can education support the acquisition of new skills required by the new jobs?*
This article focuses on the above questions, and presents the main opportunities that the digital revolution offers for sustaining education for future jobs in a lifelong perspective.
Keywords: *digital technology, education challenge, future jobs, labor market changes.*

Introduction

It has been estimated that 47 percent of US jobs, 57 percent of jobs across the OECD, and 77 percent of jobs in China are susceptible to automation over the forthcoming decades, a substantial proportion of which are concentrated in the service sector (Frey & Osborne, 2017).

As a consequence, many current professions and jobs will undergo changes and new ones will arise. For example, smartphones and the internet are mainly used today for social purposes, but it is expected that in the near future they will be used for increasing the productivity of workers, and that they will create new job opportunities (Leonardi, 2015; Kwahk & Park, 2016; van Zoonen, Verhoeven, & Vliegenthart, 2016).

However, although many manual works will be automated, it is undoubtedly true that professions such as barber, janitor, farm worker, house cleaner, cook, gardener, repairman, carpenter, caregiver, etc., will remain largely stable, since these jobs require complex manual abilities as well as specific intellectual skills.

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3334

Nowadays, the category of complex manual jobs employs about 19 percent of workers in OECD states, and it is considered likely that the figure will remain at roughly this level (Halal et al., 2016).

A recent report by the World Bank (2016) argues that the number of jobs directly created by digital technologies is fairly modest, but the number of jobs enabled by them can be significant, as the 10 million jobs created in online stores in China by the country's booming e-commerce demonstrates (World Bank, 2016). The same report underlines that the lives of the majority of the world's population will remain largely untouched by the digital revolution. In fact, data shows that only around 15 percent of the world's population can afford access to broadband internet, meaning that, at least in the short term, advanced internet services will remain unavailable, inaccessible, and unaffordable to the majority (Figure 1).

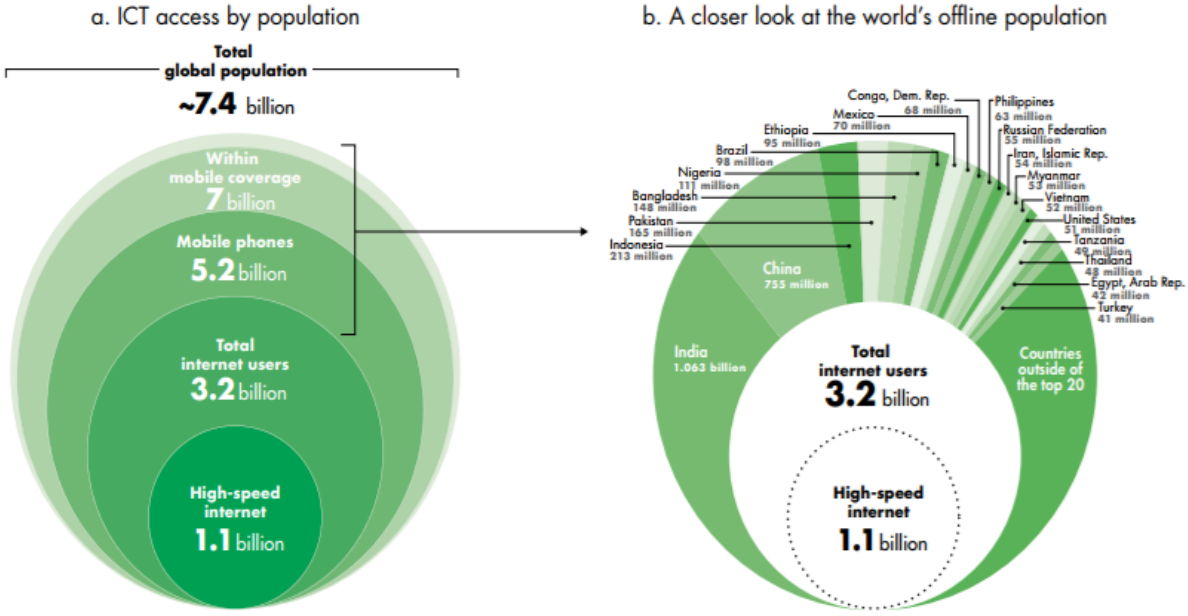


Figure 1. **Internet access by world population (source: World Bank, 2016: 8)**

As a consequence, we can expect that in developing countries the impact of digital technology does not appear to be immediate, but in the next few decades the effects of the digital divide, both physical and cultural, could be really disastrous, and will only serve to reinforce existing inequalities. In fact, the digital divide will prevent access to essential services, media, and information that will be ever more sophisticated and require broadband connection as well as digital skills.

There is broad consensus that education will play a crucial role in minimizing the negative impacts of the spread of digital technology. This article focuses on the challenges and opportunities that the digital revolution offers for sustaining

education for future jobs in a lifelong perspective. It results from an ongoing research being conducted into the labor market of the future.

Research methodology

The research was based on a systematic analysis of the literature conducted by the authors. Following the general guidelines of the systematic literature review method (Moher et al., 2009), we analyzed the current literature available on databases such as SAGE, the Institute for Employment Research, World Development Indicators, and NBER Working Papers, as well as reports published by international organizations (Eurostat, World Bank, OECD, and so on). The process of identifying and reviewing the literature was conducted in two phases in 2017. In the first phase, from January-June 2017, we searched for combinations of keywords, such as 'future professions', 'future jobs, 'new skills', 'labor market', 'technology impacts', 'labor world changes', and 'workers' challenges'. We collected a total of 245 articles and 32 reports. A screening was then made based on abstracts. We decided to eliminate material published before 2013. We also used Google scholar to evaluate the popularity of articles, taking account of their citations. At the end of the screening process, 87 articles and 11 reports were selected. In the second phase (July-December 2017), selected materials were classified according to four main themes:

- Future changes in the labor market (22 articles, 5 reports)
- Future of skills and competencies (41 articles, 8 reports)
- Future of Professions and Jobs (33 articles, 9 reports)
- Challenges for the educational system and Lifelong Learning (19 articles, 3 reports)

Some articles and reports were assigned to more than one class, on account of their overlapping content. The selected materials were then analyzed by the authors, and a preliminary report was drawn up. This will be discussed at an international meeting in order to define a new research project.

This article synthesizes the findings that emerged from our research on future skills and educational needs.

Educational issues

Experts and professionals are persuaded that investments in lifelong learning by government, industry, and professional bodies can mitigate the negative effects of technology on the labor market. Modular educational programs should be created which are constantly updated in response to changing skill demands.

From our research, the principal educational questions related to changes in the labor market can be summarized as follows:

- What are the most important skills needed to succeed in the workforce of the future?
- Which of these skills can be taught effectively via online systems through a self-learning and social learning approach?
- Which skills present teaching challenges?
- What new types of credentialing systems should support non-formal and informal learning programs?
- How can traditional educational models be improved through digital technologies?

Figure 2 presents the skills for the future, many of which involve digital competencies and innovative attitudes.

Figure 2. **Ten skills for the future (source: Tracey Wilen-Daugenti)**[1]

Experts unanimously indicate that critical thinking and creative thinking are crucial factors for the success of the future workforce.

Nevertheless, current data on the composition of the labor market seems to contradict the experts' opinion, at least in the short term. At present, workers who are really creative and innovative often encounter various difficulties to be hired, since they are considered to be problematic to manage and, therefore, less reliable. Indeed, many organizations discourage leaders from being strategic and thinking beyond what the organization is currently doing, since greater rewards are harvested by simply doing what has always been done well. In this regard, what Perry, the popular executive recruiter, observed in 2009 remains valid:

[1] Careers 3.0 Future Skills Future Work, slide presentation; available at https://www.oecd.org/site/eduimhe12/Tracey%20Wilen-Daugenti.pdf; last accessed on 10.11.2017.

Let me emphasize that creativity is not appreciated by most HR people. HR - and rightfully so - are the last bastion of risk avoidance in a company. Thinking outside the box doesn't apply. They want you in the box.[2]

Furthermore, there are also some managers who restrain innovative initiatives that they don't understand whilst, in many public institutions, ineffective information systems that don't meet the emerging needs and societal changes complicate the life of workers who are creative and critical thinking.

From our research, it emerges that acquiring skills in computational thinking could be more fruitful for promoting novel attitudes to thinking. Computational thinking is a method of thought that is used in computer sciences (Grover & Pea, 2013), but experts argue that it can also influence the way people solve any type of problem.

Computational thinking can be understood as the mental activity of formulating a problem in such a way as to admit a computational solution (Wing, 2014).

In this regard, learning coding may help to improve the way in which any kind of problem is tackled in an increasingly digitalized world.

In the near future, computational thinking could provide the skills necessary in the sphere of work, but will also bring great social benefits since it can favor the design of innovative solutions for people's livability. Computational thinking enables complex problems to be tackled in efficient ways, as well as provide for the upscaling of good solutions.

Shifting people into new professions and jobs

There is a broad consensus that the digital revolution is moving towards the reshaping of traditional professions and jobs. Experts encourage people, especially the young, to focus on skills that they want to acquire because, whilst obtaining a professional degree, for example as an architect or engineer, is clearly important, skills are the essential prerequisite to finding and maintaining a job.

In this regard, it is demonstrative that an emerging profession is that of *coach* in all its multifarious variations, such as personal coach, professional coach, career coach, executive coach, etc. Indeed, coaching is a process that aims at improving individual or organizational performance, empower leadership capability, and support professionals to meet their professional and personal goals (McNally & Lukens, R., 2006).

At the moment, to deal with the impact of digital technology on current jobs and professions, experts suggest paying attention to digital technology that will open new opportunities.

[2] https://www.theglobeandmail.com/report-on-business/strategies-for-the-job-hunt/article1200249/; last accessed on 22.11.2017.

Moreover, online learning is considered to be a crucial means by which to sustain the skilling and re-skilling of workers. Researchers and experts argue that online learning not only reduces costs and improves access but also offers the possibility of increasing the quality of the teaching/learning experience and of the evaluation of learning achievements. Accordingly, investments in online learning are hoped for, since this would create new professional skills and facilitate the transformation of current learning programs. However, experience seems to demonstrate that the human guidance in educational processes cannot be eliminated.

We found a lot of evidence pointing to the fact that new educational skills should be created to involve learners in a collaborative online environment.

Self-directed digital learning

Companies are looking for workers who professionalize themselves in order to meet the changes brought about by advances in technology. Lifelong learning is fast becoming a must for workers and a crucial requirement for their career development.

Although topical, Self-Directed-Learning (SDL) is not a new concept. Indeed, the most commonly followed definition of SDL, coming from Knowles (1975), is as a process in which individuals take responsibility for their own learning by taking the initiative in diagnosing their own learning needs, "formulating learning goals, identifying human and material resources needed for learning, choosing and implementing appropriate learning styles and evaluating the learning outcomes" (Knowles, 1975: pg. 18).

Nowadays, SDL is often put in relation to 'cooperative learning', 'collaborative learning', and social learning, which are included in the broad area of non-formal learning and sometimes of informal learning. Web based social learning is also spreading as a consequence of the application of the social network paradigm to educational processes (McIntosh, 2016).

The advent of the Internet has increased the interest of researchers and teachers in self-directed learning due to the massive amount of knowledge and support available online. However, the effectiveness of self-directed learning depends as much on the availability of effective and controlled knowledge sources as on the attitude of learners.

From our research, the success of self-directed digital learning appears to be significantly conditioned, at least in the early stages, by the guidance of trainers in the use of technology-enhanced materials for learning (Murphy et al., 2014). To use self-directed digital learning environments, learners should be taught

carefully. They have to know what it means to manage their own learning, and how to utilize the resources available online.

Furthermore, research is needed to understand the role of non-cognitive learners' attitudes in self-directed online learning environments, for example in relation to motivation, persistence, and resourcefulness.

We are persuaded that in the short term, and especially in the case of adult education, hybrid solutions should be preferred that integrate self-online learning with online collaborative guidance.

Training ecosystem

Nowadays, one of the main challenges in education and training is the definition of effective learning programs in a lifelong learning perspective. Indeed, as our research has shown, people's employability depends on various skills, such as their capacity for team-work, advanced communication, critical thinking, and problem-solving. We also found that great emphasis is put on interactive teaching and on practices that can reinforce learner's reflections and experience-based exercises.

Many authors highlight that an interactive teaching approach requires skilled trainers and well-designed programs. In this regard, we have to underline that an increasing number of educators have to deal with digital technologies that, recently, have come to include ubiquitous computing and cloud computing applications. The Internet, today, appears as a massive repository where precious information is buried under a huge mass of useless and rubbish data. As a consequence, new paradigms and tools, as well as new skills, are needed to find and handle big volumes of data available on the internet. It is possible to highlight some emerging professions in the field of Information Technology.

- *Machine learning specialist.* The demand for cognitive computing skills is gaining attention. Candidates should be skilled in unstructured data processing, statistical extraction of entities, machine learning, natural language processing, and online searching. Requirements are for a degree in Machine Learning, Statistics, Applied Mathematics, Computer Science, Information Systems, or a related quantitative discipline, with a minimum of five years of relevant experience.
- *Blockchain engineer*. A blockchain engineer is a person who is responsible for everything relating to Bitcoin in a company, and who designs procedures in order to accept and process Bitcoin transactions. They must be expert in cryptography, distributed systems, and hash algorithms, as well as in trading platform and secure identification.

- *Virtual reality engineer*. Virtual reality is not a prerogative of game applications. A virtual reality engineer is an expert in the definition and execution of advanced technologies for Virtual Reality.
- *IoT architect*. An IoT architect's job consists of designing end-to-end IoT solutions that solve real business problems in many fields (for example, in the automotive, aerospace, and medical equipment industries, and in manufacturing, electronics, telecommunications, etc.). The IoT architect position combines domain knowledge, technical skills, and the necessary competence to integrate various disciplines.
- *Cybersecurity specialist*. A cybersecurity specialist analyzes alerts from multiple and various sources within both public and private organizations in order to determine possible causes of such alerts, identifying and distinguishing between false and real cybersecurity incidents. Indeed, a cybersecurity issue takes places any adversary seeks to gain something from their activity, for example obtaining private information, undermining the system, or preventing its legitimate use (Singer & Friedman, 2014).

Finally, it is expected that IoT will spread to education, allowing the construction of intelligent instructional environments, to enrich experimental teaching, to assist educational management, and to extend educational activities outside the classroom (Harmon, Castro-Leon, & Bhide, 2015).

Conclusion

In their study, Frey and Osborn observed that engineering and science-based occupations have a low susceptibility to computerization. They argue that this is largely due to the high degree of creative intelligence that engineering and scientific tasks require.

Although the literature abounds with appreciation for innovation and creativity, organizations, especially large ones, stifle creativity with rules and provide no slack for innovation. The reasons for this are well be synthesized by Serrat:

> *Monopolistic structures, "adhocism," tight budgets, and heavy workloads can also hinder the long-term investment and commitment that is needed to truly embed a culture of innovation. Paradoxically, the need to keep up sometimes also means that new technologies or ways of working are adopted before a prior innovation takes root (Serrat, 2017: 907).*

The deficit in innovation will create serious problems for workers and citizens, since it will either disincentive the reskilling of workers, or increase the bureaucratic burden for citizens due to the computerization of procedures that have not been rethought appropriately.

Experts suggest investing in education to exploit the opportunities offered by the technological revolution. However, ongoing transformations will not wait for the reform of the current educational system. It is therefore urgent and critical to prepare educational programs in order to re-train the current workforce. In this regard, governments should develop effective policies to sustain the educational effort and favor innovation, especially social innovation, and make people aware of the challenges that await them.

References

Frey, C. B., & Osborne, M. A. (2017). The future of employment: how susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, *114*, 254-280.

Grover, S., & Pea, R. (2013). Computational thinking in K–12: A review of the state of the field. *Educational Researcher*, *42* (1), pp. 38-43. Available at: http://life-slc.org/docs/LSLC_rp_A189_Grover-Pea_ER_K-12CT.pdf; last accessed on 19.01.2018.

Halal, W., Kolber, J., Davies, O., & Global, T. (2016). Forecasts of AI and Future Jobs in 2030: Muddling Through Likely, with Two Alternative Scenarios. *Journal of Futures Studies*, *21* (2), 83-96.

Harmon, R. R., Castro-Leon, E. G., & Bhide, S. (2015, August). Smart cities and the Internet of Things. In *Management of Engineering and Technology (PICMET), 2015 Portland International Conference on*, 485-494).

Knowles, M. (1975). *Self-directed learning: a guide for learners and teachers*. Follett.

Kwahk, K. Y., & Park, D. H. (2016). The effects of network sharing on knowledge-sharing activities and job performance in enterprise social media environments. *Computers in Human Behavior*, *55*, 826-839.

Leonardi, P. M. (2015). Ambient Awareness and Knowledge Acquisition: Using Social Media to Learn" Who Knows What" and" Who Knows Whom". *Mis Quarterly*, *39* (4), 747-762.

McIntosh, D. (2014). Vendors of learning management and e-learning products. *Learning Management Vendors*, *2014*, 88-96.

McNally, K., & Lukens, R. (2006). Leadership development: An external-internal coaching partnership. *Journal of Nursing Administration*, *36* (3), 155-161.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement, *PLoS Med. 6* (7). Available at: http://journals.plos.org/plosmedicine/article?id= 10.1371/journal.pmed.1000097; last accessed 19.01.2018.

Murphy, R., Snow, E., Mislevy, J., Gallagher, L., Krumm, A., & Wei, X. (2014). Blended learning report. *Michael & Susan Dell Foundation*. Available at: https://www.edweek. org/media/msdf-blended-learning-report-may-2014.pdf; last accessed 19.01.2018.

Serrat, O. (2017). *Knowledge Solutions: Tools, Methods, and Approaches to Drive Organizational Performance*, Springer.

Singer, P. W., & Friedman, A. (2014). *Cybersecurity: What Everyone Needs to Know*. Oxford University Press.

van Zoonen, W., Verhoeven, J. W., & Vliegenthart, R. (2016). How employees use Twitter to talk about work: A typology of work-related tweets. *Computers in Human Behavior*, *55*, 329-339.

Wing, J. (2014). Computational thinking benefits society. *40th Anniversary Blog of Social Issues in Computing, 2014*. Available at: http://www.utad.pt/vPT/Area2/eventos/Documents/Artigo%203.pdf; last accessed on 19.01.2018.

World Bank (2016). *Digital Dividends. World Development Report 2016,* The World bank.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 348-356

HABITS OF USING INTERNET AND DIGITAL DEVICES IN EDUCATION

Kristine Mackare

Anita Jansone
Liepaja University, Latvia

Abstract. *According to Central Statistical Bureau data of 2017 at least 46.8 % of Latvian population are involved in educational activities. Such digital devices as computers (both desktop computers and laptop computers), tablets, smartphones, book readers, etc. and the internet directly or indirectly are used in both formal and non-formal education. Digital devices can be used in training or study process, or some part of it directly, as well as students or training participants may be assigned tasks to be performed with these devices – searching for information, reading and learning e-material, writing articles, etc. In addition to statistical data research, two e-polls were conducted for respondents who are computer users in different age groups. Respondents were asked about their habits in using the internet and digital devices, additional interest was about which of the digital tools are used and for what purposes these devices are used. All answers have been analysed. The survey results show that the responses provided by the participants of the sample group are very close to the whole population, both for the use of the Internet and digital devices. The results also show the purpose of using digital devices, especially in education, and which devices are most commonly used for each purpose. More than 90 % of respondents use digital devices to get information. In order to participate successfully in e-learning and e-studies, users need both good e-skills and well-designed e-learning materials: high-quality content, comfortable, easy-to-understand and comprehensible text, suitable formatting parameters of text.*
Keywords: *education, e-study, Information Technologies, internet, users' habits, digital devices.*

Introduction

Can you imagine your daily routine without the Internet or digital devices? According to Internet World Stats data of 2017, at least 51.7 % of world population use the Internet. (Miniwatts Marketing Group, 2017; Kemp, 2017) It depends on the world region but there are 80.2 % Internet users in Europe (Miniwatts Marketing Group, 2017) and 85.7 % in the EU. (Miniwatts Marketing Group, 2017) Growth of the Internet usage is incredible. Average growth rate is 976.4 % in World during last 17 years. (Miniwatts Marketing Group, 2017)

There are 66 % unique smartphone users worldwide (Report, 2017) and more than 31-34 % active smartphone users. (Statista, 2017) In Europe it is almost

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3248

100 % and 40 % respectively. (Report, 2017) Annual growth of active smartphone usage is 30 % worldwide and 11 % in Europe. Also, Internet use on mobile phone at least 46-50 % of total population (year-on-year change +30 %), laptop and desktop computers – 45 % (year-on-year change -20 %), tablet devices – 5 % (year-on-year change -5 %) and other devices – 0,12 % (year-on-year change +33 %). (Report, 2017) This is still increasing at an impressive rate. We all are part of it.

The Internet is no longer just a rare-use information search place, and devices are no longer just sometimes-helping tools - it's the "must-have engine" of modern society. It is connecting us to the people and things daily and the process of transforming numerous areas of our everyday lives. As a result, it is becoming a norm to get most information through it.

Digital devices provide information and knowledge. Digital devices can be divided into two main categories. First, we find the devices specifically designed for reading, like Kindle from Amazon, which use electronic ink on their screens. In the second category, there is the rest of the digital devices used in digital life: tablets, computers, cell phones, smartphones, televisions. They are not specifically designed for reading. (Martinez & López-Río, 2015)

Reading research shown that screen reading is much difficult (Khan & Khushdil, 2013). There are seen different effect on reading, learning and comprehension as well as on vision functions. (Olyslager, 2012; Khan, & Khushdil, 2013)

Internet and digital devices have deeply rooted themselves into schools and universities. Students are increasingly moving away from paper books toward screens. E-learning and e-study have become common practice in the education and study system. Such digital devices as computers (both desktop computers and laptop computers), tablets, smartphones, book readers, etc. and internet directly or indirectly are used in both formal and non-formal education. Digital devices can be used in the training or study process, or some part of it directly as well as students or training participants may be assigned the tasks to be performed with these devices - information searching, reading and learning of e-material, writing articles, etc. (Vincent & Haddon, 2018; Saulles, 2015)

It is known, nowadays, getting knowledge by using digital devices and the Internet begins in the education process as early as kindergarten and continues all life. Reading on digital devices has become a widely debated issue in mass media and academia (Martinez & López-Río, 2015). But how much and how often the Internet and digital devices are used in Latvia for getting knowledge?

The aim of the study is to review the current situation in usage of the Internet and digital devices in Latvia, especially in the field of education.

Also, these results are planned to be used in research to develop a tool for formatting e-materials based on vision science and user-preferences: to make sure

what reading on digital devices is up to date and research end-goal is important and up to date in the current situation worldwide. Main question is how to help and facilitate reading and comprehension as well as make it suitable for visual features.

Research methodology

First, Central Statistical Bureau data research has been made. There have been used data about Latvian inhabitants for an overview of the current situation: Latvian population distribution by age, gender; if they are involved in educational activities and in that kind of education; internet and computer using habits; what kind of problems want-to-learn persons meet.

Second, additional to statistical data research, two e-surveys in Latvian were conducted for respondents from Latvia. They were freely available online. Respondents are Latvians and computer and Internet users in different age groups. All respondents participated in the surveys on a voluntary basis.

Respondents were asked about their internet and digital devices using habits, additional interest were about which of the digital tools are used and for what purposes these devices are used. All answers have been analysed.

Data analysis methods

Statistical data and e-surveys descriptive statistics analysis have been made.

An overview of current situation

According to Central Statistical Bureau data of 2017, the population of Latvia is 195,0116 people. (CSB, 2017) Of course, it is only 0.03 % of the world population but each person in the world is very important. For population distribution Worldwide and in Latvia see Table 1.

Statistical data show that at least 46.8 % of the Latvian population are involved in educational activities: 94.3 thousand are pre-school students, 215 thousand - pupils in general education schools, 29 thousand - students in professional education establishments, 82.9 thousand - students in universities and colleges, and 485.9 thousand - in non-formal education. (CSB, 2017)

Table 1 **Population distribution Worldwide and in Latvia**

Distribution	Global Overview report, 2017, Worldwide	%	Central Statistical Bureau data, 2017, Latvia	%
Total	7476000000	100	1950116	100
Females	3705000000	49,6	1054433	54,1
Males	3771000000	50,4	895683	45,9
0-4 y.o.	655000000	8,8	106973	5,5
5-9 y.o.	632000000	8,5	101634	5,2
10-14 y.o.	610000000	8,2	94980	4,9
15-19 y.o.	600000000	8,0	85799	4,4
20-24 y.o.	601000000	8,0	102510	5,3
25-29 y.o.	612000000	8,2	137155	7,0
30-34 y.o.	564000000	7,5	138635	7,1
35-39 y.o.	514000000	6,9	125024	6,4
40-44 y.o.	490000000	6,6	132105	6,8
45-49 y.o.	471000000	6,3	133550	6,8
50-54 y.o.	425000000	5,7	135855	7,0
55-59 y.o.	342000000	4,6	144574	7,4
60-64	303000000	4,1	123413	6,3
65-69	235000000	3,1	110632	5,7
>70	422000000	5,6	277277	14,2

Table 2 **Computer and Internet use distribution, % to all population of Latvia**

Distribution	Have used ever		Use regularly: (at least once a week)	
	Computer	Internet	Computer	Internet
Total	84,1	84,2	76,2	78,5
Males	84,1	84,3	76,4	78,6
Females	84,0	84,0	76,1	78,3
16-24 y.o.	99,5	99,5	95,8	98,9
25-34 y.o.	99,6	99,7	92,9	97,3
35-44 y.o.	95,3	96,0	89,6	92,5
45-54 y.o.	87,3	87,5	78,7	80,0
55-64 y.o.	72,4	72,3	61,6	62,6
65-74 y.o.	45,6	45,3	34,9	35,5
Pupils, students	99,7	99,5	95,8	98,4

Statistical data in January 2017 show that 84.2 % of the population of Latvia have used the Internet and 84.1 % - computer but 78.5 % regularly used (at least once a week) the Internet and 76.2 % - computer. (CSB, 2017) But data in Jun /

July 2017 show that 85.6 % of Latvians use the Internet. (Miniwatts Marketing Group, 2017) It is 1.4 % grow of the Internet usage in 6 months. It is a huge growth amount for such a small country as Latvia.

Also, almost all pupils and students use both computer and the Internet. The least use of computer and the Internet are in 65-74 y.o. group of population. See Table 2.

Results of surveys

Two e-questionnaires have been analysed. There are 146 respondents (102 females and 44 males) in Questionnaire 1 and 106 (70 females and 26 males) – in Questionnaire 2. As the target group was computer users, the results are not surprising, they showed that all respondents use the Internet regularly.

Only 6.8 % of respondents in Questionnaire 1 use the Internet less than once a day. Questionnaire 2 doesn't have such data. Mostly, in both surveys, respondents use the Internet several times per day (temporarily) – about 41 %. Nearly ¼ of Internet users admit that they use the Internet almost continuously all-day long. See Table 3.

Data show that all respondents not only use the Internet but also different digital devices. The most popular digital device among respondents is the smartphone. Both laptop and desktop computers follow it. The least popular are book readers. See Table 4.

Table 3 **Internet use frequency**

	Users' Questionnaire 1		Users' Questionnaire 2	
Internet usage frequency	Number of respondents	%	Number of respondents	%
several times per day (temporarily)	54	40,9	42	40,8
every day	39	29,5	13	12,6
almost continuously all-day long	32	24,2	48	46,6
less than once a week	5	3,8		
2-3 times a week	4	3,0		

Table 4 **Internet and digital device use**

	Number of answers	%
Internet	106	100,0
Smartphone	81	76,4
Laptop	80	60,6
Desktop computer	69	52,3
Tablet	49	37,1
Book reader	16	12,1

Not only the Internet is used a lot. 45.6 % of respondents use digital devices almost continuously all-day long. One third use them several times per day for a long time. Only 5.8 % use devices every day but rarely. See Table 5.

Table 5 **Digital device usage frequency**

Digital device usage frequency	Number of respondents	%
almost continuously all-day long	47	45,6
several times per day (each time more than 20 min)	34	33,0
several times per day (each time less than 20 min)	16	15,5
every day (rarely)	6	5,8

98.6 % respondents of Questioner 1 and 96.2 % respondents of Questioner 2 use digital devices for getting knowledge in different ways. 78.1 % of respondents use digital devices for learning and study e-material reading and 75.3 % - for creating them. Directly for e-learning and e-study devices have been used by 65.1 % of respondents. Most respondents use digital devices for the Internet access, e-mail reading and social media access. Also, there are other different device using purposes. See Table 6.

Table 6 **Purposes of all digital device usage**

Purpose	Number of answers	%
Total number of respondents	146	100
Internet access	129	88,4
E-mail reading	123	84,2
Social media (Facebook, Instragram, Twitter)	121	82,9
Learning / study material reading	114	78,1
Work / personal document reading	113	77,4
Work / personal document creating	113	77,4
Learning / study material creating	110	75,3
Long text reading	109	74,7
Game playing	108	74,0
e-Learning/ e-study	95	65,1
Book reading	87	59,6
Other reasons	53	36,3

For book reading, e-mail reading, social media access, game playing, and other purposes, that are not mentioned, the most popular device is smartphone. For learning and study e-material reading and creating, work and personal

document reading and creating, long text reading, and e-study and e-learning respondents most often use laptops.

Table 7 **Digital device and purpose**

Digital device	Book reading		Learning / study material preparing		Learning / study material reading	
	resp.sk.	%	resp.sk.	%	resp.sk.	%
Smartphone	23	17,4	33	25,0	40	30,3
Laptop	18	13,6	67	50,8	56	42,4
Desktop computer	15	11,4	45	34,1	41	31,1
Tablet	16	12,1	15	11,4	18	13,6
Book reader	19	14,4	8	6,1	8	6,1
Don't use for this purpose	22	16,7	8	6,1	9	6,8
	Work / personal document preparing		Work / personal document reading		Long text reading	
	resp.sk.	%	resp.sk.	%	resp.sk.	%
Smartphone	15	11,4	39	29,5	41	31,1
Laptop	66	50,0	59	44,7	58	43,9
Desktop computer	51	38,6	46	34,8	34	25,8
Tablet	12	9,1	24	18,2	22	16,7
Book reader	0	0,0	6	4,5	7	5,3
Don't use for this purpose	7	5,3	6	4,5	11	8,3
	E-mail reading		Social media		Game playing	
	resp.sk.	%	resp.sk.	%	resp.sk.	%
Smartphone	81	61,4	101	76,5	65	49,2
Laptop	63	47,7	57	43,2	43	32,6
Desktop computer	51	38,6	38	28,8	35	26,5
Tablet	26	19,7	29	22,0	30	22,7
Book reader	0	0,0	1	0,8	0	0,0
Don't use for this purpose	3	2,3	5	3,8	8	6,1
	e-learning / e-study		Other reasons			
	resp.sk.	%	resp.sk.	%		
Smartphone	35	26,5	28	21,2		
Laptop	53	40,2	21	15,9		
Desktop computer	31	23,5	22	16,7		
Tablet	13	9,8	11	8,3		
Book reader	4	3,0	3	2,3		
Don't use for this purpose	10	7,6	15	11,4		

Analysis the purpose of digital device usage shows that all devices are multipurpose. Tablets are mostly chosen for game playing, book reader devices -

for book reading, smartphone – for social media access, laptop – for work and personal document reading, and desktop computers – for work and personal document creating and e-mail reading. For book reading and other reasons not mentioned in the table, digital devices are used the least. For more detailed view see Table 7.

Conclusions

The survey results show that the choice group responses are very close to the whole population in Latvia and Worldwide, both for the use of the Internet and digital devices.

Results show that all digital devices are multipurpose. Most popular are smartphones and laptops. Most respondents use digital devices for the Internet access, e-mail reading and social media access.

Nearly half of respondents use digital devices almost continuously all-day long. It brings a big near work load for vision system daily, which, in turn, brings us to big nowadays problem – myopia progress Worldwide.

As at least 96.2 % respondents use digital devices for getting knowledge in different ways, it is important to know how devices affect users' reading and learning possibilities and try to eliminate disadvantages and improve digital device suitability for getting knowledge.

To successfully participate in e-learning and e-studies, users need both good e-skills and well-designed e-learning materials: high-quality content, comfortable, easy-to-understand and comprehensible text, suitable formatting parameters of text.

Summary

The purpose of this study was to show the present situation of the Internet and digital devices usage in population worldwide and in Latvia. It was theoretical research of statistical data global and local. Additional e-surveys helped to get more detailed information on how often the users of the Internet use digital devices and what their purposes are.

The most important finding is that nearly half of the respondents use digital devices almost continuously all-day long as well as that at least 96.2 % respondents use digital devices for getting knowledge in different ways.

It shows that information reading in digital devices is up to date. It means, that research end-goal - development of a tool for formatting e-materials based on vision science and user-preferences - is important and up to date for the current situation worldwide and for the population nowadays.

As digital devices and learning by using devices is topical nowadays, the questions arise how it affects population's vision system and quality of life. Are digital devices suitable for comfortable knowledge getting? How is it possible to improve quality of text comprehension from screens?

References

CSB (2017). *Centrālā statistikas pārvaldes dati*. Retrieved from http://www.csb.gov.lv/dati/statistikas-datubazes-28270.html

Khan, M. K. (2013). Comprehensive Study on the Basis of Eye Blink, Suggesting Length of Text Line, Considering Typographical Variables the Way How to Improve Reading from Computer Screen. *Advances in Internet of Things Vol.3 No.1*.

Kemp, S. (2017). *Digital in 2017: global overview*. Retrieved from https://wearesocial.com/special-reports/digital-in-2017-global-overview

Martinez, G. V., & López-Río, J., (2015). About the Horrific Peril of Reading on Digital Devices. *Procedia - Social and Behavioral Sciences 00 (2015) 000–000*

Miniwatts Marketing Group (2017) *Internet usage statistics*. Retrieved from http://www.internetworldstats.com/stats.htm

Miniwatts Marketing Group (2017) *Internet Usage in the European Union*. Retrieved from http://www.internetworldstats.com/stats9.htm

Olyslager, P. (2012). *The Optimal Text Layout is More Than Line Length*. Retrieved from https://www.paulolyslager.com/optimal-text-layout-line-length/

Report from We Are Social and Hootsuite (2017). *Global Digital Statshot Q3 2017*. Retrieved from https://www.slideshare.net/wearesocialsg/digital-in-2017-global-overview

Saulles, D. M. (2015). *Information 2.0: New models of information production, distribution, and consumption*, Second edition, Facet Publishing, London.

Statista (2017) *Number of smartphone users worldwide from 2014 to 2020 in billions*. Retrieved from https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

Vincent, J., & Haddon, L. (2018). *Smartphone Cultures*. Routledge, NY.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 357-368

ОРГАНИЗАЦИОННЫЕ И ТЕХНОЛОГИЧЕСКИЕ ПРИНЦИПЫ ПОСТРОЕНИЯ SMART-ПЛАТФОРМЫ ЦИФРОВОЙ ОБРАЗОВАТЕЛЬНОЙ СРЕДЫ СОВРЕМЕННОГО УНИВЕРСИТЕТА

Organizational and Technological Principles of Building a Smart Platform for Digital Educational Environment of a Modern University

Irina Maslova

Aleksei Frolov

Anron Uzharinskyi
Orel State University named after I. S. Turgenev, Russian Federation

Abstract. *The article presents conceptual architectural and technological solutions. In the article is justified application of technology and integration of SMART subsystems platform based on a single integrating data schema. The structure of the integrated information and computing environment, based on the classical architecture of SOA and differing by the presence of a repository of services which stores information about all available web services and the ability to remotely call the methods of services by clients.*
Keywords: *digital university, digital educational environment, information and computing environment, integration of information systems, data integration scheme.*

Введение
Introduction

Активное развитие и внедрение информационных технологий во все сферы жизни общества ознаменовали появление нового типа экономик – цифровой экономики. ВУЗы, как передовая инфраструктура, работающая с молодыми и для молодых, одними из первых отреагировали на эти тенденции и отдельные вузовские процессы автоматизированы и интегрированы с сетевым пространством Интернет уже более 15-20 лет.

Государственная программа «Цифровая экономика Российской Федерации» реализуется в соответствии со «Стратегией развития информационного общества в Российской Федерации на 2017-2030 годы», основным направлением которой является создание условий для развития

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3407

общества знаний. Одна из целей Стратегии – создание экосистемы цифровой экономики на основе эффективного взаимодействия научно-образовательного сообщества с бизнесом, государством и гражданами.

Согласно официальным прогнозам, цифровое образование сейчас – один из самых быстрорастущих сегментов мирового рынка образования. Темпы ежегодного прироста составляют в среднем 23 % с 2012 года по настоящее время. Но в общем объеме образовательных услуг доля цифрового образования составляет всего 3 %. Более 50 % всего рынка принадлежит США.

Потенциал российского рынка цифрового образования очень высок – темпы прироста в целом выше среднемировых (более 25 %), при том, что объем российского рынка представлен на уровне 10,7 млрд рублей. Факторами, позволяющими сделать вывод о значительном потенциале российского рынка цифрового образования, являются следующие: большая географическая территория страны и удаленность ряда территорий от центральных образовательных организаций, а также со значительным уровнем развития доступа к широкополосному Интернету (охват 73,41 % населения). Также стабильно растет рынок «облачных» услуг - примерно на 40 процентов ежегодно.

Таким образом, цифровые технологии становятся все доступнее и все более востребованы, поэтому ведущие вузы страны создают агрегированные интернет-порталы для дистанционного открытого обучения. Большинство таких вузов расположено в Москве и Санкт-Петербурге, однако региональный охват становится все шире, достаточно развит в этом направлении дальневосточный регион, республика Татарстан, Якутия и др.

Инновационные подходы в образовательной среде, включая практическое применение современных информационно-коммуникационных технологий, способствуют формированию условий для развития последующих поколений граждан Российской Федерации, формирования компетенций в будущем востребованных специалистов на рынке труда, подготовленных к эффективной и качественной трудовой деятельности в условиях развития информационного общества. Обучающиеся включаются в научно-исследовательские проекты и творческие разработки, чтобы с целью получения навыков создания, понимания и осваивать нового, представления авторских мыслей, реализации решений, а также оказывать помощь друг другу, при обозначении интересов и понимания возможностей.

В настоящее время активно развернулся процесс информатизации учебно-воспитательного процесса и очень актуальным становится использование различных информационных систем (ИС). Оснащение образовательных учреждений локальными сетями позволило объединить в

единую структуру отдельные рабочие места педагогов и учащихся и осуществить сетевое взаимодействие между ними. Этот фактор повлиял на переход педагогов от применения в своей работе однопользовательских цифровых образовательных предметных ресурсов к использованию интегрированных систем, установленных на сервере образовательного учреждения, объединяющих на одной платформе разные предметы школьного курса, имеющих единый интерфейс и систему управления.

Цифровизация образования позволяет создавать комфортные условия обучения для различных групп лиц, не имеющих возможности очного посещения занятий, что достигается за счет применения дистанционных технологий обучения.

Однако сосредоточение управленческих усилий на образовательном направлении деятельности вузов приводит к разрыву в уровне цифровизации с управленческой, научной, воспитательной видами деятельности, отсутствию системности в управлении цифровым университетом, что сказывается на уровне качества образования.

В последнее время возникает потребность в активном использовании проектного подходе в менеджменте вузов, так как отдельные образовательные программы, научно-исследовательские, международные проекты требуют новых подходов к управлению в дополнение к традиционному процессному подходу, лежащему в основе концепции Системы менеджмента качества. Система управления процессами и проектами на основе информационных технологий для обеспечения качества сильно отстает от потребностей цифровой экономики, особенно в регионах. Применение информационных технологий с позиций системного подхода способствует повышению качества управления на основе сочетания процессного и проектного подходов, для чего предлагается создание сетевой SMART-платформы с открытой архитектурой.

Данная платформа может быть построена на основе следующих принципов. Необходима разработка пакетов методологической базы и согласованного концептуального подхода к построению модели SMART-платформы на основе изучения лучших международных практик, а также рекомендаций по формированию политики и стратегии управления цифровым университетом с позиций системного подхода. Актуальным является проработка технологии интеграции модели цифрового университета при различных уровнях цифровизации образовательной среды (e-learning и b-learning), в том числе для трансляции неявных знаний лидерами мнений. Необходимо проработать методику построения модернизированной инфраструктуры университета, в основе которой лежит широкое применение технологий «Интернета вещей», разработанной на основе анализа современного состояния цифровизации образования в мире.

Необходимо разработать Методику внедрения в модель цифрового университета современных технологий менеджмента образовательной и научной среды на основе сочетания процессного и проектного подходов: lean-менеджмент, SCRUM, SMART Tribes, Agile. На основе проработки концептуальных вопросов деятельности цифрового университета разрабатывается модель виртуальной международной научно-образовательной сети на базе онлайн-платформы.

Технологические принципы построения SMART-платформы Концептуальные архитектурные решения и технологии построения SMART-платформы

Technological principles of SMART platform. Conceptual architectural solutions and technologies to build SMART platforms

Рассмотренные выше организационные принципы построения и развития SMART-платформы современного университета определяют принципиальные архитектурные решения и технологии построения информационно-вычислительной среды.

1. SMART-платформа – это интеллектуальная, построенная на единой организационно-технической идеологии, адаптируемая под задачи конкретного университета информационно-вычислительная среда.
2. SMART-платформа – это набор облачных сервисов, обеспечивающих подключение университетов, их объединение в консорциумы, с предоставлением функционала как для цифровизации внутренних процессов университетов, так и их сетевого взаимодействия.
3. SMART-платформа должна включать также сервисы, обеспечивающие вовлечение в цифровую среду университета и сетевую среду консорциума абитуриентов, студентов, преподавателей и исследователей.
4. SMART-платформа должна строиться по модульному принципу, с участием широкого консорциума разработчиков – университетов и компаний, интегрирующих в нее свои подсистемы – «лучшие практики».
5. SMART-платформа должна использовать защищенное хранилище данных о деятельности университетов.

Современный уровень развития инфокоммуникационных технологий обеспечивает широкий спектр решений и инструментов для построения SMART-платформы. Поэтому основной организационно-технической проблемой представляется необходимость интеграции разнородных систем

различных университетов и компаний в единую информационно-вычислительную среду. С одной стороны это требование обусловлено невозможностью построения SMART-платформы «с нуля» за разумное время и при разумных финансовых вложениях. С другой стороны это требование определяет важную научно-техническую проблему интеграции разнородных информационных систем в web-среде с учетом специфики видов деятельности современных университетов. С развитием сетевых технологий, облачных платформ и приложений эти проблемы приобретают особую значимость и популярность. Анализ различных технологий интеграции разнородных приложений показывает, что наиболее целесообразной при построении SMART-платформы представляется технология интеграции на основе единой интегрирующей схемы данных, являющаяся наиболее гибкой и простой в реализации.

Современные подходы к решению задачи интеграции данных разнородных приложений
Current approaches to solving the problem of data integration for heterogeneous applications

Задача интеграции данных заключается в объединении информации, находящейся в различных источниках и предоставлении универсального механизма для доступа к ней пользователям (Liu et al., 2017).

В литературе описывается два основных подхода к решению данной задачи – это интеграция данных на физическом уровне и интеграция данных на логическом уровне. Первый подход предполагает физическое извлечение данных из источников и сохранение их в едином формате для реализации эффективных механизмов поиска и обработки информации по запросам пользователей (McKendrick, 2016). Популярным в настоящее время примером реализации данного подхода является технология Hadoop data integration с применением Apach Spark технологии поиска данных. Данная концепция базируется на принципе кластеризации и распределённого хранения информации и выполнения вычислений. Для этого используется распределённая файловая система Hadoop Distributed File System (HDFS). Данные из внешних источников должны быть загружены в эту систему с помощью процедуры импорта. После этого над ними можно выполнять различные операции, такие как агрегация, анализ и преобразование. Узкие места данного подхода заключаются в дублировании хранимой информации, необходимости наличия большого количества распределённых серверов для хранения и обработки информации, сложность актуализации информации в реальном времени.

Преимуществами данного подхода является высокая эффективность выполнения операций по поиску и обработке данных в системе.

Для преодоления основного ограничения первого подхода связанного с ограниченностью возможностей физического хранения данных предлагается подход с использованием логического хранилища данных. Данный подход предполагает, что данные не перемещаются в единое хранилище. Вместо этого предоставляются логические представления для различных источников данных (McKenna, 2017). В качестве источников данных могут выступать, как облачные сервисы и файловые хранилища, так и простые базы данных отдельных приложений. Примерами таких систем являются системы класса Sales force Service Cloud и integration platform as a service (IPaaS). Данные системы предоставляют набор сервисов для доступа к информации из различных источников. При этом каждая группа пользователей работает только со своей информацией, не задумываясь о том где и как физически хранятся данные. Логические хранилища данных могут масштабироваться для размещения любого объема данных в любом количестве источников для удовлетворения текущих и будущих потребностей. Однако отсутствие единого представления и структуры данных приводит к проблемам, связанным с извлечением и агрегацией данных из разных источников при обработке запросов. Это снижает производительность таких систем.

Анализируя современные подходы к интеграции данных в распределённых системах можно выделить следующие основные тенденции в области создания технологий интеграции (Krishnan, 2016; Wu, 2016):

1. Интеграция приложений выполняется в основном через службы REST и SOAP.
2. Интеграция данных большого объема возможна с применением hadoop баз данных, или в хранилище данных на основе облачных вычислений.
3. Интеграция должна быть основана на событиях, а не времени.
4. Интеграция в первую очередь ориентирована на документы.
5. Интеграция гибридная и охватывает сценарии cloud-cloud и cloud-ground.
6. Интеграция сама по себе должна быть доступна через OSAP / REST.
7. Интеграция должна быть гибкой.
8. Интеграция должна предоставляться как услуга.

Более подробно содержание описанных тенденций раскрыто в работе V. Krishnan (2016). На основе описанных трендов можно прийти к выводу, что современная система интеграции должна представлять из себя

облачный портал, построенный на сервис-ориентированных технологиях и доступный как сервис для пользователей. Данное приложение должно обладать гибкостью и возможностью настройки под конечные задачи пользователей, содержать в себе логическую модель данных, описывающую потребности конечного пользователя и абстрагированную от особенностей реализации.

Структура интегрированной информационно-вычислительной среды
Structure of the integrated information-computational environment

Структура интегрированной информационно-вычислительной среды включает в себя набор разрозненных самостоятельных сервисов, взаимодействующих друг с другом с помощью центрального сервера интеграции и управления web-сервисами (Крюков, 2007). Описанная структура интегрированной среды представлена на рисунке 1.

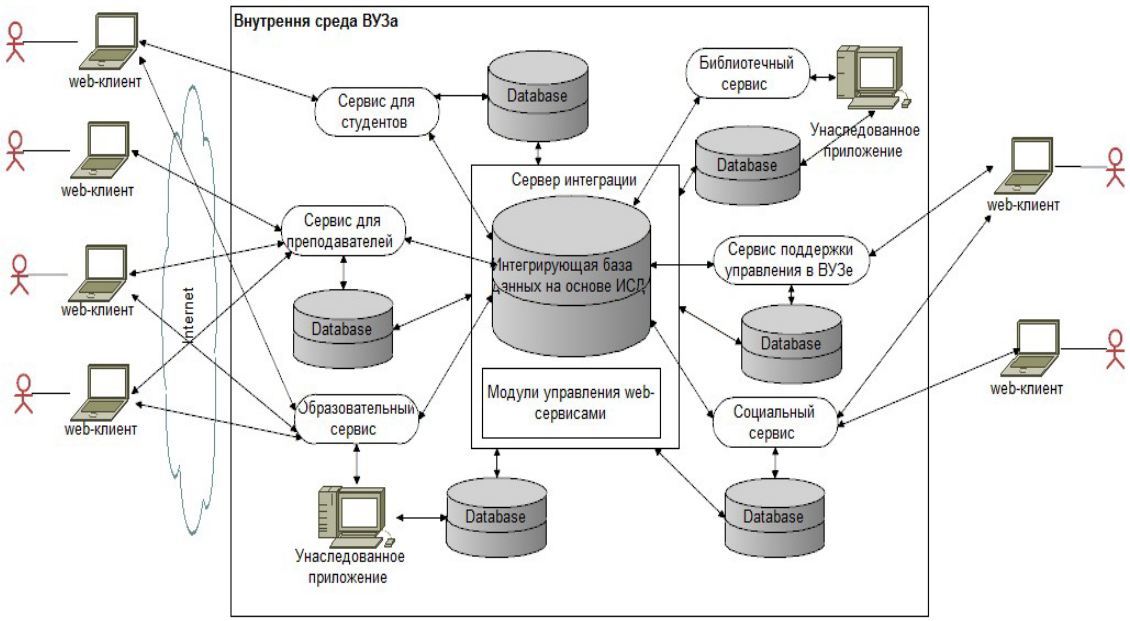


Рисунок 1. **Структура интегрированной системы управления ВУЗом с использованием web-сервисов**
Figure 1. ***Structure of the integrated system of University management using web services***

Структура интегрированной среды базируется на классической архитектуре SOA. Характерными особенностями данного подхода является наличие репозитария сервисов, хранящего информацию обо всех доступных web-сервисах, возможность удалённого вызова методов сервисов из удалённых клиентов, использование стандартного формата сообщений и языка xml для взаимодействия между сервисами. Ключевым отличием

предложенной структуры системы является использование сервера интеграции и управления web-сервисами.

Общая методика и пример интеграции сервисов
The general methodology and example of service integration

На основе описанной архитектуры smart-платформы разработана методика интеграции информационных ресурсов. Данная методика включает в себя два этапа. На первом этапе осуществляется процесс настройки smart – платформы для работы с различными источниками. Основными задачами этого этапа являются:

1. Анализ структуры и информационных потоков интегрируемых источников. Необходимо выявить информацию, хранящуюся в источнике, определить формат представления и хранения этой информации, способы доступа к источнику данных и получения требуемой информации.
2. Анализ бизнес процессов и проектирование информационных потоков сервисов, предоставляемых разработанной smart-платформой. В рамках данной задачи необходимо определить какие информационные сервисы будут предоставляться в рамках разработанной smart-платформы и какие информационные ресурсы необходимы для поддержки их функционирования.
3. Проектирование единой интегрирующей схемы данных (ИСД IDM (Integration Data Model)) для описания информационных ресурсов smart-платформы. ИСД занимает ключевое место в процессе интеграции и служит для моделирования предметной области и описывает общую схему данных для всех сервисов и объектов, входящих в состав smart-платформы. Информационный обмен между сервисами и smart-платформой будет осуществляться в терминах разработанной схемы данных. В связи с этим к ИСД предъявляются следующие требования:
   - схема должна максимально полно отражать все сущности предметной области и удовлетворять информационным потребностям существующих и подключаемых в будущем сервисов.
   - схема должна быть адекватной доступным или предполагаемым источникам данных, которые будут интегрироваться.
   - схема должна быть независима от физических особенностей хранения информации в интегрируемых источниках.

В качестве базовой модели для построения ИСД в smart-портале применяется объектно-ориентированная модель данных в связи с её гибкостью и наибольшим соответствием реальным объектам и отношениям предметной области. В соответствии с данной моделью необходимо настроить классы объектов, их методы и атрибуты.

4. Описание алгоритмов для преобразования данных из интегрируемых источников к структуре, прописанной в ИСД. При подключении нового источника данных к smart-порталу необходимо настроить компонент адаптер, который будет связан с источником, и предназначен для осуществления обработки первичной информации, поступающей от источника в систему. Для типовых источников данных с известной структурой возможно применение стандартных адаптеров, реализованных в системе. Для настройки более гибких алгоритмов преобразования в smart-портале предусмотрен механизм создания пользовательских сценариев обработки данных на формальном языке описания правил манипулирования данными, основанном на базе аппарата реляционной алгебры, дополненного и расширенного с учётом объектной структуры данных.

Второй этап – организация непосредственного доступа к данным smart-платформы для пользователей. Основными задачами данного этапа являются:

1. Обработка запросов пользователей и предоставление им требуемых данных в установленном формате. Для решения данной задачи в рамках smart-платформы реализованы алгоритмы трансляции и выполнения запросов на доступ к данным. В качестве языка запросов используется объектный язык Object SQL. В процессе трансляции запроса определяются источники данных, в которых хранятся требуемые информационные ресурсы. При выполнении запроса с использованием разработанных адаптеров происходит доступ и преобразование данных от интегрируемых источников. Полученные результаты консолидируются и направляются адресату запроса в установленном формате.
2. Разграничение доступа к данным. Для решения данной задачи в рамках smart-платформы реализован гибкий механизм разграничения прав, основанный на ролевой модели. Существует несколько категорий прав для пользователя, которые назначаются для каждого отдельного объекта или группы объектов.

Рассмотрим реализацию предложенной методики на примере интеграции библиотечных информационных ресурсов. Существуют разные

форматы описания библиотечной информации – MARC, ISDB, Z39.50. В процессе обработки запроса необходимо получить данные о наличии литературы из различных библиотечных систем. В рамках при обработке данного запроса определяются все информационные источники, содержащие данную информацию. После этого через адаптеры этих источников рассылаются запросы и получаются результаты в формате выбранного источника. Полученные результаты преобразуются адаптерами к единому объектному представлению, описанному в ИСД. Дальше происходит анализ полученных результатов, формируется результирующая выборка данных и полученные результаты отправляются адресату. Описанный механизм работы портала представлен на схеме на рисунке 2

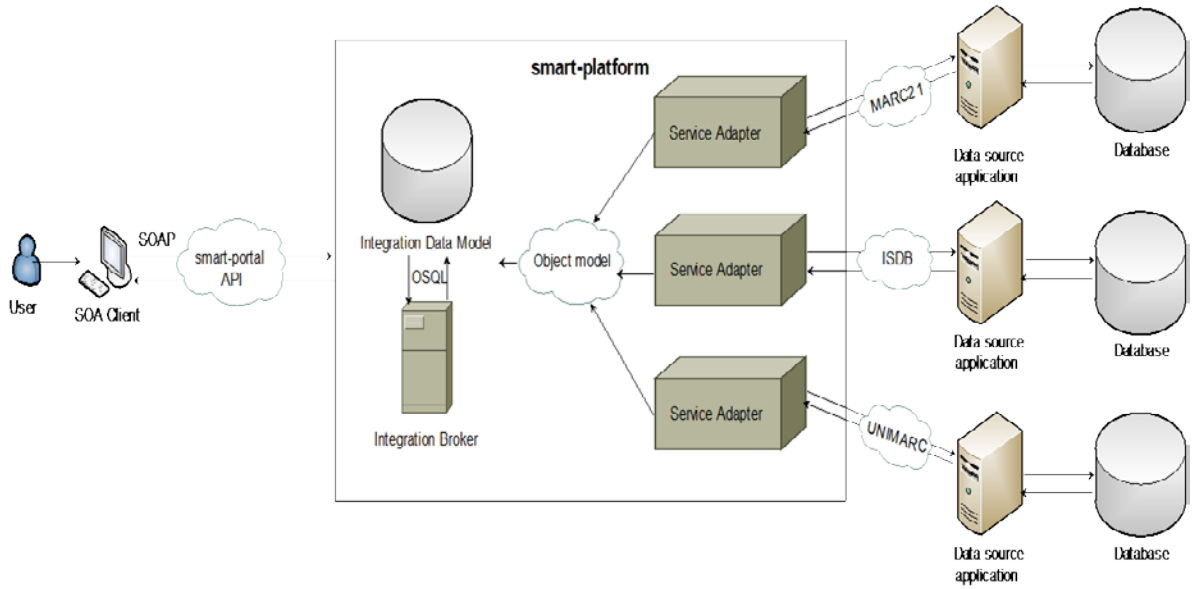


Рисунок 2. **Модель работы smart-платформы при интеграции информационных сервисов.**

Figure 2. ***Model of the smart-platform for the integration of information services***

Выводы
Conclusion

Предложенные в статье архитектура и структура интегрированной информационно-вычислительной среды «SMART-платформа» обеспечивает существенное снижение трудоемкости объединения сервисов различных университетов и компаний в единую систему.

Анализ различных технологий интеграции разнородных приложений показывает, что наиболее целесообразной при построении SMART-платформы представляется технология интеграции на основе единой

интегрирующей схемы данных, являющаяся наиболее гибкой и простой в реализации.

Интегрируемые в обезличенном виде, данные о деятельности университетов и их консорциумов сформируют массив bigdata, пригодный для анализа и принятия управленческих решений в университетах и их консорциумах с применением методов искусственного интеллекта на принципиально новом качественном уровне.

Summary

At the beginning of the article the authors describe the current situation in the field of digital education in the world and the role and place of Russia in the digitalization of the educational environment. In General, Russia lags behind in the development of the digital economy, but the Russian market has significant potential and its implementation is facilitated by significant rates of development of digital infrastructure both in education and in remote areas, which makes digital technologies available.

Today it is not enough for universities to use local digital technologies and leading universities are increasingly uniting through Internet portals to exchange best practices and spread online education. The development of aggregated Internet portals contributes to cooperation in innovation and social spheres.

Considering the situation it should be mentioned that there is no consistency in the introduction of information technology in various administrative, educational, scientific and social processes of universities. At the same time, the project approach is increasingly used in the activities of universities, which also requires changes in the architecture of the information systems used.

The article proposes the use of a network SMART-platform with an open architecture, on the basis of which it is possible to combine process and project approaches, exchange the best practices of universities connected to it, communication not only on educational but also scientific and social projects. All this will contribute to improving the quality of university activities.

In the article authors consider the technological options for building of the SMART-platform and features of architectural solutions that determine its flexibility and openness. For the purposes of the online platform it is necessary to solve the problems of data integration, for which the article considers modern approaches and trends. The authors proposed the structure of the integrated university management system, a feature of which is the use of the server integration and management of web-services. An example of integration of information services is given.

An important point is that eventually generated an array of depersonalized data represents an array of bigdata that provides opportunities for management decisions with using artificial intelligence methods

To summarize we can conclude that the article is interdisciplinary in nature, because organizational and managerial aspects are connected with IT competencies. The authors form a cross-format team, which explores the development of network interaction of digital universities from the perspective of different scientific areas – economic and management, and information technology.

Suggested in the article the structure and architecture of integrated information-computing environment "SMART platform" provides a significant reduction in the complexity of combining the services of different universities and companies into a single system.

Analysis of different technologies integration of various applications shows that the most suitable when building a SMART platform is the technology integration based on a single integrating data schema, which is the most flexible and easy to implement.

Integrable in anonymised, data on the activities of universities and their consortia will form an array of big data available for analysis and managerial decision-making in universities and their consortia, applying artificial intelligence methods to a fundamentally new qualitative level.

Литература
References

Chen, X., Ding, F., Zhang, T., Hou, G., & Lan, L. (2017). A Cost-Optimized Resource Provisioning Policy for Heterogeneous Cloud Environments. *IEEE Access, Volume 5*, 26681-26689/

Krishnan, V. (2016). *10 New Requirements for Modern Data Integration.* Retrieved from http://www.dbta.com/Editorial/Trends-and-Applications/10-New-Requirements-for-Modern-Data-Integration-109146.aspx

Kuzilek, J., Hlosta, M., & Zdrahal, Z. (2017). Data Descriptor: Open University Learning Analytics dataset. *Scientific Data, Volume 4*, 28 November 2017

Liu, X., Wang, X., Wright, G., & Liu, R. (2017). A State-of-the-Art Review on the Integration of Building Information Modeling (BIM) and Geographic Information System (GIS). *International Journal of Geo-Information 6* (2), 5, February.

McKendrick, J. (2016). Data Integration for the Modern Enterprise - How Cloud Shifts the Balance. *Databases trends and applications*, Sep 28. Retrieved from http://www.dbta.com/Editorial/Think-About-It/Data-Integration-for-the-Modern-Enterprise---How-Cloud-Shifts-the-Balance-113710.aspx

McKenna, B. (2017). Logical data warehousing. *Computerweekly, Jan 05*. Retrieved from http://www.computerweekly.com/blog/Data-Matters/Logical-data-warehousing

Wu, J. (2016). 3rd principle of modern data integration. *DIYOTA*, May 04. Retrieved from https://www.diyotta.com/3rd-principle-of-modern-data-integration/

Крюков, В. В. (2007). *Корпоративная информационная среда ВУЗа: методология, модели, решения. Монография.* Владивосток: Дальнаука.

Программа «Цифровая экономика Российской Федерации» (2017). утверждена распоряжением Правительства Российской Федерации от 28 июля 2017 г. № 1632 р.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 369-379

CLOUD COMPUTING BASED INFRASTRUCTURE IN EDUCATION: INVESTING INTO THE PRIVATE INFRASTRUCTURE OR USING OUTSOURCING SERVICES

Regina Miseviciene
Kaunas University of Technology, Lithuania

Daiva Kalvaitiene
Marijampole College, Lithuania

Vilma Riskeviciene
Marijampole College, Lithuania

Danute Ambraziene
Kaunas University of Technology, Lithuania

Dalius Makackas
Kaunas University of Technology, Lithuania

Abstract. *The main challenge for higher education in the nearest future is the global competitiveness, as the present global market requires the higher schools to present their courses in the international level. Thus, traditional universities must adapt educational infrastructures in response with the global requirement. Outsourcing of cloud computing based services increased over the years. The solutions allow not only create more effective teaching methods and new communication chances for the whole education society, but also to reduce costs of installing and maintaining programs.*
Aim of the article is to prepare a cost/benefit case analysis between investing into the private information and communication technology infrastructure and using outsourcing services. This paper focuses attention on cloud computing based information and communication technology infrastructures of two higher education institutions.
Research methods include analysis of scientific literature, review of legal institutional documentation and reports and interviews with institutional representatives about education practices.
Keywords: *cloud computing, deployment expenditure, education, outsourcing.*

Introduction

Nowadays in the world of globalization and technological development, the competition between academic institutions is inevitably increasing. With the aim of attracting, more learning organizations are forced to modernize their

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3132

information and communication technology (ICT) and seek for innovative teaching solutions. Modern studies are based upon various mobile smart devices in their learning process. It is essential to have an unlimited access to the study materials. Online resources must be accessed from different types of such devices: personal computer, laptop, tablet, or smartphone, at any time and place through the Internet connection.

Many IT leaders like Microsoft, Google, Amazon and IBM provide initiative to support education institutions with the necessary learning services. Some of these tools are free with no cost (Alharthi, et al., 2015). Such information technologies leaders are offering many useful online-based software tools to their clients (Gonzalez-Martínez et al., 2015).

For example, Google corp. includes cloud email, word processing and collaboration tools such as Gmail, Chat and Calendar. Google is providing an online service called Google Docs for several years so far. This is a free office suite, which provides tools to edit text documents, slide presentations, numerical data sheets and presentation files. The work with the office programs is made possible with a help of a web browser. All information is stored in the Google account and can be accessed at any time from any device, which has an Internet connection.

The other market leader Microsoft corp. in 2011 has presented a new service called Office 365. This is an online alternative of MS Office tools, which provides a possibility of communicating and working independently of physical location and types of smart devices. All programs, e-mails, shared documents, calendar events and personal contacts are made available on the personal computers or smart phones via the Internet browser as well (Bukelis, 2012; Miseviciene et al., 2013).

Other learning service Virtual desktop infrastructure (VDI) presents computers desktop in virtualisation mode. The revolutionary model is used to deliver remote desktop working on a remote server of cloud data centre. The model separates software from the basic hardware and provides a focus on what is delivered; it not concerns about how it was delivered or from where it was transferred. With the help of a virtualization, user's working environment (i.e. OS, applications and data) is partly isolated from the hardware making the process of workplace administration easier, ensuring user's mobility needs, and reducing operating loads. The tools allow the end users to access their "virtual desktop" from anywhere, anytime and any devices (Ibrahim, 2016). The users can access their desktop applications by using various devices.

The VDI paradigm implements new sharing capabilities with help so called "thin client" or "zero clients" devices. The devices have no CPU, memory or moving parts. The devices use only 1 to 5 watts electricity. It is less than 10 %

that of personal computer (PC). As opposed to traditional PC, the "zero client" devices can last for 8 to 10 years (Agrawal, 2014).

According to Gartner Magic Quadrant report "on x86 server virtualization infrastructure for 2015 (Gartner, 2015). VMware and Microsoft retained their spots in the top right quadrant, which Gartner reserves for the leaders. Vendors that made it into the niche players' quadrant are Citrix, Huawei, Odin, Oracle, and Red Hat".

Above-mentioned ICT services are tied up with different cloud computing technologies. National standards and technology institute (Mell and Grance, 2011) official announces that "the cloud computing is a model, which allows to have a convenient access to the common computer resources, e.g. a computer network, servers, data storages, application programs, and other program tools, with a minimum interference by the service providers". In other words, the main concept is to eliminate some of the in-house infrastructure parts of ICT systems and instead rely more extensively on outsourced services in accordance with specific needs of an institution (Gonzalez-Martínez et al., 2015). Cloud computing separates service users from dealing with the actual software acquisition and installation difficulties.

The cloud computing services help to improve the education quality by offering accessibility and mobility via the Internet. Such tools enable dynamic and interactive learning and allow the students in different ways to collaborate and communicate more virtually (Alharthi, et al., 2015). The cloud computing solutions allow not only to create more effective teaching methods and new communication chances, but also to reduce costs.

Most of the latest scientific researches wrote about VDI technical solutions or energy saving consumptions. The authors' research (Di Salvo et.al, 2017) is based on electricity consumption reduction and disregard several other important "green" label-related aspects. The authors (Chang et al., 2016) study investigating intentions from traditional enterprise information systems to private cloud for large enterprises. The author (Lam, 2017) analyses investment efficiency in industries with correlated demand. The research (Wang et. al, 2016) identifies the opportunities and dilemmas IT project when encountering in managing cloud projects, and to develop a system dynamics model to capture the complexity of cloud adoption. The authors in (Byrne et.al, 2016) present the links between ICT prices, technology and productivity. The authors in the article (Mastelic, et al. 2015) perform analysis of cloud computing model with respects to energy efficiency. The authors in (Agarwal, et al. 2014a) analyse how VDI helps not only to reduce cost of infrastructure, but also presents green computing benefits by reducing energy costs. The authors (Ibrahim, et al. 2016) review usefulness and energy reducing problems of VDI and illustrates by some experiments.

As was shown in the latest scientific researches, the scientific publications mostly pays attention on respects to energy saving only. So far, too little attention has been paid to the aspect of costs of the cloud computing based technologies. Our study contributes to filling this gap.

Aim of the article is to prepare a cost/benefit case analysis between investing into the private ICT infrastructure and using outsourcing services.

This article focuses the analysis on cloud computing based infrastructures in two selected academic institutions, namely Kaunas University of Technology and Marijampole College. The cost/benefit case calculation method is based on the source (Baltneta, 2010).

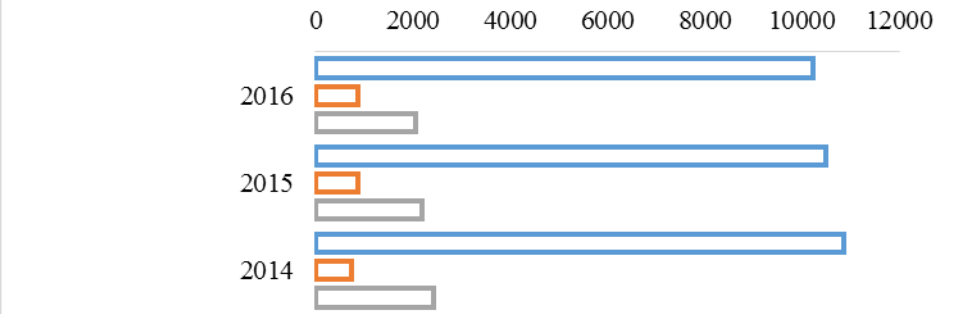
Participants of study process

Embracing the cloud based technology, it is important to know how much and what users will work with them. The main group of participants of the study process are students, lecturers and administrators. Every higher school may have other additional users that are actually reasonable and useful.

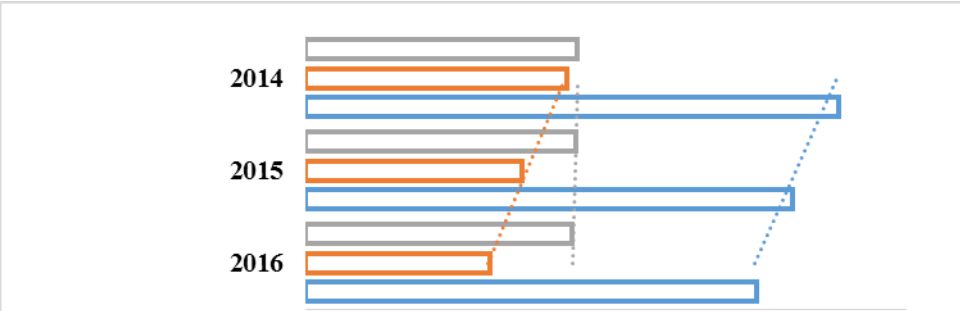
Kaunas University of Technology (KUT) has 10,895 students, of which 7,895 are Bachelor's, 2,648 are Master's, 566 are foreign, and 352 are Doctoral students. The main users of Kaunas University of Technology are students and academic staff as it is shown at the left in Figure 1 (KTU, 2016).

The total number of students at the KUT every year a slight decline. This was influenced by Lithuania's demographic situation and the decline in the total number of graduates in the country. A growing number of foreign students in the recent years reflects work to strengthen the University's internationalization. In 2016 year at University studied 861 foreign students. This represents 8.42% of the total number of university students. The indicator rose slightly compared with 2015.

Marijampole College (MC) - is an educational institution open to advanced technologies and higher education achievements. There are about a thousand students currently studying at the college. The number of students is declining every year. Figure 1at the right presents the changing trend (MARKO, 2016). The decrease of number of students is caused because some of the students are crossed out of the study program before finishing it for all sorts of reasons, such as, low grades, financial liabilities not met, their own choosing and others. More students takes part-time studies. This can be explained by the facts that older applicants prefer part-time studies. That allows them to work not only in Lithuania but also abroad.



	2014	2015	2016
# of students, including foreign students	10856	10495	10230
# of foreign students	751	877	861
# of academic staff	2421	2182	2067



	2016	2015	2014
# of part-time students	532	541	543
# of full-time students	368	433	522
total # of students	900	974	1065

Figure 1. **Number of users**

The college has more than 170 employees. The college staff consists of 1) academic personnel (professors, lecturers or other) 2) personnel that gives out academic help to students 3) other administration staff.

Information and communication infrastructure

Kaunas University of technology has its own hybrid infrastructure. The infrastructure combines local university infrastructure with third-party Microsoft corp. public cloud e-services with composition between the two platforms. A simplified view of KUT hybrid architecture demonstrates Figure 2. VMware and Citrix solutions are used for flexible management of the hybrid KUT infrastructure.

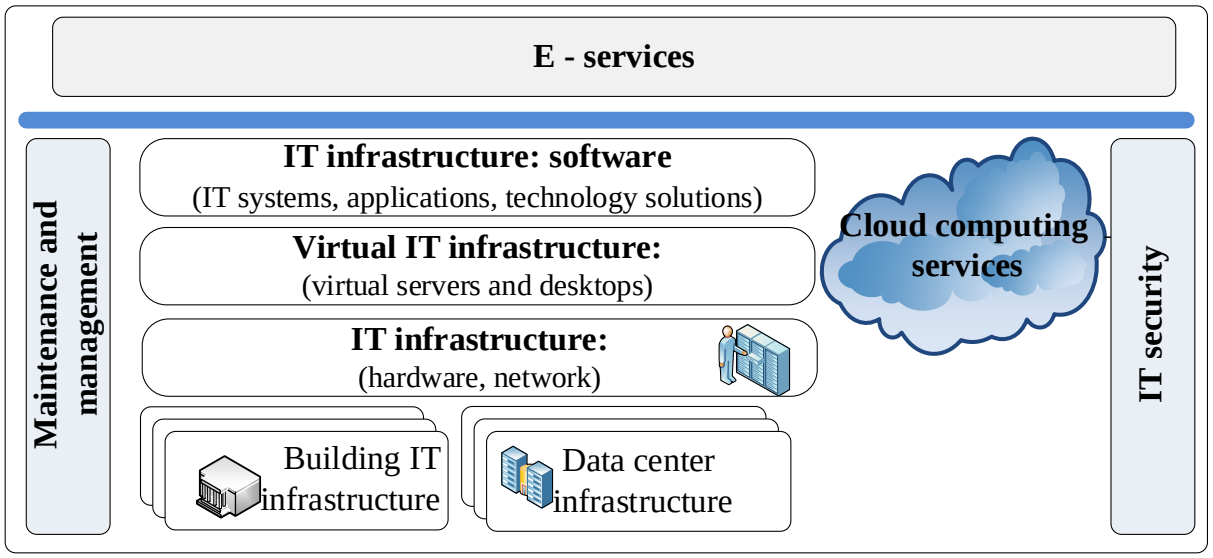


Figure 2. **Hybrid infrastructure of Kaunas University of technology**

The architecture of the hybrid cloud presents three layers:

- Physical layer includes the physical infrastructure of the system. The infrastructure includes computers, networks, routers, switches, hard disks and other physical component. In the layer are located facility means, such as heating, ventilation, electricity and other components.
- Virtual layer involves virtual machines used within the system. There are three types of virtualization solutions: virtual machine (VM), virtual desktop interface (VDI) and virtual applications (VAps). VM virtualizes physical machines in order to provide functionality of a physical computer. VMware solutions allow managing the virtual machines. VDI hosts a virtual desktop system on a centralized server in a data centre and provides each user with personal own desktop that can be customized like a traditional physical desktop. Citrix solutions provide many virtual desktops connecting to a terminal server. VAps component provides self-service programs while working in a virtual environment.
- Software layer. The highest layer reside IT systems, applications and other technology solutions.

KUT has implemented a Single-Sign-On (SELF) and Identity Management System solution (IMS). The purpose of the systems is to manage and administer institutional identities. Staff and students are provided with login credentials that are valid for the KUT e-services. Once the new user registers, the login name and the password are valid for all the services provided by the KUT network.

Virtual Desktop Infrastructure

Kaunas University of Technology owns the Virtual Desktop Infrastructure (VDI). The infrastructure provides a virtual computing environment to the staff and students in numerous training courses and research projects. Figure 3 illustrates the service infrastructure. The VDI structure is implemented using Citrix solutions. Citrix provides a complete virtual app. and desktop solution. It provides persistent Windows or Linux fully personalized desktops that can be customized to the users' needs anywhere on any device. Citrix Xen Desktop server manages the interconnection of users with the applications. This server comes out as a controller, which gives the user the right virtual environment, access rights to applications and so on. Another server (at this moment there are three servers Citrix-server app.) is running application programs (MS Office, MathCad, MatLab, etc.).

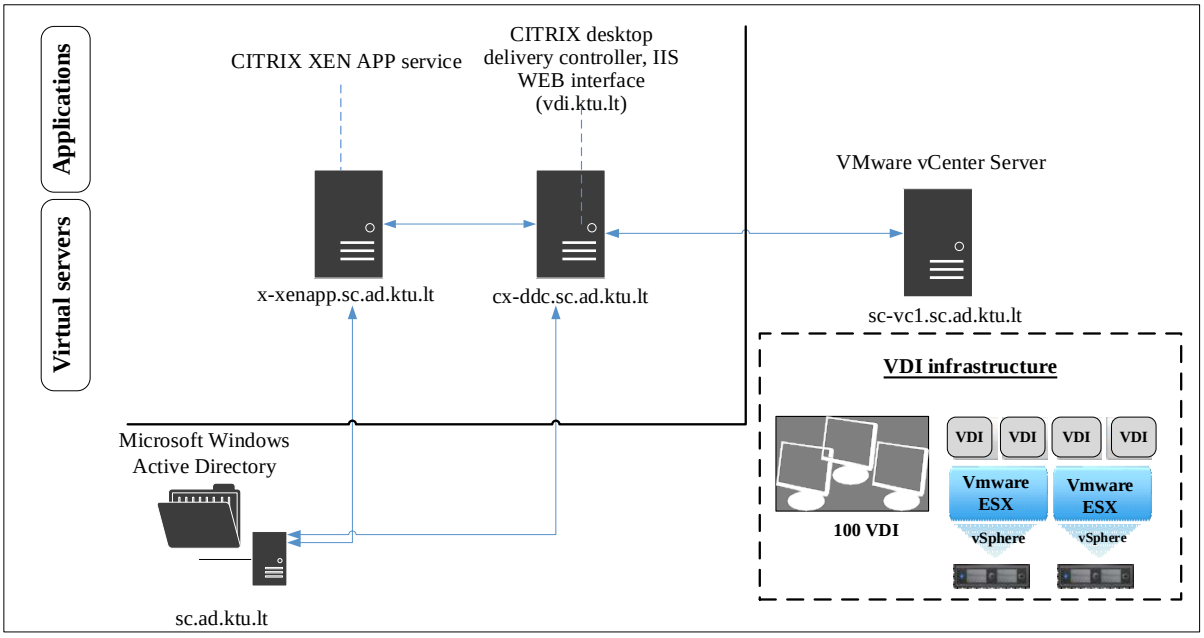


Figure 3. **Solutions of VDI**

Additionally, in the VDI structure are implemented administrator tools that help to manage users who are invoked the virtual services. The system administrators manage users when working with virtual resources and, is possibility to disconnect the users if they are not using resources for their work (for example, users are downloading torrents, etc.).

Use case analysis showed that Kaunas University of Technology is running its own hybrid ICT infrastructure. The infrastructure combines local university infrastructure and third party Microsoft corp. public cloud services. VDI is

implemented in hybrid KUT infrastructure. The infrastructure provides an opportunity for students to work with virtual desktops and a range of applications like MathCad or MatLab that are not normally available on their home computer. As this service is installed in KUT, the possibility of outsourcing the service is not discussed in the article.

The use case analysis of Marijampole College showed that the higher school has a low number of students, from which the bigger part are studying part-time. A big part of the users is changing. Equipment is not be fully used or it just be used for short period. It is lack of ICT equipment to provide qualified teaching service. MC users do not have VDI opportunities.

Cost Accounting Decision

The part of article discusses the VDI outsourcing possibilities in Marijampole College. Outsourcing is defined as purchasing a service from an outside vendor rather than producing the service in Marijampole College. The decision to outsource certainly considers reducing costs as a goal. If you can get the same service from outsourcing for less than producing the same service in Marijampole College, why not?

Author of the article (Blue, 2013) suggested evaluating four main parameters when making an investment decision: hardware, software, connection services, and personnel:

1) Computers, monitors, servers, printers, computer network adapters, and smart devices are so called hardware. In the process of assessing hardware budget, it is essential to evaluate depreciation, lease, technical maintenance, and upgrade expenditure. Moreover, it is important to take into account electricity costs of running the equipment as well.
2) While assessing a specific software it is necessary to pay attention to the aging of programs, required updates, possible changes, maintenances, and license costs.
3) In the evaluation of ICT services, it is important to determine website development, maintenance and safety expenses. In fact, it might require substantially greater investments than expected to implement a reliable safety environment online.
4) The process of setting up an IT specialists' budget necessitates accounting for salary, teaching, and tools charges.

Answering the question "when it is more economical to invest into the private ICT infrastructure and when it is more worth outsourcing it as a cloud service", administration of Marijampole College must evaluate the facts:

1) MC has a low number of students, from which the bigger part are studying part-time.

2) A big part of users is changing.
3) Computers are not fully used or just for short period.
4) It is not enough of IT equipment to provide qualified teaching service.

The costs analysis was executed based on the BALTNETA (2011) calculation method, which involved all four facts about MC, discussed above, and compared expenditure for constituents of conventional computer classes and VDI cases.

The outsourcing decision involves a variety of costs factors. In the case of conventional computer classes, the Total Cost includes the sum of all direct and indirect costs. The direct factor includes Investment costs and Operational expenditure costs. The Investment costs are used to acquire hardware and software packages. The Operational expenditure costs are spent on electricity, salaries of IT administrators, maintenance, safety and data loss prevention and so on. Indirect costs comprise of expenses incurred due to an unexpected failure of hardware, downtime loss in time, deadlines overdue by the service providers etc.

The calculations are made for 20 and 40 conventional computers in the MC. Computers are installed with the Windows operating system and a free Office tools package. The local IT administrator maintains computers workspace in the institution.

In the first case of a conventional computer classes the Investment costs consists of funds needed to acquire computers, operating systems, and office tools. The Operational expenditure costs account for maintaining computer systems, safety insurance and electricity consumption.

In the second case of VDI outsourcing, the Total Cost is calculated with Thin Clients including. Therefore, there are no investment costs. Staff and students can also use devices that now are in College. Having in mind that there are no investment costs in the VDI outsourcing scenario, the Operational expenditure costs comprises of VDI workspace lease and electricity charges only. Outsourcing of VDI by a third-party service provider is typically based on a monthly subscription fee model.

The calculations showed the savings over the period of 5 years (Figure 4). The case of Outsourcing of VDI saves a significant amount of funds spent on IT hardware and software each year.

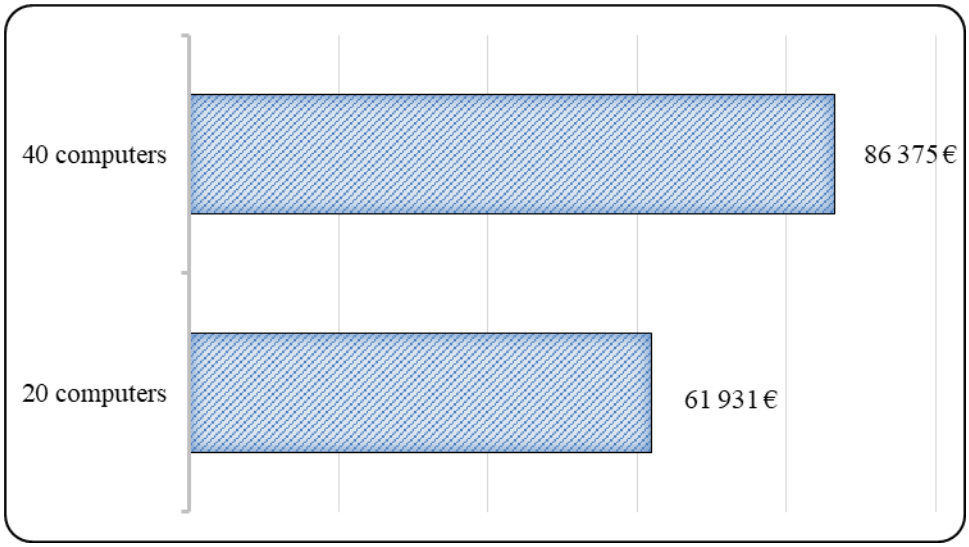


Figure 4. **Savings over 5 years**

Conclusions

Outsourcing VDI would allow to have a remote access for the Marijampole College's students and staff to the virtual desktop and other application at the college premises and at home. In addition, it would help to save a significant amount of funds spent on IT hardware and software each year.

Since VDI grants options of remote, modular, part time and continuous teaching of individuals and other members of labour market, the service is expected to contribute towards increasing the overall number of students.

References

Agarwal, S., & Nath, A. (2014). Desktop virtualization and green computing solutions. *Proceedings of the Second International Conference on Soft Computing for Problem Solving (SocProS 2012), December 28-30, 2012,* 1439-1449.

Alharthi, A., Yahya, F., Walters, R. J., & Wills, G. (2015). An overview of cloud services adoption challenges in higher education institutions. *Emerging Software as a Service and Analytics 2015 Workshop (ESaaSA 2015), May 20 – 22, 2015.* 102-109.

Baltneta (2011). *Virtual Workspace Infrastructure – VDI.* Retrieved from http://www.balt.net/

Byrne, D., & Corrado, C. (2016). *ICT Prices and ICT Services: What do they tell us about productivity and technology?* Retrieved from https://www.conference-board.org/pdf_free/workingpapers/EPWP1605.pdf

Blue Bridge Bond (2013). *Four things to consider when planning an IT budget.* Retrieved from https://www.15min.lt/mokslasit/straipsnis/verslas/keturi-dalykai-kuriuos-butina-ivertinti

Bukelis, D. (2012). Virtual Desktop Infrastructure - The supposition of DaaS solution. *Verslas – Studijos – Mokslas, 18,* 44 – 51.

Chang, Y. W., Chang, P. Y., Xu, Q., Ho, K. H., & Halim, W. L. (2016). An empirical investigation of switching intention to private cloud computing in large enterprises. In *Communications (APCC), 2016 22nd Asia-Pacific Conference* (pp. 323-329). IEEE.

Di Salvo, A. L., Agostinho, F., Almeida, C. M., & Giannetti, B. F. (2017). Can cloud computing be labelled as "green"? Insights under an environmental accounting perspective. *Renewable and Sustainable Energy Reviews, 69*, 514-526.

Ibrahim, A. A. Z. A., Kliazovich, D., Bouvry, P., & Oleksiak, A. (2016). Using Virtual Desktop Infrastructure to Improve Power Efficiency in Grinfy System. In *Cloud Computing Technology and Science (CloudCom), 2016 IEEE International Conference* (pp. 85-89). IEEE.

Gartner (2015). *VMware and Microsoft are the top virtualization leaders.* Retrieved October 14, 2016, from http://www.techrepublic.com/article/vmware-and-microsoft-are-the-top-virtualization-leaders-according-to-gartner/

Gonzalez-Martínez, J. A., Bote-Lorenzo, M. L., Gomez-Sanchez, E., & Cano-Parra, R. (2015). Cloud computing and education: A state-of-the-art survey. *Computers & Education*, *80*, 132-151.

Lam, W. M. W. (2017). *Investment in Flexible Resources with Demand Correlation: an application to cloud computing*. Retrieved https://orbi.uliege.be/bitstream/2268/206850/1/Lam_investment%20in%20flexible%20resources%20with%20demand%20correlation.pdf

KTU (2016). *Kaunas University of Technology, Annual Activity Report.* Retrieved from https://issuu.com/ktu.lt/docs/ktu_2016_metu_veiklos_ataskaita

Marko (2016). *Marijampole College 2016 activity report.* Retrieved from http://www.marko.lt/wp-content/uploads/2017/02/Ataskaita_-2016-m._patvirtinta.pdf

Mastelic, T., Oleksiak, A., Claussen, H., Brandic, I., Pierson, J. M., & Vasilakos, A. V. (2015). Cloud computing: Survey on energy efficiency. *Acm computing surveys*, *47*(2), 33.

Mell, P., & Grance, T. (2011). The NIST definition of Cloud Computing. *Communications of the ACM, 53(6)*, 50.

Miseviciene, R., Plestys, R., Zakarevicius, R., Ambraziene, D., & Pazereckas, N (2013). Virtual desktop infrastructure technology based study and research. *International Journal of Education and Research, 1*(4), 1-10.

Wang, C., Wood, L. C., Abdul-Rahman, H., & Lee, Y. T. (2016). When traditional information technology project managers encounter the cloud: Opportunities and dilemmas in the transition to cloud services. *International Journal of Project Management, 34*(3), 371-388.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 380-389

USE OF MODERN INFORMATION TECHNOLOGY IN MICROBIOLOGICAL LABORATORY

Dominika Olszewska
Institute of Chemistry, Environmental Protection and Biotechnology
Jan Dlugosz University in Czestochowa (Poland)

Tomasz Prauzner
Institute of Technology and Safety Systems,
Jan Dlugosz University in Czestochowa (Poland)

Piotr Krupa
Institute of Chemistry, Environmental Protection and Biotechnology
Jan Dlugosz University in Czestochowa (Poland)

Paweł Ptak
Institute of Optoelectronics and Measurement Systems Faculty of Electrical Engineering Czestochowa University of Technology (Poland)

Abstract. *In today's world, the utilisation of modern information technology is becoming increasingly common in educational process – not only at primary and secondary school level, but most of all, at university level. The present article is a proposition of the implementation of information technology as a complement of microbiological laboratories. These classes are, most of all, practical, so a tweak of programs and simulations forms a prominent challenge for an academic. A student, who participates in laboratories, achieves specified abilities, however, he or she does not always have an opportunity to preserve them. In the thesis, there is presented a proposition of innovations, implemented into the educational process, which are a result of a long-time educational practice in terms of educating on the university level. Inasmuch as a complex process of teaching and learning (complete with concurrent components, which qualify its didactic effectiveness) is a subject matter of general didactics, the utilisation of information technology may form an excellent complement of laboratories. The utilisation of such solutions helps students to preserve the practical skills, which they acquire in laboratories. The emphasis is on simulation programs, and the open-source learning management system Moodle, which are considered as educational tools which have a relevant impact on the tenor of learner's cognitive processing. Taking into consideration the advantages of these tools, and the commonness of modern information technology, the authors indicated a large universality of this medium, and its usefulness in the problem and empirical teaching. The presented group of software may bring a significant contribution to the development, the desirability, and the increase of absorption in vocational training. The ponderations are based on the basis of the cognitive theory and the idea of constructive education.*
Keywords: *modern information technology, microbiological laboratory, complex process of teaching.*

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3281

Introduction

The article is a proposition of the way of the implementation of computer technology as a complement of microbiological laboratories. These classes are, most of all, practical, so a tweak of programs, simulations, simulation programs and the environment of virtual didactic work forms a prominent challenge for an academic. The article is based on the grounds of the research which shows that the work of students, who participate in the Internet course, is more effective and their knowledge is wider. It is very substantial that the article presents solutions which were employed during laboratories – purely practical classes.

Theoretical substantiation of the problem

In today's world, the utilisation of modern methods and teaching aids is becoming increasingly common in the educational process – not only at primary and secondary school level, but most of all, at university level. The didactic process is formed not only by students, learning program and lecturers but also by omnifarious modern technologies and ITC Technologies. More and more students use only online sources, which started to eliminate textbooks and academic books. Thereupon there have been created more and more extensive and developed databases. Due to that, the option for an impact on the didactic process expands (if we use multimedia and Internet tools properly) (Mehrabi & Masoumeh, 2012). The utilisation of platforms, such as Moodle, and simulation programs (which are used as tools which substitute or complete courses at universities), is getting more and more common. This method holds good in case of humanistic programs and language acquisition. Unfortunately, there is a problem, which is caused by the implementation of these techniques to the teaching process of general science, especially from the area of life science. Until now IT tools were used in branches of knowledge only during lectures and conservatories but it is increasingly necessary to fortify practical classes, such as laboratories, with them (Brooks, 2010). Some of the subjects can be easily adapted to the utilisation of modern computer techniques, the other ones present a fair challenge for an academic.

A student, who participates in laboratories, achieves specified abilities (such as knowledge of: techniques of culturing microorganisms, the making of microscopic slides, etc.), however, he or she does not always have an opportunity to preserve them. During work with young people, we can notice that they have difficulty with memorisation, for instance, they cannot make a note of the order of relevant operations or they do not know how to use a given technique properly. There is no doubt that there may be a few reasons why it happens: too large number of participants in groups, insufficient amount of

didactic hours and laboratories which are not available all the time – it all makes that students' skills are not satisfactory. More and more young people have trouble with finding a job in their fields, or just after graduation they have to complete post-graduate studies or extra training courses.

To respond to this issue, the utilisation of modern IT tools was offered as help to enrich General microbiology and Food microbiology laboratories in the fields of study: Biotechnology and Dietetics.

On Moodle platform, there has been compiled an online course, which is ment to help to perpetuate practical skills, and also to benefit from a simulation program and to compare the results of this simulation program to the real experiments, which students can do on their own or in groups. (Noga et al., 2017). The utilisation of the latest information and communication technology in the process of education has a profitable impact on the quality of this process, provided that methods based on this technology are prepared properly, premeditated, and corresponding to the current working conditions and a class profile (Prauzner, 2012).

Discussion

The supplementary General microbiology course (on Moodle platform) has been devided into steps and it consists of, most of all, instructional films, which show in details the techniques of microbiological laboratory work. The next step is made up of quizzes, which enable to examine acquired information. An instructional film, which explains how to do streaking, sets a great example.

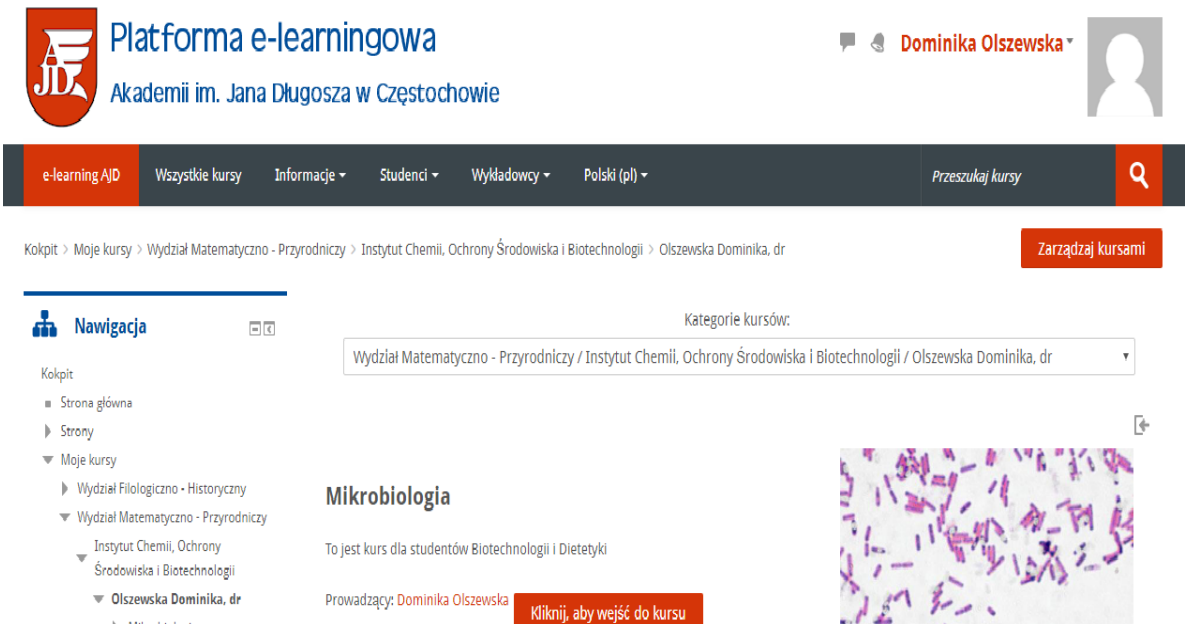


Fig. 1. **Microbiology course on Jan Dlugosz University in Czestochowa Moodle platform (own data source)**

During laboratories, the majority of students forget to anneal and to cool an inoculation loop between the particular phases of culture. The quality of culturing (done by students) streamlined due to multiple video replay and taking the quizzes on the platform. Students do exercises much more efficiently and precisely, so a lecturer can do a talk seamlessly, and there is no need to repeat some of the subject matters and to explain them once again.

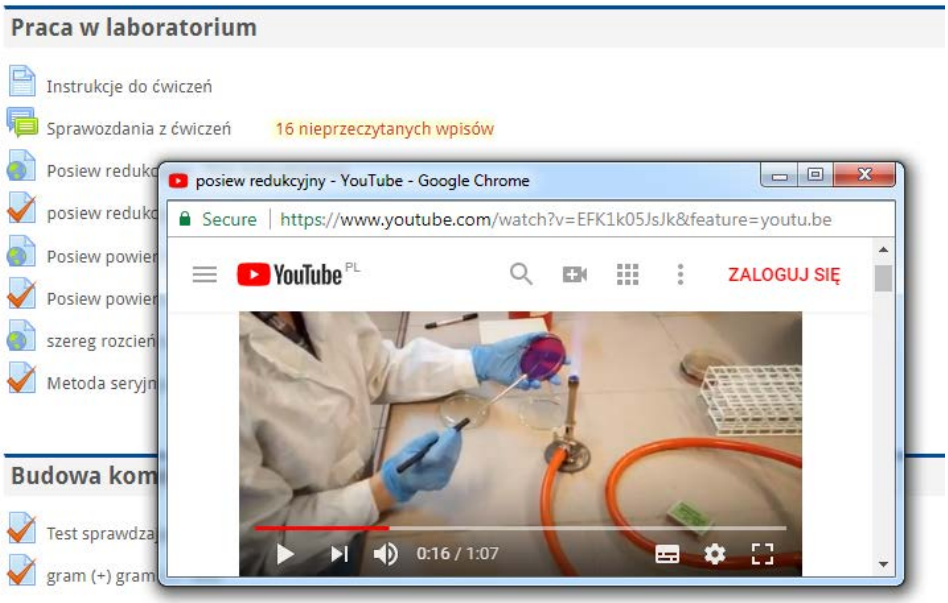


Fig. 2. **An exemplary instructional film on Moodle platform (own data source)**

The same situattion relate to the skillfulness at confecting of serial dilutions of the sample. Students have a huge problem with making mental notes of the order of relevant operations. As in the case of culture, a student can watch a film and take a checking quiz.

The putting of exemplary photographs of bacteria under a microscope holds good, moreover, it uprated students' skill of making distinctions of Gram-positive and Gram-negative bacteria.

There also have been implemented online discussion groups and chats, which simplify to share results, which they drew during laboratories. They discuss conclusions and analyse mistakes. It has an enormous impact on the quality of reports, and it decrease the number of mistakes, which students make during classes. Especially, awareness of sterile working conditions and preservation of sterile conditions during culture have increased prominently.

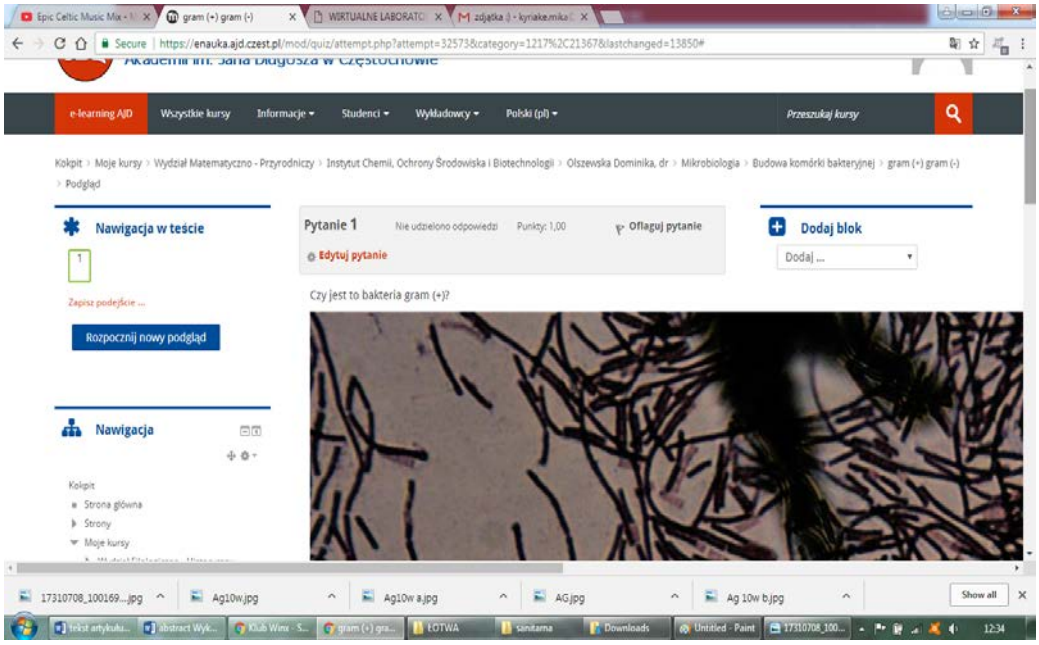


Fig. 3. **An exemplary question from a checking test which examines the knowledge of morphological bacteria forms (own data source)**

A lot of experiments which use germs, and that young people need at professional work, are very expensive and require specific equipment as well as plenty of time. Not every university or academic institution can purchase costly equipment nor can extend Microbiology classes. Therefore, a various kind of simulation programs, that is predictive microbiology, is used to make such microbiological analysis. They make it possible to determine how microorganisms will grow, and predict, for example, the inactivation and the activation level of microorganisms. Based on mathematical dependents, predictive microbiology determines behaviour of microorganisms in specified environmental conditions, such as temperature, the pH, availability of acid and organic salts, and oxygen (Tarczyńska et al., 2012).

In the process of creating the classes, we can use the following forecasting models:

- the primary models, which are utilised to determine the elementary parameters of the growth of grems, the lenght of lag phase λ, and the factor of growth rate μ in specified environmental conditions;
- the secondary models present the changes of parameters, which are defined by the primary models depending on the environment;
- the tertiary models are a combination of the primary models and the secondary models; they were created as computer programs and were used to make simulations of the development of germs in various environmental conditions (Kowalik et al., 2011).

The most famous and didactically valuable forecasting models are: the ComBase Predictor (the model of Barnyi and Roberts), Pathogen Modeling Program (the Gompertz model), and the Pathogen Modeling Program (PMP70). The ComBase Predictor model was created with the aid of a database of the development of many microorganisms, which live in food products and culture medium for microorganisms, and also including developing environmental factors. The database proceeded from experimental data (Kowalik et al., 2012).

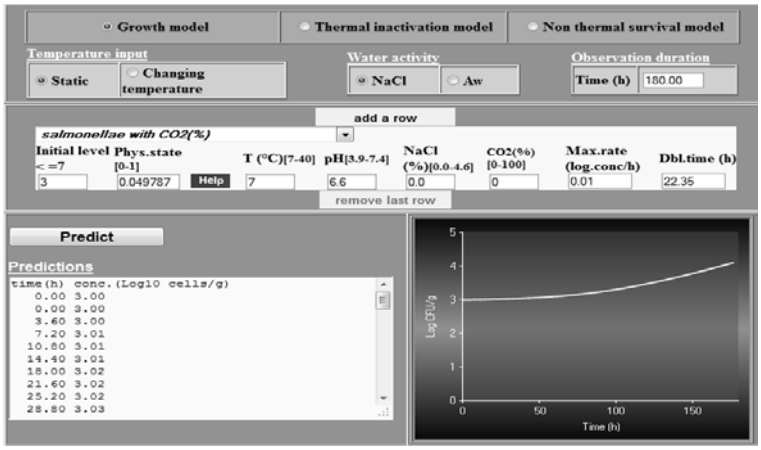


Fig. 4. **An exemplary screen of ComBase Predictor which charts the growth forecast of *Salmonella* cells (source: www.combase.cc)**

The implementation of such an innovative type of complement to laboratories improved effectiveness of the teaching process significantly. Students absorb practical skills better and faster due to the virtual repetition. Modern computer techniques and simulation programs have a meaningful impact on the educational process because they accommodate to the modern world, and breed students who will know how to use modern technology at their works, and who learnt to think critically and out of the box (Woźniak et al., 2006).

By virtue of cognitive science, the implementation of these tools was preceded by the analysis of the didactic process during acquiring practical skills in laboratories. Cognitivism is a neurobiological concept, which was grounded on the understanding of the functioning of the brain, and its abilities to gaining and memorising knowledge, so the use of modern technologies is immediately obvious (Prauzner, 2016). The present generation of young people lives mainly in a virtual world and sources information from the Internet. To achieve a didactic success, lecturers should accommodate to interests and capability of learners, and they have to adjust curriculum and the way of teaching to students' needs. Lecturers drop serving of ready-made solutions and, somewhat, they force pupils to independent thinking, group working, making inferences, and analysing information. Such an approach is compatible with the idea of

constructivism, which is founded on recognition of student's individual and cognitive abilities. The employing of modern technology is very important because it features unassisted resolving an issue by a student – not only by experiments and experiences in laboratory but also by perpetuation and repetition of brand new information (Prauzner, 2017).

Due to such types of solutions the time of doing particular exercises in laboratoies has reduced to the minimum. Students are getting more and more meticulous and they plan on experiments way better. The understanding of vocabulary and microbiological issues refind in comparision to classes which did not exploit Moodle platform and simulation programms. The process of enhancement of didactic effectiveness continues and it is founded on observations and comments of students theirseves.

Methodology

Our students, who study Biotechnology and Dietetics, took part in the research. On the basis of data, Internet tools were modified and improved. Students answered the question by gauging the rightness (in the scale of 1-5) of the given statements. I created a survey, and I asked my students to respond to it. The questions, which were used in the research:

1. Do you think that the utilisation of didactic materials published on Moodle could appeal to the execution time of an exercise?
2. Did the proposed simulation programs let you understand relevant microbiological vocabulary better?
3. Did your command of the laboratory working techniques increase due to the films and the other material published on Moodle platform?
4. Is your awareness of sterile working conditions better due to the utilisation of modern IT technques?
5. Does the utilisation of a chat and a forum on Moodle platform improve analytical skills and effectiveness of inference?

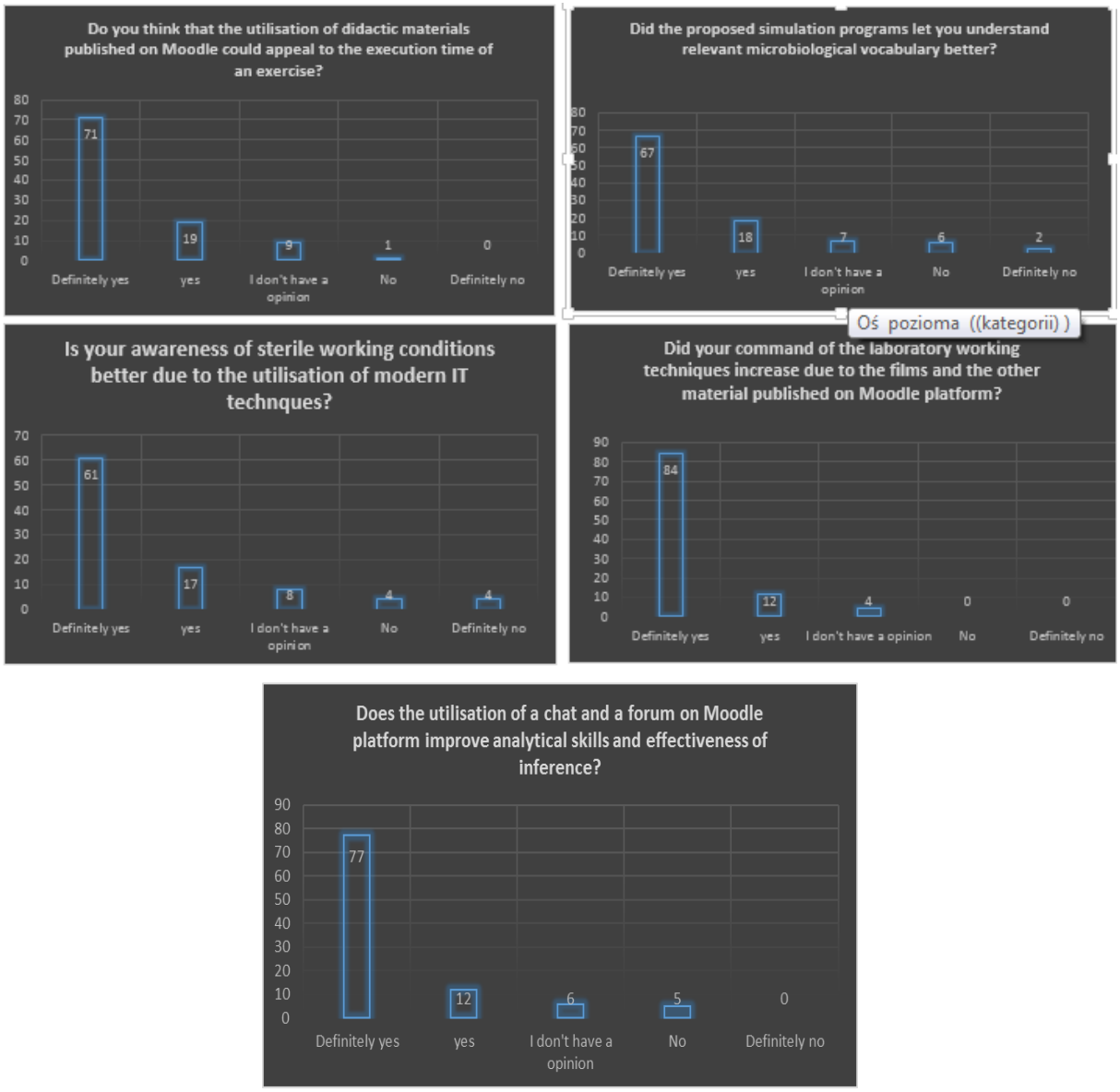


Fig. 5. **The results of the survey**

Concluding remarks

Concerning the question if the utilisation of didactic materials published on Moodle could appeal to the execution time of an exercise, a considerable amount of students (71 %) responded “definitely yes”, 19 % said “yes”. A slightly less than the first group (67 %) claim that simulation programs let them understand relevant microbiological phenomenons. And now, we are going to analyse the answer “definitely no” – 2 %. It may be caused by the fact that some students do not want to or cannot use simulation programs because it is much more time-consuming than taking part in an Internet course.

The most of interviewees – 96 % in total – responded “definitely yes” and “yes” to answer the question if students improved the knowledge of working techniques and microbiological vocabulary. There was no negative reply. It proclaims that the opportunity of multiple exploit of materials, which are available on an e-learning platform, helps to perpetuate abilities acquired during laboratories in a much better way.

Concerning the question about the utilisation of chats and an interned forum, 77 % of students gave a positive reply. In the beginning of the course, the utilisation of these tools was small. In the end, it became very popular as a tool of a communication between students. The answer “no” was picked by only 5 % of respondents. It can be caused by student’s individual approach of public expression.

On the other hand, 8 % of respondents said “no” and “definitely no” to answer the question about the improvement of awareness of sterile working conditions. It may be a result of the fact that the practical experience is very needed to preserve the sterile conditions during microbiological culturing.

In all, the substantial majority of interviewees comment on proposed solutions in a very positive way. It suggests that such types of tools simplify the achievement of practical skills, and the preservation of new information acquired during laboratories.

In the opinion of an lecturer, there can be noticed the development of work efficiency, not so significant, if we would like to take into consideration the results of the examination, but it is big enough to continue such a complement of microbiology course.

Summary

The implementation of modern computer techniques, as a complement of microbiological laboratories, has improved the didactic process significantly. The use of Internet tools, ITC Techniques and simulation programs relevantly raise the productivity of education and let students improve their skills. Their command of the laboratory working techniques and awareness of sterile working conditions has increased. On the grounds of the survey data, we can notice that such a complement of microbiological laboratories improves and makes work more attractive. It also raises didactic productivity and it helps to educate finer specialists. The vast majority of students, who took part in the research, admit that sharing of virtual didactic material, watching instructional films, and having an opportunity to exchange their observations on an Internet forum have improved their practical skills (used during microbiological laboratories) increasingly. The utilisation of simulation programs during microbiological laboratories still causes a problem, but there are implemented procedures relating to the improvement of the educational process to utilise such types of solutions to stimulate students to take up a challenge, and to bring to perfection their practical skills.

References

Brooks, J. (2010). Academic E-Learning Helps Anatomy & Biology Students Make the Grade. Retrieved from http://blogs.articulate.com

Korczak, J., & Woźniak, D. (2008). *Zastosowanie nowoczesnego e-learningu i multimediów w edukacji.* Zeszyty Naukowe Instytutu Ekonomii i Zarządzania. Koszalin: Wydawnictwo Uczelniane Politechniki Koszalińskiej

Kowalik, J., Zuzga, E., & Tarczyńska, A. (2012). Zapewnianie bezpieczeństwa zdrowotnego mleka i produktów mleczarskich w łańcuchu chłodniczym, *Journal of Managment and Finance, Vol 3, part 2*. Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego

Kowalik, J. (2011). Prognozowanie na nowo. *Forum Mleczarskie Biznes 1/2011 (10).*

Mehrabi, J., & Masoumeh, A. (2012). Teaching with Moodle in higher education. *Procedia-Social and Behavioral Science, 47.*

Noga, H., Olszewska, D., Ptak, P., Prauzner, T., & Migo, P. (2018). Badanie i symulacja oddziaływania zmiennego pola elektromagnetycznego na rozwój mikroorganizmów. *Przegląd Elektrotechniczny, R 94, Nr 1.*

Prauzner, T. (2017). The effectiveness of school education - featured implications considerations. *Society. Integration. Education. Proceedings of the International Scientific Conference. Volume III, May 26th-27th 2017*, Rēzekne: Rēzeknes Augstskola, Latvia.

Prauzner, T. (2016). Interactive computer simulation as a response to contemporary problems of technical education. *Society. Integration. Education. Proceedings of the International Scientific Conference. Volume II, May 27th-28th 2016*, Rēzekne: Rēzeknes Augstskola, Latvia.

Prauzner, T. (2012). Metodologia nauczania w szkole wyższej. *Kształcenie zawodowe: Pedagogika i Psychologia.* Polsko-Ukraiński Rocznik Ukraińsko-Polski. Częstochowa-Kijów: Wydawnictwo Akademii im. Jana Długosza w Częstochowie.

Tarczyńska, A., Kowalik, J., & Łobacz, A. (2012). Modelowanie mikrobiologicznego bezpieczeństwa żywności. *Przemysł Spożywczy. Vol 6*

Woźniak, D., Królikowski, T., & Bałasz, B. (2006). E-learning w nauczaniu jako technologia postępu edukacyjnego. *Nowe technologie w kształceniu na odległość*. Koszalin: Wydawnictwo Uczelniane Politechniki Koszalińskiej.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 390-401

POSSIBLE USES OF COMPUTER SYSTEMS IN UNIVERSITY TRAINING OF IT PROFESSIONALS

Natalija Prokofjeva
Department of Software Engineering, Riga Technical University, Latvia

Diana Zagulova
Riga Baltic International Academy, Latvia

Sabina Katalnikova
Department of Software Engineering, Riga Technical University, Latvia

Kateryna Synytsya
International Research and Training Center for Information Technologies and Systems of National Academy of Sciences, Ukraine

Abstract. *In this paper, learning and knowledge control systems developed by the Faculty of Computer Science and Information Technology of the Riga Technical University are described. These systems are used in teaching various subjects on different study programs and specialties. The paper also presents results of use of computer systems in student self-study and self-control. Students could freely choose, whether or not to use these systems during their studies. We focused on two scenarios of non-compulsory use of computer systems, namely with a motivating system or without one. In both cases students actively used computer systems for self-control and self-study. Our research shows that using computer systems for both knowledge control and study (as opposed to knowledge control alone) increased knowledge level of all students, regardless of their overall performance.*
Keywords: *education, knowledge control, student performance, self-study, self-control.*

Introduction

Nowadays, due to the increasing pace of scientific and technical progress, requirements to knowledge and skills of modern specialists continuously grow. One of the most important aspects of any educational activity is the system of knowledge quality control. However, the discrepancy between the capabilities of traditional teaching methods and the amount of actual knowledge that modern society demands from graduates of educational institutions indicates a problem in the system of modern higher education. Therefore, the issues of computer training and knowledge control are of interest for many researchers, in the field of both education and information technologies (Gütl et al., 2011) (Golitsyna, 2012) (Lau et al., 2011) (Manako & Sinitsa, 2012).

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3185

Unfortunately, although technologies of computer education have significantly progressed in comparison with early 1990s (with virtual reality, multimedia, and remote internet access being used instead of former local networks of personal computers), global problems in this field stay the same. These problems were identified already in the late 1980s in a series of monographs, to which Riga Technical University (RTU) scholars L. P. Leontiev, L. A. Rastrigin, L. V. Nicetsky, L. V. Zaitseva, L. P. Novitsky and others contributed (Rastrigin & Erenshtein, 1986, Nicetsky, 1977, Zaitseva et al., 1989).

Currently there exist many international conferences, both scientific and scientifically methodical, (IEEE, ICALT, IADIS e-Learning, IASTED CATE and others), as well as electronic journals (Journal of Educational Technology & Society, 2017, The Electronic Journal „International Academy, Research, and Industry Association, 2017, The Electronic Journal of e-Learning, 2017), that focus on issues in computer education and knowledge control.

In addition to that, higher education of today poses high demands to the way students organize their individual studies. Organization of students' individual studies to a great extent defines the overall quality of learning. Self-study skills acquire relevance as an essential factor in the development of general competencies (Klizaitė & Arlauskienė, 2015). This lets one put forth a hypothesis that computer education systems furnished with appropriate technology can be used with high efficiency in solving such tasks.

In the study process at RTU, computer systems providing different methods of automatized teaching and training of IT professionals (acquisition of reference information, distance learning, exercises and other means of knowledge control) are also employed. These systems are also used in shaping skills necessary for individual studies.

In this paper, we use methods of mathematical statistics in order to demonstrate that use of the mentioned systems of computer learning and knowledge control indeed motivates students to pursue self-learning and increases performance of future IT-specialists.

Research Materials and Methods

The following systems have been developed and are now in use at the Faculty of Computer Science and Informational Technology:

- Learning Management System (LMS);
- Intelligent knowledge assessment system (IKAS);
- Computer-based system ORTUS.

Teaching and student knowledge control is performed using these systems in many subjects, e. g. "Data structures", "Programming Languages", "Technologies

of Software Development", "Metrology and Planning of Software", "Basics of Artificial Intelligence", "System Theory Methods" and others.

For this paper, we have chosen two subjects. "Data Structures" is a compulsory course taught during the second term in the first year, while the course "Technologies of Software Development" is taught during the sixth semester in the third year.

Thus, the first group comprises 67 students of the Computer Systems study program. The second group comprises three specialties: Computer systems (134 students), Information Technology (116 students) and Automation and Computer Equipment (64 students)

Statistical analysis of data was carried out using the Statistica 8.0 software for Windows. The interconnection of parameters was assessed based on the Spearman's nonparametrical coefficient (Glantz, 1998). To assess the validity of differences among the groups one actor dispersion analysis (ANOVA) was used with subsequent aposteriori analysis according to the Turkey method for unequal groups (Tukey HSD for unequal N)[1].

Computer Systems in Study Process

IKAS is an intellectual system of knowledge control that has the form of a web application. It focuses on assessing students' structural knowledge. It was developed in 2005 and described in many publications (Grundspenkis & Anohina, 2009, Prokofjeva et al., 2013). The main tasks of the system are: a) assisting students in self-assessment of their structural knowledge and b) supporting teachers in enhancing study courses based on systematic analysis and evaluation of students' knowledge structure.

IKAS supports three categories of users: administrator, teacher, and student. The system has six tasks of different complexity. The use of the system is based on interpreting the values of parameters available in the student model. The student model supports four types of operation adaptation in IKAS: selection of initial level of complexity of the task on the first stage of its evaluation, its change on the further stages of evaluation, set-up and modification of priorities of types of explanation concepts (feedback). More than 20 courses have been developed in IKAS: "Basics of Artificial Intelligence", "System Theory Methods", "Discreet Structures in Computer Science" etc. Results of use of this system are described in the following work (Anohina-Naumeca et al., 2011).

The ORTUS computer system is available to all RTU students and has been used in the study process since 2008 (Zaiceva & Prokofjeva, 2012). In this system the teacher can create a test, set the time and place of its competition, set the

[1] http://www.statsoft.ru/home/textbook/modules/stanman.html

number of attempts to complete the test. Thus, the test can be either a control work (one attempt) and take place in class, or an exercise (more than one attempt) completed remotely. It is possible to create tests from different categories of questions of similar type (10 question types are realized in ORTUS), considering their complexity, i. e. to assign more points to questions of higher complexity. All question types presuppose comments. The only drawback of the ORTUS environment is use of just one knowledge control method, namely, "random sampling".

Currently 13 computer courses are realized in the ORTUS system for the subjects "Programming Languages", "Data Structures", "PHP Language in Development of Web Applications" etc. Such digitization of courses, according to all the teachers who have used ORTUS, helps to conduct knowledge control of different types and consider students' performance at the exam. Thus, in the subject "Data Structures" electronic courses "Pointers, Arrays and Strings" and "Lists, Stacks and Queues" ensure border knowledge control, as they let evaluate level of student knowledge on separate themes and incorporate the control work results into the outcome of the final exam. The subject "PHP Language in Development of Web Applications" includes the control work "HTML and CCS" that performs initial control letting assess the knowledge level of the students before they get to study PHP. All study courses within the subject "Programming Languages" must be completed remotely and are also taken into account when grading student performance at the exam.

The LMS system was developed by a professional group "Technology of software development" in 2004 (Zaitseva & Bule, 2008, Zaiceva et al., 2017). The system supports two modes directly related to knowledge control: random choice of tasks and/or questions for control and teaching. Both can also be used for self-control. The random choice mode implements non-adaptive method of control. In this case the number of questions for knowledge control in a students' group is set by the teacher, who also specifies the number of tasks of different complexity (maximum, medium, minimum) to be included in each set of control questions. The teacher also defines the type of comment students get in response to their answers: short (correct, imprecise, incorrect) or extended, including the explanation of mistakes. In case of self-control the student herself sets these parameters. The method implemented by teaching mode depends on choice made: it can be either non-adaptive (involving a fixed sequence), where the student completes all or a selected number of control tasks, or partly adaptive (considering students' answers), where the number of tasks offered to the student depends on how well they are completed. In this mode, it is also possible to set the type of comment. On completing control the student get a grade that takes into account not only correctness of the answers, but also their value (maximum, medium, minimum) and complexity.

Currently LMS includes 8 learning programs in subjects "Software Development Technology", "Metrology and Planning of Software", "Instruments and Environments of Software Development", that can be used in all modes described above, as well as one electronic course for college students in "Programming Languages". During the initial stage of LMS use in the years 2004–2006 students could use the courses available in the system for self-control, training and/or learning. Starting with 2007, student knowledge control in the courses is obligatory and is usually performed during practical classes. Each student is offered 6 to 8 tasks for control. Within 2 days after taking the control work the student can take it again in order to improve her result. In this case the work is graded by the teacher. Other modes of the system can be used by students at any time (Zaitseva, 2008).

In what follows, the LMS and ORTUS systems get assessed from the point of view of their influence on student performance as the result of non-compulsory use.

Non-compulsory use of the LMS computer system for self-study and self-control of knowledge: effects on student performance

The role of individual studies is constantly growing in educational process. This explains the relevance of the question of organization of individual work of students and development of corresponding skills (Rupšienė & Mažionienė., 2011). Computer learning systems can foster this process on the condition that their use is optimized for such tasks. The first thing to be determined is whether the students will employ computer systems of learning and knowledge control if their use will not be declared compulsory. The question regarding the motivation to non-compulsory self-control is also of importance.

In the research presented here influence of computer-based systems of learning and knowledge control on student performance was analyzed, with special focus on the question: whether use of computer-based for self-learning and self-control facilitates task solving in practical works? To research this question third year students were offered to freely attend test classes in "Software Development Technology".

In the course of a semester students could voluntarily employ the LMS computer-based learning and knowledge-control system while completing practical works. The analysis of the collected data revealed:

- statistically significant ($p<0,05$) correlation between the average laboratory class grade and attendance at test classes (0 to 4), Spearman's correlation coefficient 0,57;

- statistically significant ($p<0,05$) correlation between the average laboratory class grade and the average test work grade, Spearman's correlation coefficient 0,47.

Using ANOVA, the interconnection between attendance at test classes and the average score for laboratory works, exam grades and total rating of student performance (Fig. 1-3).

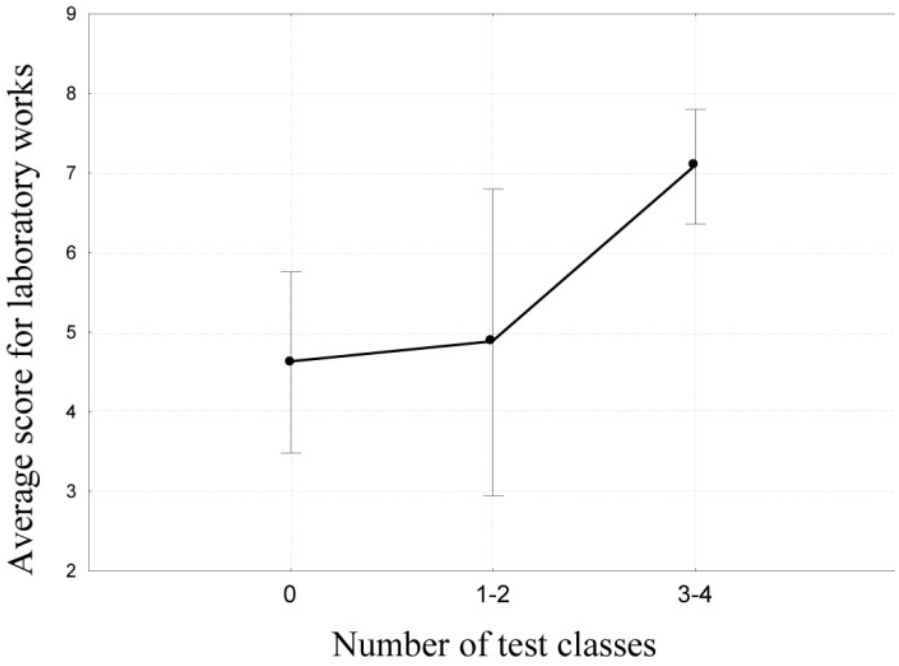


Figure 1. **Average values of "average score for laboratory works" and confidence interval (95 %) in groups with different test class attendance rate**

For students, who had attended 3 to 4 test classes, the average score for practical works and exam grade were statistically much higher, than for students not having attended test classes or having only attended 1-2 classes (Table 1).

Table 1. **Average values (M) of "average score for laboratory works" and difference significance level (Tukey HSD test) in groups with different attendance rates**

	group 1 M=4,62	**group 2 M=4,87**	**group 3 M=7,08**
group 1		0.8	0.002*
group 2	0.8		0.005*
group 3	0.002*	0.005*	

Figure 2 shows the dependence between average exam grade (subject "Software development technology") and attendance of test classes.

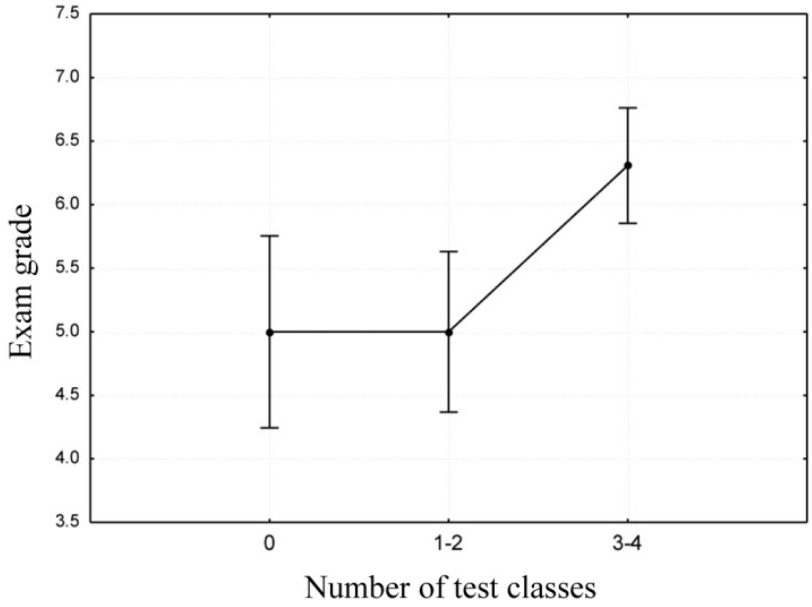


Figure 2. **Average values of "exam grade" and confidence interval (95 %) in groups with different test class attendance rate**

The next table includes information on the level of significance of differences in the three groups with different test class attendance rate (Table 2).

Table 2 **Average values of "exam grades" (M) and levels of significance of differences (Tukey HSD test) in groups with different test class attendance rate**[2]

	group 1 M=5,00	**group 2 M=5,00**	**group 3 M=6,31**
group 1		1.0	0.005*
group 2	1.0		0.003*
group 3	0.005	0.003*	

Thus, the acquired data show that those students have higher performance, who have individually, voluntarily, without any additional external motivation benefited from computer-based learning and knowledge control system.

[2] In the tables 1 and 2 the following data is represented: the first group is made up of students not having attended test class, the second group – of students having attended 1–2 test classes, the third group – of students having attended 3–4 test classes.

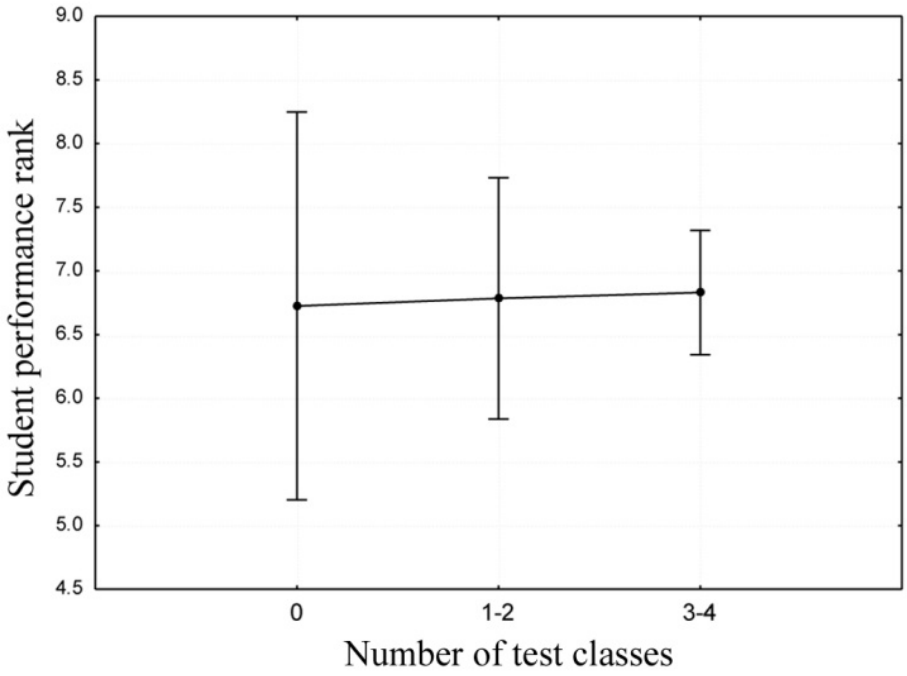


Figure 3. **Average values of "performance rank" and confidence interval (95 %) in groups with different test class attendance rate**

However the question remains, whether students' overall attitude toward studies (tests are mostly attended by more successful and motivated students) contributes to these results, or is it fully the consequence of using a computer-based system. In order to find it out, the student's overall performance at the university was assessed. A hypothesis was made that, if test class attendance will prove to be mutually dependent from overall performance, it will be possible to conclude that higher final grades received by students are mostly due to their individual capacities and not to use of computer-based systems. If, to the contrary, no connection will have been discovered between overall performance and test class attendance, then likelihood is very high that the tests are attended by all students regardless of their attitude toward the study process in general.

Data analysis has revealed that student performance rank does correlate with exam grade value and with average score for laboratory works, but does not correlate with test attendance rate. It was furthermore shown, with the help of ANOVA, that student performance at the university does not statistically significantly differ between groups with different class attendance rate (Fig. 3).

From this it can be concluded that test classes are attended not only by students with high performance and their higher scores for laboratory works and exam grade are consequence of their attending these classes. The second approach also motivated students with various levels of performance to engage in individual studies.

Non-compulsory self-control of knowledge: effects on the performance of students enrolled in the course

The scheme of learning described above computer courses was used by students for independent knowledge acquisition and control. The task was to find out, what role in student learning can be played by computer-based knowledge control, considering the fact that such systems can also be used by students themselves for self-assessment of their knowledge in the respective field. In order to optimize the use of computer systems in the study process, it is important to have a clear understanding of how motivated self-assessment is connected to student performance in a given subject. The question of motivation becomes particularly important when the use of computer-based systems depends on the free choice of students, i. e. under conditions of non-compulsory self-study and self-control.

In the aims of this research, first year students were offered the opportunity to freely complete the tests in “Data structures”. As a motivating factor, the score acquired in the tests was taken into account in producing the final exam grade.

The research was conducted in groups of students of the following specialties: computer systems (134 students), informational technologies (116 students) and automation and computer equipment (64 students). During a semester a prevalent majority of the first grade students (72,3 %, 227 students) attended all test classes, 2 test classes were attended by 12,1 % (38 students), 1 test class – 8,3 % (26 students) and 7,3 % (23 students) didn’t attend a single test class. IT must be noted that test class attendance rate statistically significantly ($p<0,05$) correlated with presence of exam grade (Fig. 4), with Spearman’s non-parametric correlation coefficient being 0,41.

As it can be seen from the diagram, the number of students having passed the exam did not statistically significantly vary in groups having attended one test class and not having attended any.

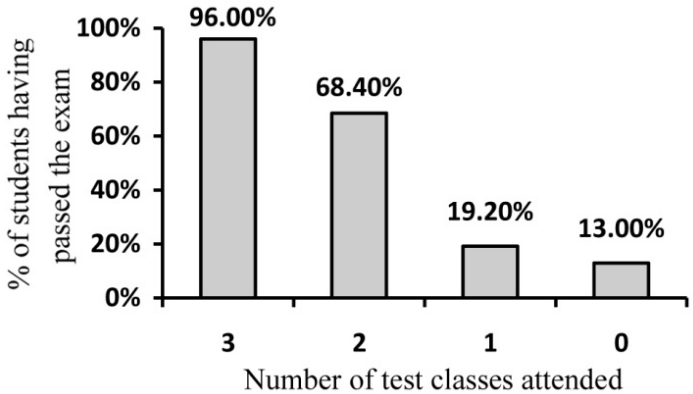


Figure 4. **Relative number of students having passed the exam in “Data structures” depending on their test class attendance rate**

The analysis of laboratory work scores in "Data structures" depending on test class attendance showed that the average laboratory work score does not depend on the number of test classes attended.

At the same time, in the group of students that had passed the exam, there existed a statistically significant ($p<0,05$) correlation with Spearman's correlation coefficient being 0,31 between scores obtained for tests and laboratory classes. Furthermore, test class attendance rate statistically significantly correlated with laboratory work attendance rate (Spearman's correlation coefficient 0,49, $p<0,05$).

It must also be noted that all first year students who have passed the exam and were transferred to the next year had attended at least one test class in "Data structures" during the academic year.

The research however showed that general performance of students during the semester has statistically significant correlation ($p<0,05$) to performance indicators in the "Data structures" subject. The correlation coefficient of general performance of students during with average grade for test tasks is 0,31, with grade for the course paper – 0,43, and with average grade for work at laboratory classes – 0,38.

Thus, the results show that:

- average laboratory class grades did not depend on how often self-control was performed;
- however, these grades were higher for students with higher test grades;
- students who made less use of computer-based self-control were more often absent from classes;
- performance in the "Data structures" course correlated with performance in other subjects.

The acquired results show that students independently used the knowledge control system when they had sufficient motivation. It was established that non-compulsory self-control of knowledge positively affected the quality of studies. Such approach can foster skills of individual learning which are crucial to adapt to the demands of contemporary working environment.

Conclusion

Transformations taking place in the world today set new requirements to study process. Traditional educational paradigm gives way to intensive independent learning activity. Both students' capacity to self-study and technologies that can foster it acquire greater and greater significance (Rupšienė & Mažionienė, 2011). The traditional educational paradigm presupposes compulsory knowledge control performed by the teacher. However,

such system does not allow to effectively educate a person that would be capable of independently improving their skills. Students' motivation poses a complicated issue, as independent study requires active stance to acquiring new knowledge, i. e. self-motivation.

In the conducted research we assessed the possibility of use of LMS and ORTUS systems by students for independent study and self-control of knowledge in the situation when these systems are not declared compulsory. We also discussed the way the use of such systems affects student performance. The results show that students are ready to use LMS and ORTUS computer-based systems for individual study and self-control of knowledge.

However, it must be noted that the effectiveness of introduction to the course program of tests for knowledge self-control alone will depend on the level of students' overall performance. Acquired results show that even with positive motivation, test-based self-control was more effective for students with better performance in other subjects. At the same time, unmotivated independent use of the LMS complex system for studying and knowledge control positively affected students' level of knowledge regardless of their performance in all the subjects. Furthermore, such approach motivated students to independently absorb the study material. By way of conclusion we recommend the use of the complex LMS system not only for shaping professional competencies, but also for developing skills of self-study.

We can conclude that independent use of computer-based systems with options of self-study and self-control can foster acquisition of skills of self-study, as well as motivation to acquire knowledge, both of which are so crucial for adaptation in today's world. However, further research is necessary to develop optimal educational technologies for students who differ from one another in terms of their attitude to studies, level of motivation and previous training.

References

Anohina-Naumeca, A., Grundspenkis, J., & Strautmane, M. (2011). The Concept Map Based Assessment System: Functional Capabilities, Evolution, and Experimental Results. *International Journal of Continuing Engineering Education and Life-Long Learning, 21* (4), 308-327.

Glantz, S. (1998). *Medico-biological statistics*. Moscow: Praktika (in Russian).

Golitsyna, I. N. (2012). Social Software in Contemporary Professional Education. *International Electronic Journal "Educational Technology & Society", 15* (4), 515-528. Retrieved from: http://ifets.ieee.org/russian/depository/v15_i4/html/11.html (in Russian).

Grundspenkis, J., &Anohina, A. (2009). Evolution of the concept map based adaptive knowledge assessment system: implementation and evaluation results. *Scientific Proceeding of Riga Technical University, 5th series "Computer Science. Applied Computer Systems", 38*, 13-24.

Gütl, C., Lankmayr, K., Weinhofer, J., & Höfler, M. (2011). Enhanced Automatic Question Creator – EAQC: Concept, Development and Evaluation of an Automatic Test Item Creation Tool to Foster Modern e-Education. *Electronic Journal of e-Learning*, *9* (1), 23-38.

Journal of Educational Technology & Society (2017). Retrieved from: http://www.ifets.info/.

Klizaitė, J., & Arlauskienė, R. (2015) Students' Attitude Towards Self-Study: A Case of College Study Programmes in Social Sciences. *Applied Research In Health And Social Sciences: Interface And Interaction, 12* (1), 2-10.

Lau, P. N. K., Lau, S. H., Hong, K. S., & Usop, H. (2011). Guessing, Partial Knowledge, and Misconceptions in Multiple-Choice Tests. *Journal of Educational Technology & Society, 14* (4), 99–110.

Manako, A. F., & Sinitsa, K. M. (2012). Computer Technologies in Education: A View from the Transformation Perspective. *International Electronic Journal "Educational Technology & Society", 15* (3), 392-414. Retrieved from: https://goo.gl/Ct8fCc (in Russian).

Nicetsky, L. (1977). *Requirements specification for development of the RPI computer-based teaching system first version*. Riga: Riga Polytechnic Institute (in Russian).

Prokofjeva, N., Anohina-Naumeca, A., & Lebedeva, O. (2013). Administration of Knowledge Assessment at Riga Technical University". *Proceedings ICCGI 2013: the 8th International Multi-Conference on Computing in the Global Information Technology,* 34-39.

Rastrigin, L., & Erenshtein, M. (1986). *Adaptive teaching with a model.* Riga: Zinatne (in Russian).

Rupšienė, L., & Mažionienė, A. (2011). Independent work at higher school from the viewpoint of social care teacher's management competencies development: students' opinion. *Bridges/Tiltai, 56* (3), 151-158 (in Lithuanian).

The Electronic Journal „International Academy, Research, and Industry Association (IARIA) (2017). Retrieved from: http://www.iariajournals.org/

The Electronic Journal of e-Learning (EJEL) (2017). Retrieved from: http://www.ejel.org/main.html

Zaiceva, L., & Prokofjeva, N. (2012). Knowledge Control during the Preparation of IT Specialists in Riga Technical University. Proceedings from ICIT-2012: *International Congress on Information Technologies (ICIT-2012): International Congress on Information Technologies*. Russia, Saratov: Saratov State Technical University, 1-10.

Zaiceva, L., Prokofjeva, N., & Kataļņikova, S. (2017). Various Methods of Knowledge Assessment during the Training of IT Specialists. *Applied Computer Systems, 21*, 80-85. doi:10.1515/acss-2017-0011

Zaitseva, L. (2008). E-courses using Results and Efficiency. Proceedings from CATE 2008: *the 11th IASTED International Conference "Computers and Advanced Technology in Education"*, 90–93.

Zaitseva, L., & Bule, J. (2008). E-learning courses using and evaluation in Riga Technical University. *Proceedings from ICALT 2008: the 8th IEEE International Conference on Advanced Learning Technologies*, 1057–1058.

Zaitseva, L., Novitsky, L., & Gribkova, V. (1989). *Computer-aided teaching systems development and using*. Riga: Zinatne (in Russian).

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 402-408

APPLICATION OF THE SOFTWARE PACKAGE LTSPICE FOR DESIGNING AND ANALYSING THE OPERATION OF ELECTRONIC SYSTEMS

Pawel Ptak
Czestochowa University of Technology, Faculty of Electrical Engineering, Poland

Abstract. *The paper presents application of the software package LTspice in the teaching of designing and analysis of electronic systems operation. The program has been used for simulating the operation of typical electronic systems, such as filters. The systems created in the simulation can provide a basis for preparing students to participate in laboratory classes. The results obtained in a simulation can be subsequently verified by testing real systems during the electronics laboratory classes. The results of simulation and real experiments can also be compared and utilised for making an analysis and writing a report on the experiment.*
Keywords: *simulation, problem task, electronics laboratory didactics.*

Introduction

Manufactured by Linear Technology Corporation® and available free of charge, application LTSpice is a kind of software intended for designing electronic systems and simulating their operation in the virtual environment (Prauzner, 2013). Constructing a measuring system involves selecting symbols denoting electronic components from the menu and inserting them into the virtual simulation screen. The connected components form a data-flow sheet, with data travelling between the components of the system (Prauzner, 2016). The components are built into the application but their inventory can also be expanded by installing libraries available at the software manufacturer's website. The program offers fairly complex functionalities and can be used for building complicated electronic systems and for observing their simulated operation. It is likewise possible to observe the behaviour of electrical and electronic parameters during a simulation thanks to in-built measuring and registering instruments (Prauzner, 2012). The value of current and voltage can be checked at a number of predetermined points of the system under test. An example of a system constructed by means of the program LTSpice is presented in Fig. 1 (Electronic Circuit, 2018).

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3118

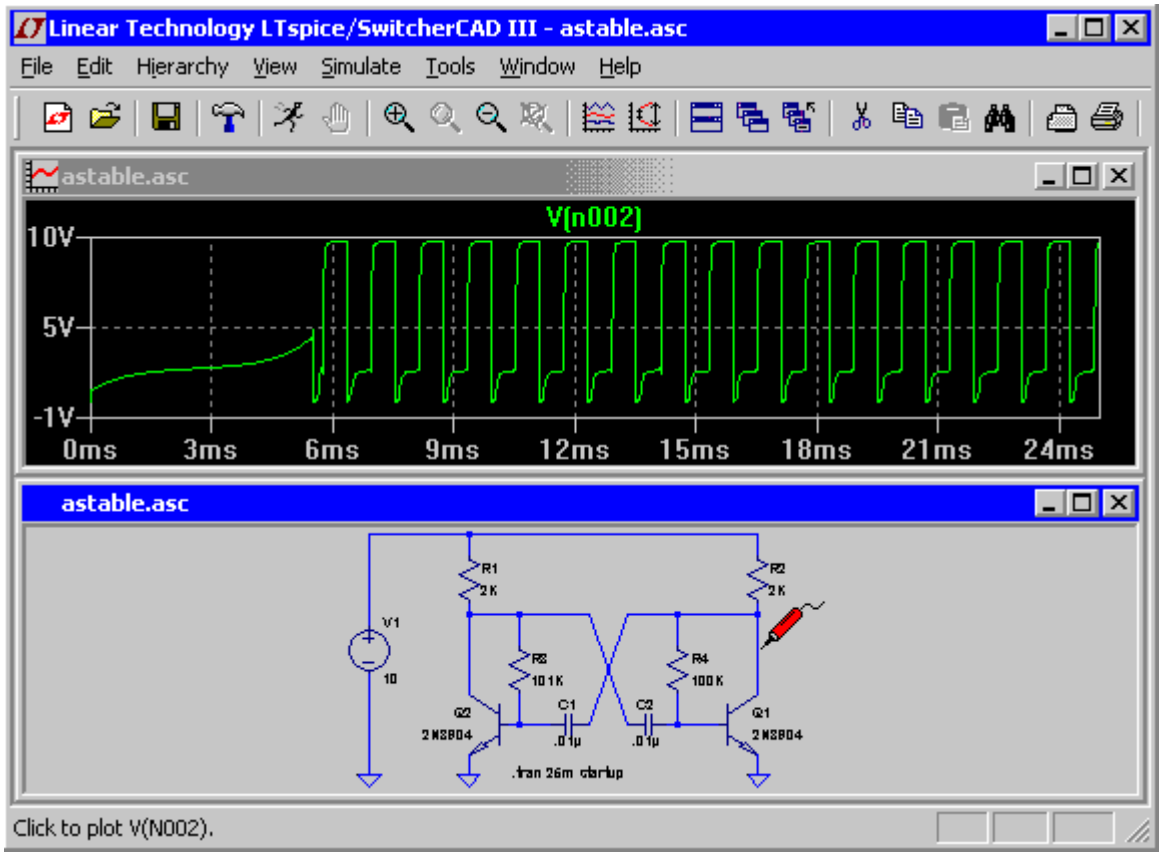


Figure 1. **Electronic system created in the LTSPice environment**

Simulation of a system under test in LTSpice

To perform a measuring task, an active band-pass filter was designed in LTSpice. The characteristics of the filter were determined by finding the value of output voltage for a constant value of the input voltage. The frequency of the filter was adjusted in the range of 20 to 20000 Hz. On the basis of the data obtained the amplification coefficient *ku* was calculated during the simulated work of the system. Fig. 2 presents the design of the active band-pass filter system created in the software LTSpice, at the filter quality $Q = 5$, and Fig. 3 the same system is shown at the filter quality $Q = 707$ (Jędrzejczyk, 2017).

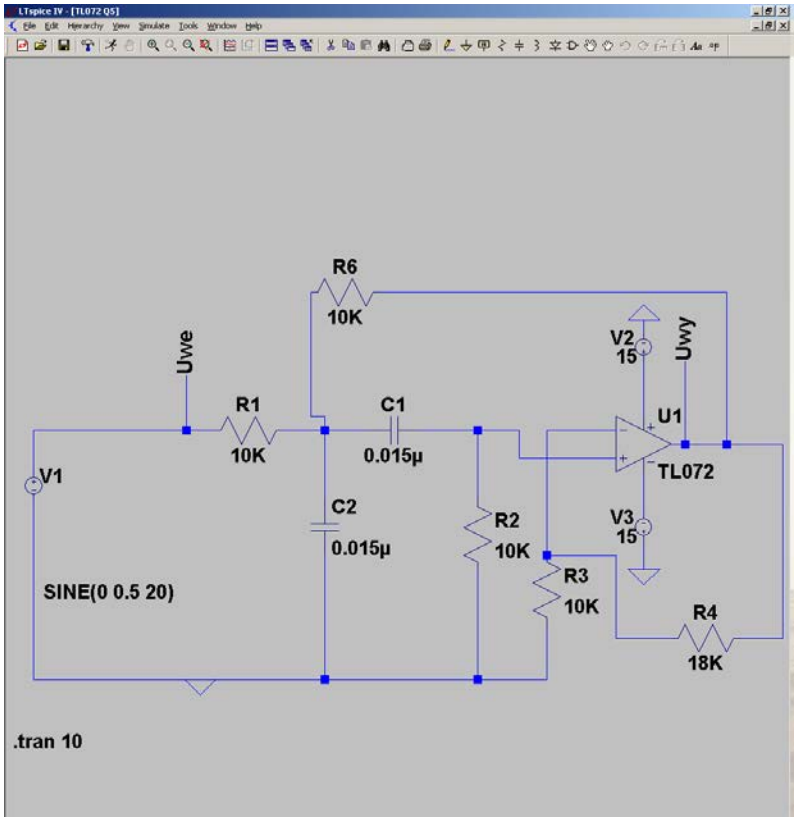


Figure 2. **System for testing a band-pass filter created in the program LTSpice at *Q* = 5**

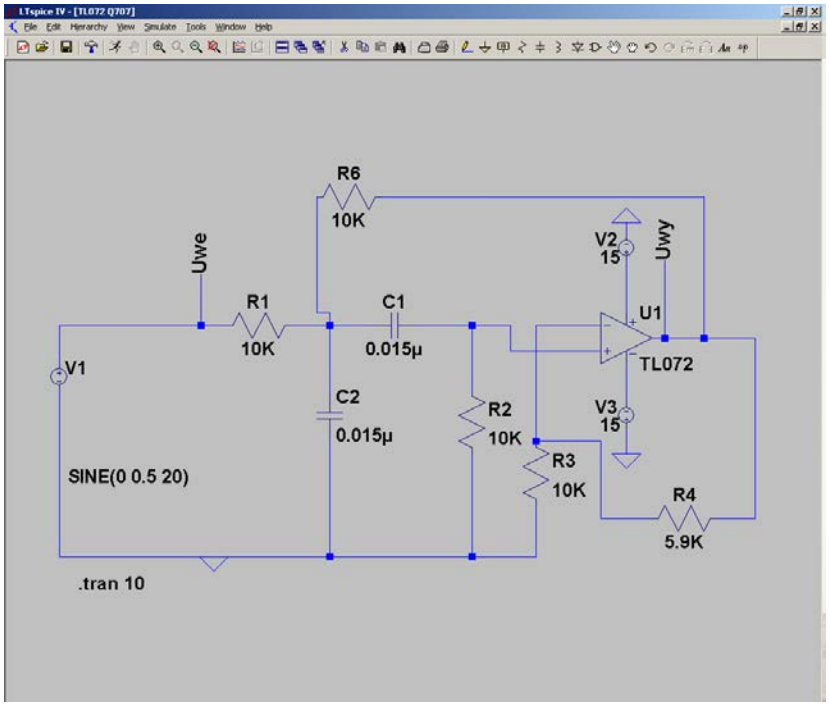


Figure 3. **System for testing a band-pass filter created in the program LTSpice at *Q* = 707**

Due to the fact that LTSpice represents the results of measurements as sinusoid curves, the values of input and output voltages of the filter under test had to be expressed as RMS values. Fig. 4 presents a screen of an LTSpice simulation of a low-pass filter system with sinusoid waveforms of input and output voltages (Jędrzejczyk, 2017).

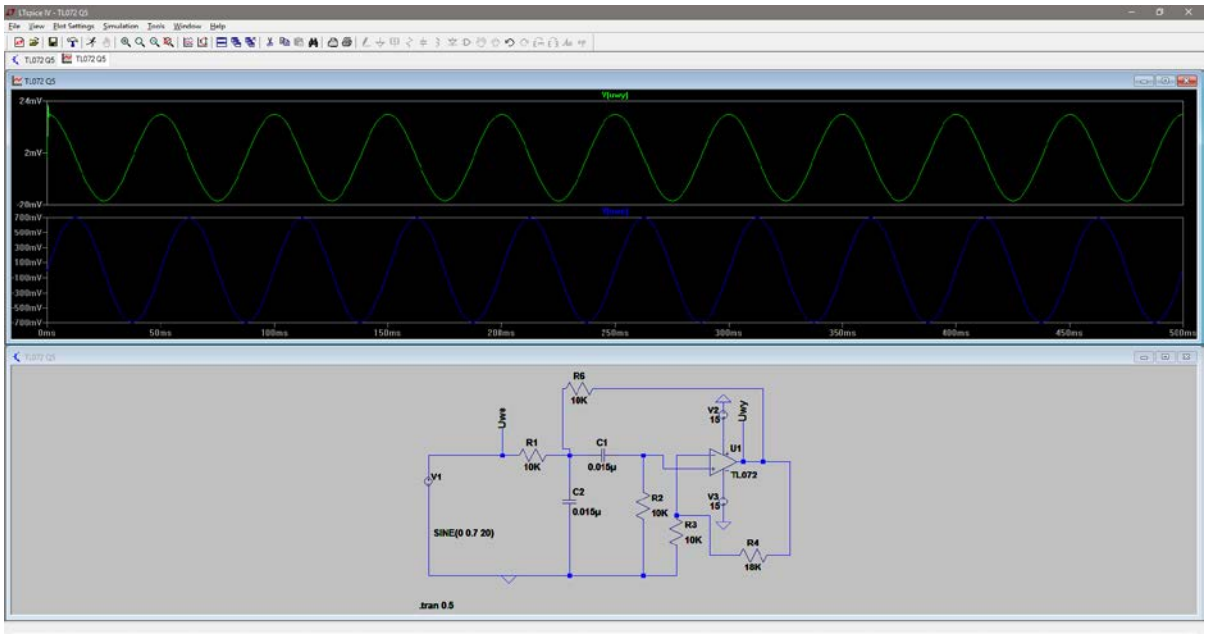


Figure 4. **System for testing a low-pass filter during simulation with sinusoid voltage curves**

The results obtained from the LTSpice simulation were further compared with results obtained from laboratory measuring instruments in real tests. The measuring data were included in tables and the results of the comparison were presented as graphs. Fig. 5 shows a juxtaposition of results obtained empirically by testing real filter systems in laboratory classes with results coming from a LTSpice simulation (Jędrzejczyk, 2017).

On the basis of the results obtained it can be observed that for the factor $Q = 5$ the shapes of the curves are similar but one is shifted with respect to the other, which can be an effect of using ideal electronic elements built into the simulation program. For $Q = 707$, the curve representing real measurements is somewhat deformed, which can result from measuring errors. The vertical shift of the measurement characteristics with respect to the simulation characteristics can be explained, like in the case of the quality factor $Q = 5$, by the fact the in the simulation ideal elements were used.

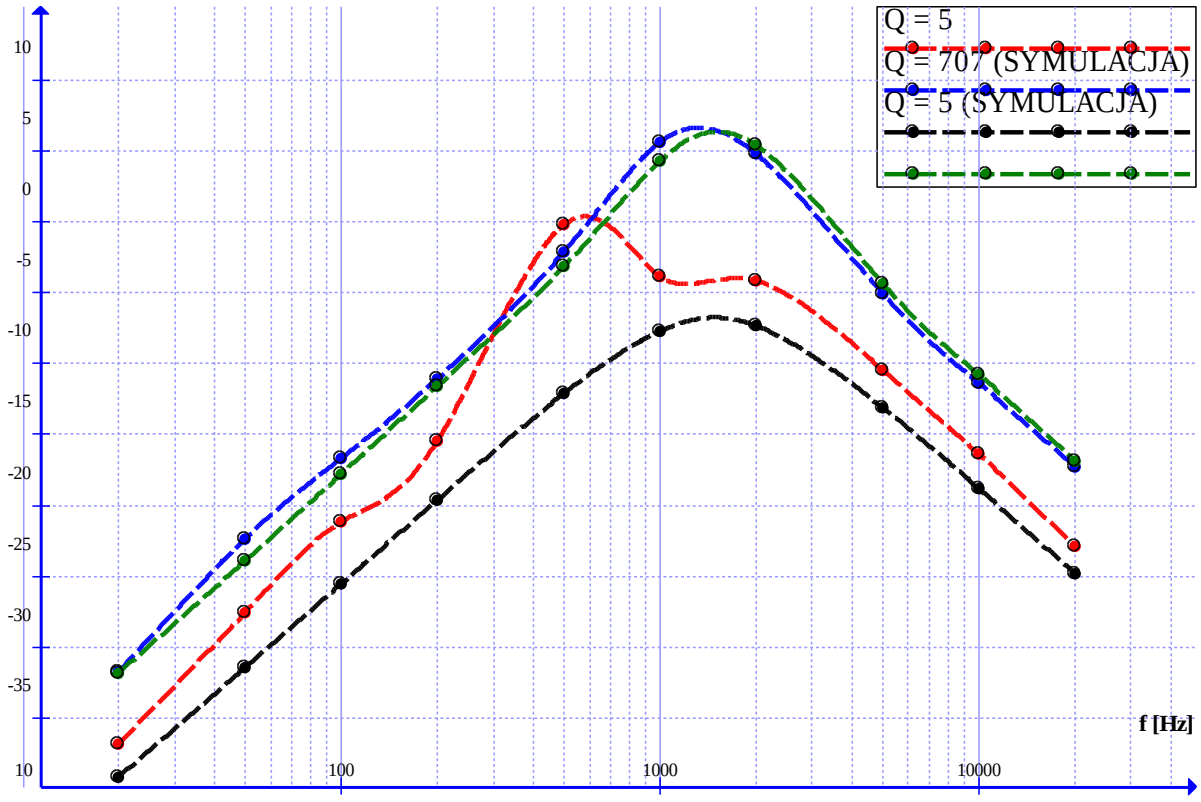


Figure 5. **Comparison of two sets of results of testing the amplification coefficient of a low-pass filter: obtained empirically and obtained in a simulation**

Concluding remarks

The research described in the paper indicates that the simulation software LTSpice offers a possibility of conducting a thorough study on the functioning of an electronic system. Thanks to that, students can test the operation of such a system at the stage of designing. They can also compare results obtained in simulations with those obtained in laboratory classes (Ptak & Prauzner, 2010; Ptak, 2016; Ptak, 2017). In this way, they have greater chances of gaining knowledge and skills in the field of electronics (Ptak, 2014; Ptak, 2015; Prauzner, 2017).

Using ideal elements in the simulation program brings to notice an important observation, namely, that the functioning of electronic systems depends not only on their construction but also on the parameters of their particular electronic components (Prauzner, 2012; Ptak & Prauzner, 2013; Ptak & Prauzner, 2014). This sheds light on how electronic systems work and how their operation can be influenced, which should appear interesting to students (Zloto et al., 2012). By active participation in designing electronic

systems, student are offered an opportunity to experiment with a number of possible designs in a creative way (Prauzner, 2015; Krzywanski et al., 2017).

References

Electronic Circuit, (2018). *LTspice IV Circuit Simulation Schematic Capture Tool.* web site: http://www.electronicecircuits.com/electronic-software/ltspice-iv-circuit-simulation-schematic-capture-tool

Jędrzejczyk, M. (2017). *Analiza możliwości i zastosowania programów symulacyjnych wspomagających nauczanie elektrotechniki i elektroniki*. Wydział Elektryczny, Politechnika Częstochowska

Krzywanski, J., Grabowska, K., Herman, F., Pyrka, P., Sosnowski, M., Prauzner, T., & Nowak, W. (2017). Optimization of a three-bed adsorption chiller by genetic algorithms and neural networks, *Energy Conversion and Management, 153 (2017)*, 313–322.

Prauzner, T. (2013). Information Technology in Contemporary Education – Individuals' Researche. *American Journal of Educational Research, 2013, Vol. 1,* No. 10.

Prauzner, T. (2015). Analysis of the results of the pedagogical research and EEG in the aspect of effective modern teaching aids in the technical education. *Society. Integration. Education, Proceedings of the International Scientific Conference. Volume IV, May 22th-23th 2015*,4 80-489.

Prauzner, T. (2017). The effectiveness of school education - featured implications considerations. *Society. Integration. Education, Proceedings of the International Scientific Conference. Volume III, May 26th-27th 2017*, 558-564.

Prauzner, T. (2012). Zakłócenia elektromagnetyczne w elektronicznych systemach alarmowych. (The electromagnetic interferences in the electronic alarm systems). *Przegląd Elektrotechniczny, 88 (2012), nr.12b*, 205-208.

Prauzner, T. (2016). Interactive computer simulation as a response to contemporary problems of technical education. *Society. Integration. Education, Proceedings of the International Scientific Conference. Volume II*, 579-588.

Ptak, P., & Prauzner, T. (2010). Wykorzystanie pakietu DasyLab w nauczaniu podstaw elektroniki. *Edukacja. Studia, Badania, Innowacje, NR 02/2010*, 159-164.

Ptak, P., & Prauzner, T. (2013). Badanie czujników detekcji zagrożeń w systemach alarmowych. *Przegląd Elektrotechniczny, NR 10/2013*, 274-276.

Ptak, P., & Prauzner, T. (2014). Analiza parametrów pracy wybranych czujników pola magnetycznego. *Przegląd Elektrotechniczny, R. 90 NR 12/2014*, 273-276.

Ptak, P. (2014). Software package dasylab supporting research and teaching. E-Technologies in Engineering Education eTEE'2014, *Zeszyty Naukowe Wydziału Elektrotechniki i Automatyki PG, Nr 37/2014, Gdańsk,* 71-74.

Ptak, P. (2015). Application of DasyLab in Teaching Electrical Engineering. *Society, Integration, Education. Proceedings of the International Scientific Conference. Volume IV, May 22nd-23rd, 2015*, 490-499.

Ptak, P. (2016). Application of software packages in research and didactics. *Society, Integration, Education. Proceedings of the International Scientific Conference. Volume II, May 27th-28th, 2016*, 589-597.

Ptak, P. (2017). *Application of computer programmes in research projects and teaching. Society, Integration, Education. Proceedings of the International Scientific Conference. Volume III, May 26th-27th, 2017*. 565-574.

Zloto, T., Ptak, P., & Prauzner, T. (2012). Analysis of signals from inductive sensors by means of the DasyLab software. *Annales Universitatis Mariae Curie-Skłodowska Sectio AI Informatica XII, NR 1/2012*, 31-37.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 409-419

APPLICATION OF MULTISIM AND LTSPICE SOFTWARE PACKAGES TO SIMULATE THE OPERATION OF ELECTRONIC COMPONENTS AS AN ALTERNATIVE TO MEASUREMENTS OF REAL ELEMENTS

Pawel Ptak
Czestochowa University of Technology, Poland

Abstract. *The paper presents the process of carrying out simulations of the operation of electronic elements by means of software packages Multisim and LTspice. Using the software, students can test a possibility of replacing real measurements by results obtained from a simulation. The can reach the relevant conclusions by comparing the results and analysing the data obtained. In this way students gain experience needed for carrying out a didactic project in a creative way.*
Keywords: *simulation, problem task, electronics lab didactics.*

Introduction

Programme LTSpice is a free app manufactured by Linear Technology Corporation®. It is used for constructing electronic systems and performing simulations on them. Equipped with an ample library of electronic components and subsystems, it offers a possibility of constructing fairly complex systems (Jędrzejczyk, 2017). The inventory of components can be expanded by installing new libraries provided by the app producer.

To insert an electronic component into the simulation screen, one has to select this component from a menu or using a keyboard shortcut (Prauzner, 2013). After the components have been placed in the simulation window, they have to be connected in accordance with the diagram of the measuring system (Prauzner, 2013).

Another program intended for constructing electronic systems and their simulation is NI Multisim manufactured by National Instruments Corporation®. It includes an extended base of subsystems consisting of about 20,000 components, both real and ideal. They can be used for constructing highly complex electronic systems (Ptak, 2016). The program is more extended and offers wider possibilities that the similar in application LTSpice. Multisim has an in-built drag and drop mechanism for inserting and measuring electronic

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3120

components into a simulation by choosing these components from scroll-down menus, in which the available components are displayed (Ptak, 2017). Simulations carried out in Multisim are interactive, and it is possible to modify the parameters of input and output signals during a simulation and to observe how such modifications affect the operation of the systems under scrutiny thanks to the in-built measuring and registering systems (Jakubiec, 2017). The signals which are being measured can be also observed on the screen of an in-built oscilloscope and recorded as graphic files (Prauzner, 2016).

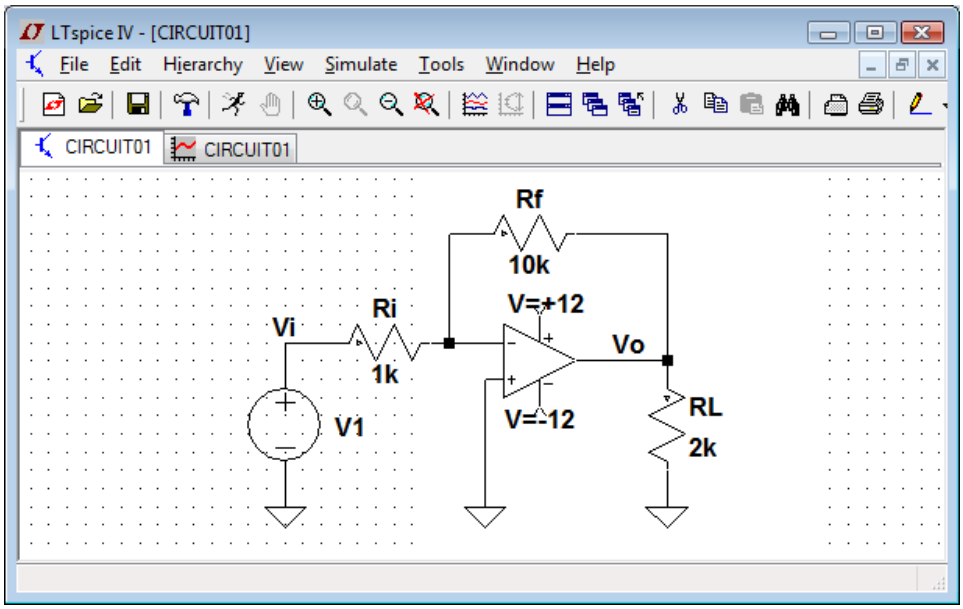


Figure 1. **Presents an example of a system constructed in the LTSpice environment** (University of Evansville, 2009)

Some of the measuring instruments are real devices, which are built into the simulation program together with a realistically looking control panel. Modifying parameters of the system during its operation and observing the results of such modifications resemble the work in a real electronic laboratory with real measuring equipment (Prauzner & Ptak, 2014). Fig. 2 presents an example of an electronic system constructed in the NI Multisim environment.

Two measuring systems were constructed to perform a task involving the testing of a semiconductor diode and a transistor. The system designed for testing the diode was constructed in LTSpice and also in NI Multisim. The other system for testing a bipolar transistor was likewise constructed in LTSpice and then in NI Multisim. Constructing the same measuring system in both software packages was justified by the need to check whether and to what extent such applications can replace laboratory measurements of real electronic components, and if yes, whether the results so obtained are comparable with those from laboratory measuring instruments.

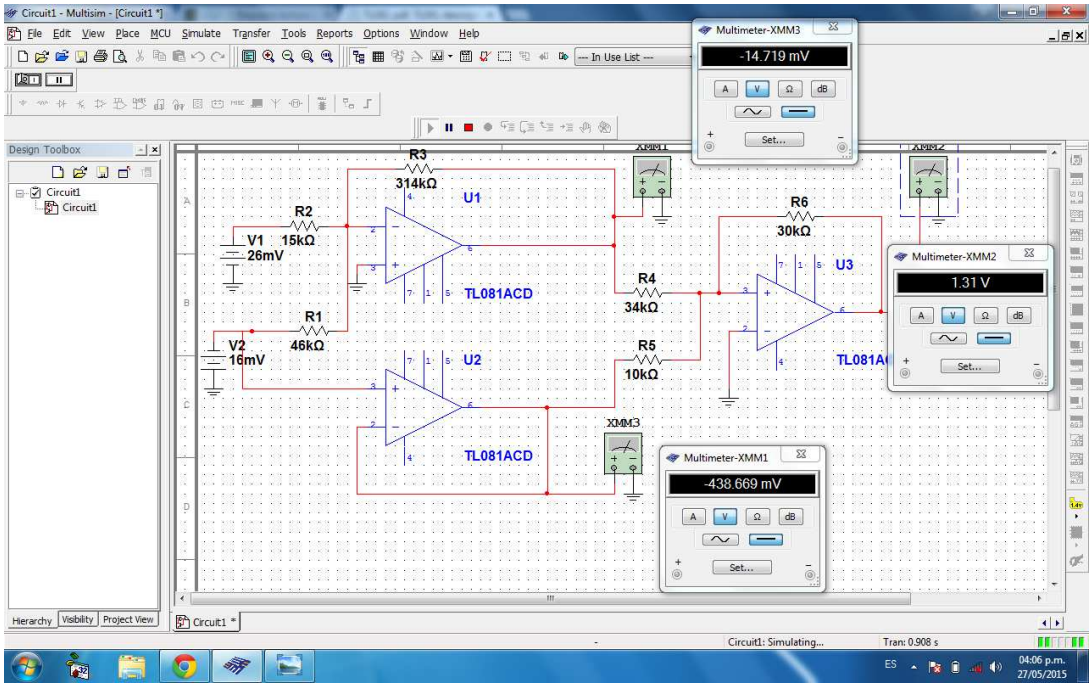


Figure 2. **Electronic system created in NI Multisim Measurements carried out in labs and simulated in programs** (Chavarin, 2015)

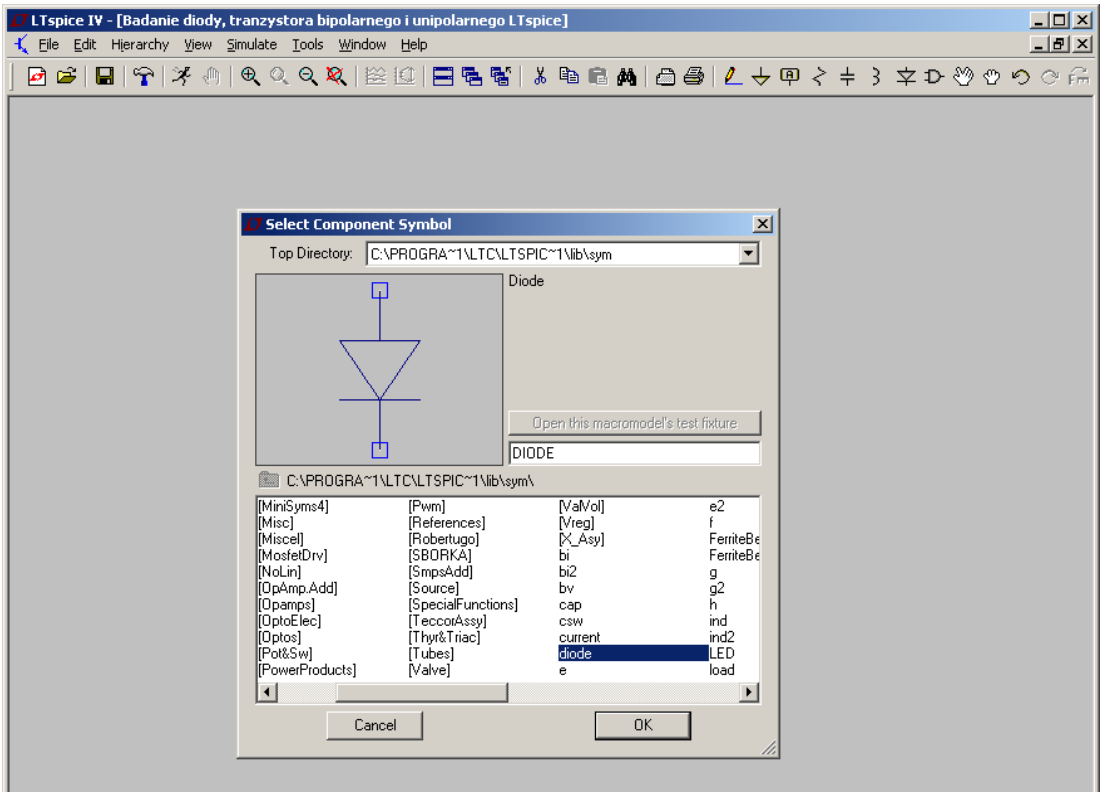


Figure 3. **Procedures for inserting electronic components to the simulation screen in LTSpice**

Fig. 3 presents the procedure of inserting electronic components to the simulation from the base available in LTSpice, and Fig. 4 shows a selection of electronic components used for a simulation in NI Multisim (Jędrzejczyk, 2017).

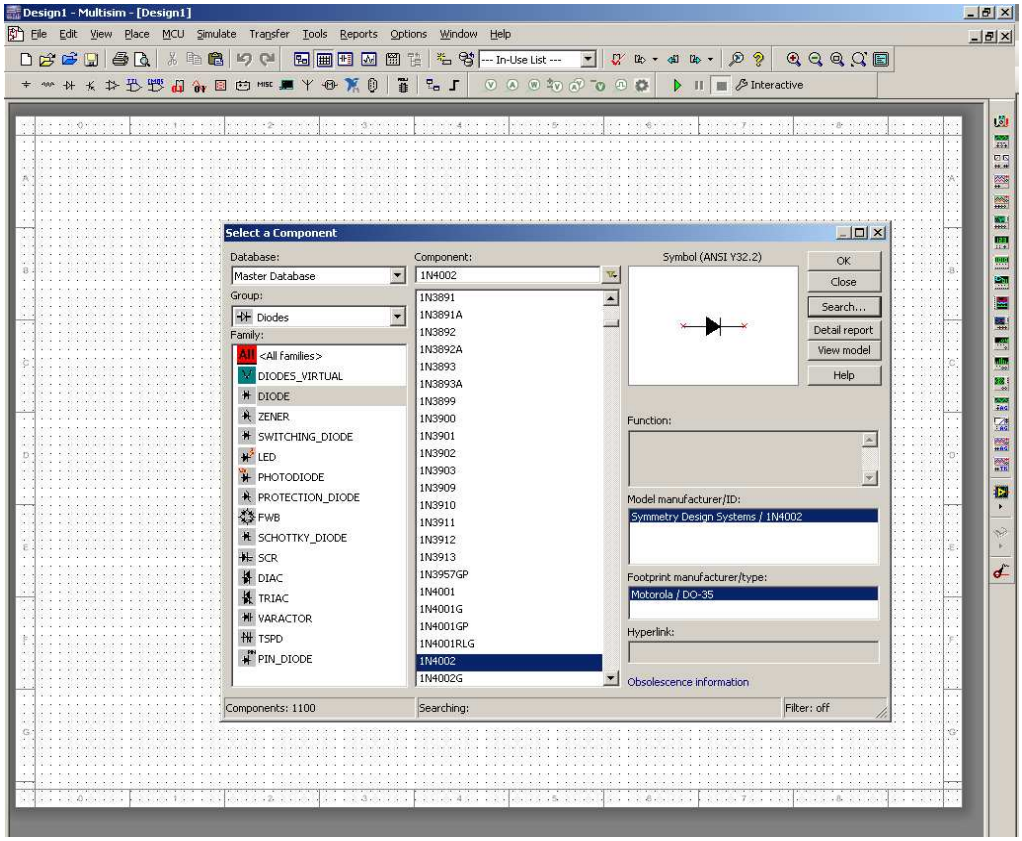


Figure 4. **Selection of electronic components for a NI Multisim simulation**

Fig. 5 presents the system designed for carrying out measurements on the semiconductor diode constructed in the LTSpice package and Fig. 6 presents the same system constructed in the program NI Multisim (Jędrzejczyk, 2017).

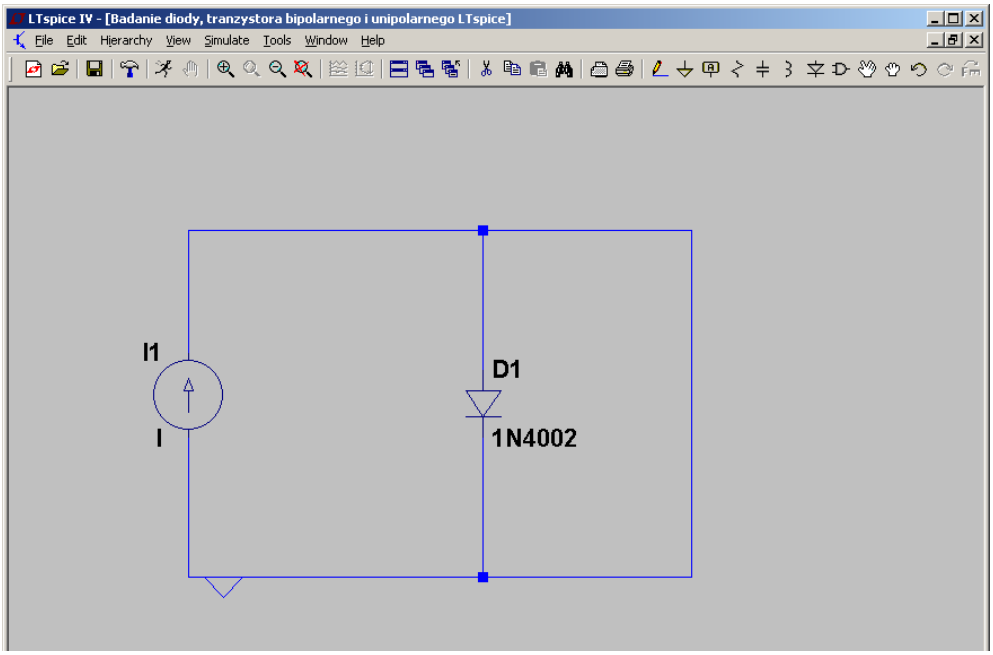


Figure 5. **System for measuring the parameters of a semiconductor diode created in LTSpice**

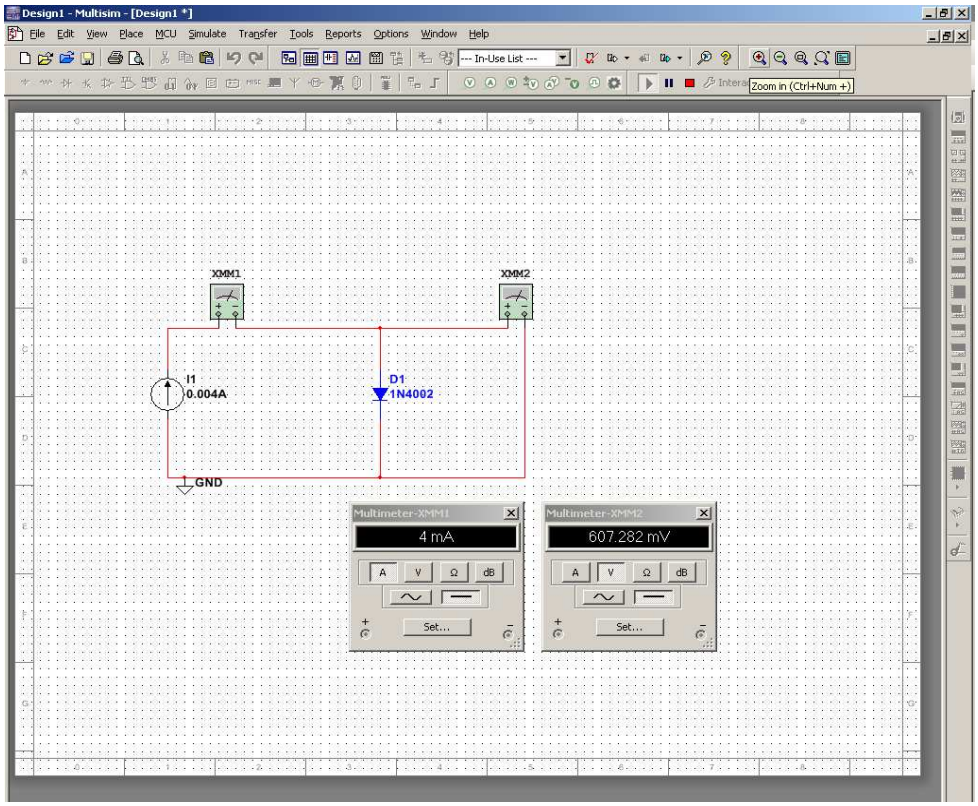


Figure 6. **System for measuring the parameters of a semiconductor diode created in NI Multisim**

After the measurements using the two software packages were performed, their results were written down in tables and represented as graphs comparing the lab results of real measurements with the simulation results. Fig. 7 presents a comparison of real vs. LTSpice results, whereas Fig. 8 real vs. NI Multisim results.

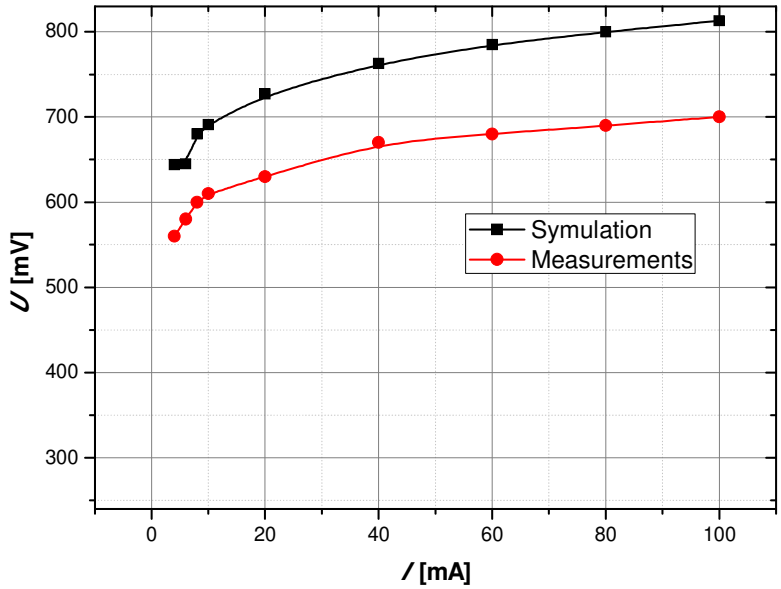


Figure 7. **Comparison of the results obtained in the program LTspice with those obtained in real measurements on a semiconductor diode type 1N4002**

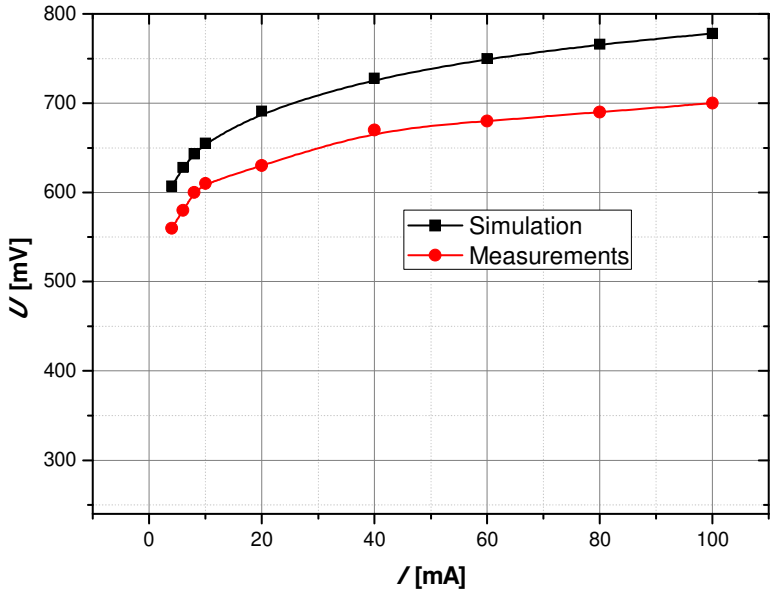


Figure 8. **Comparison of the results obtained in the program NI Multisim with those obtained in real measurements on a semiconductor diode type 1N4002**

As indicated by analyses, the characteristics representing the measurement results and those representing the simulation results are similar, with the latter being shifted vertically by a constant value. This is caused by the fact that the electronic components used in the simulations have ideal characteristics and inaccuracies and errors of real measurements are disregarded.

The other element put under test was a bipolar transistor in a measuring system. The task involved measuring the values of current at the transistor's base and collector for various values of resistance at the base and various values of voltage supplying the collector. Two measuring systems were created for this purpose, one in LTSpice and the other in NI Multisim. Figs 9 and 10 present the two bipolar transistor measuring systems constructed in LTSpice and in NI Multisim, respectively (Jędrzejczyk, 2017).

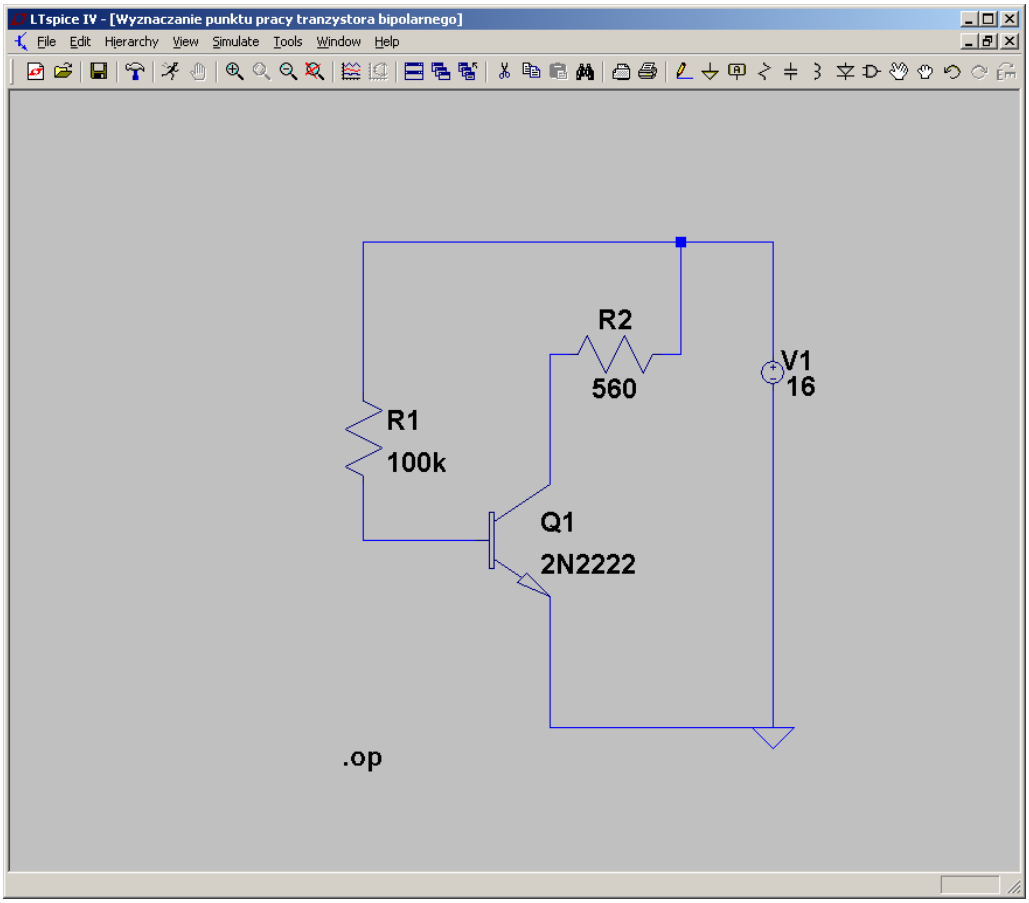


Figure 9. **System for measuring the parameters of a bipolar transistor created in LTSpice**

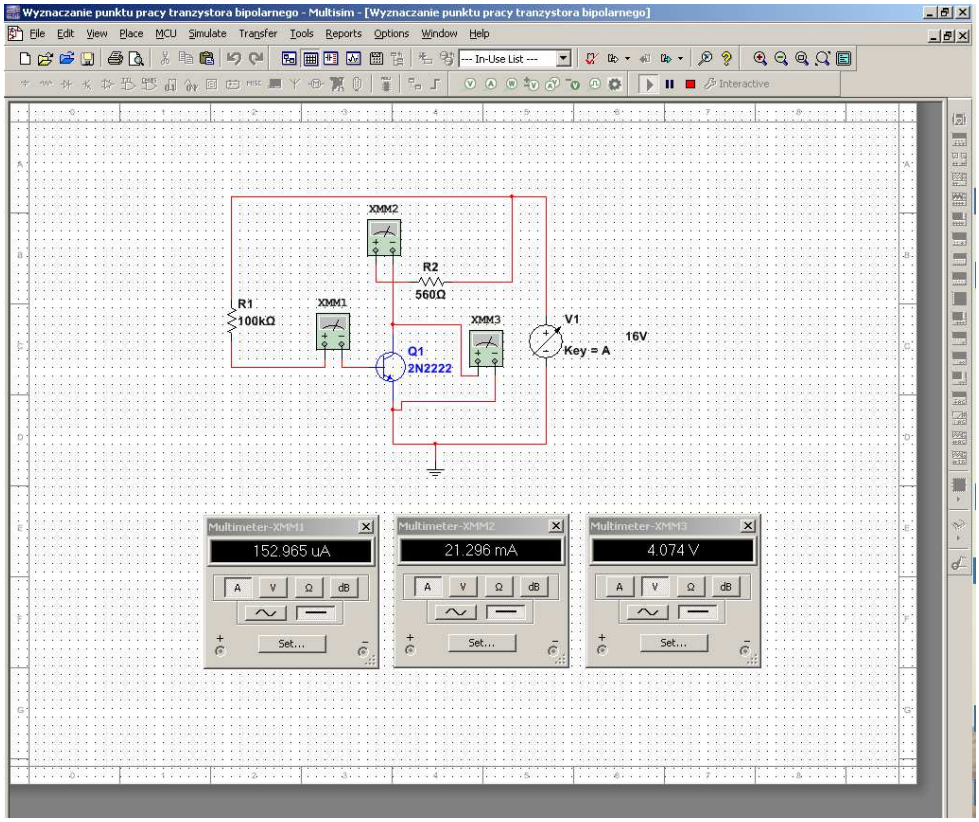


Figure 10. **System for measuring the parameters of a bipolar transistor created in NI Multisim**

The results of laboratory measurements and results obtained from simulations carried out in the software packages were written down in tables and represented as graphs, so that they could be subjected to analysis. Fig. 11 shows a comparison of results obtained from a LTSpice simulation to laboratory measurement results, whereas Fig. 12 juxtaposes NI Multisim simulation results with laboratory measurement results.

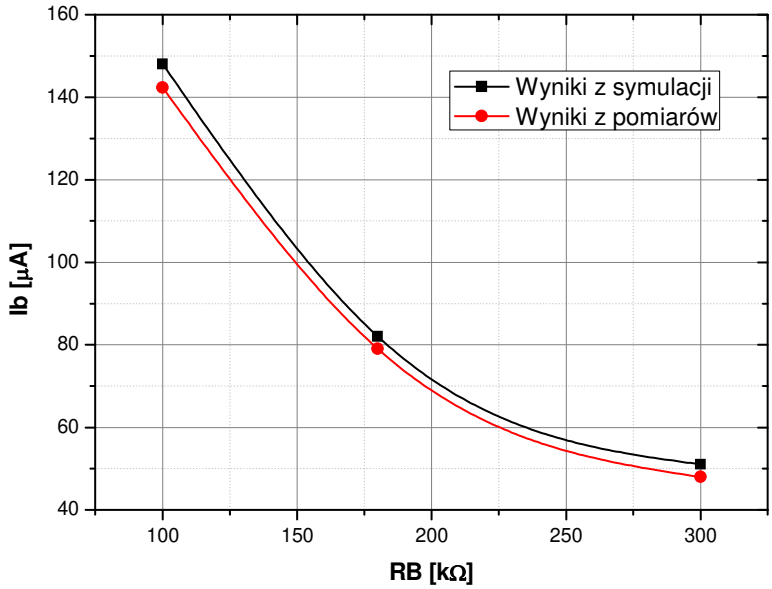


Figure 11. **Comparison between results of a LTspice simulation and results of real measurements on a bipolar transistor type 2N2222**

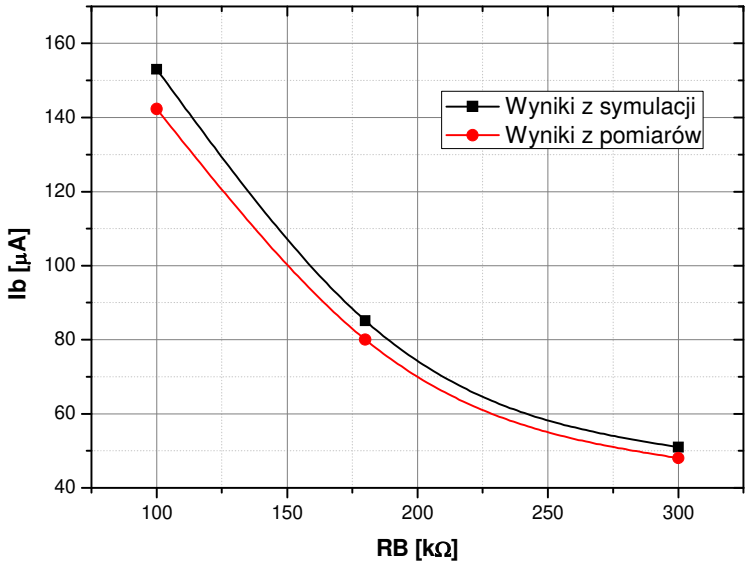


Figure 12. **Comparison between results of a NI Multisim simulation and results of real measurements on a bipolar transistor type 2N2222**

Concluding results

The research presented in this paper indicates that the results obtained from simulations carried out in the two software packages, i.e. LTSpice and NI Multisim are close to those obtained in laboratory measurements. It can be noted that the shapes of the characteristics are similar, but the values are shifted with respect to each other. The shift can be attributed to interfering factors and

variable parameters of electronic elements used in real measurements (Prauzner, 2012).

Having analysed the results obtained, it can be assumed that software packages can be successfully applied for simulating the operation of electronic systems (Zloto et al., 2012; Olesiak, 2017; Migo & Noga, 2015). Even though the results obtained in simulations do not accurately correspond to the real laboratory measurements, they sufficiently well represent the operation and parameters of the electronic components under test (Ptak, 2015; Ptak, 2014; Prauzner & Ptak, 2010).

Simulation software provides an excellent tool to complement the traditional measuring techniques employed in laboratory classes. They can be used by students to get prepared for the classes and to analyse the operation of electronic systems when they process results obtained in a lab (Krzywanski et al., 2017; Depesova et al., 2008; Noga, 2009). When it is not possible to perform measurements on real elements, e.g. due to a breakdown of a measuring stand, the work can be done using the software packages, both LTSpice and NI Multisim. Additionally, they can be used for carrying out complicated tasks involving creative experiments as it minimises possible damage to costly equipment and electronic components (Noga et al., 2014; Prauzner, 2015; Prauzner, 2017).

References

Chavarin, E. (2015). *Practica 12, Amplificador Operacional.* Electronica 1, Ultimas Entrados, web site: https://eduardochavarin.files.wordpress.com/2015/06/simulacion-multisim1.png

Depesova, J., Vargova, M., & Noga, H. (2008). *Edukacja techniczno informatyczna w opinii nauczycieli.* Uniwersytet Pedagogiczny, Kraków, 149-157.

Jakubiec, B. (2017). The utilisation of industrial process models in acquiring the practical skills of plc programming. *Society, Integration, Education. Proceedings of the International Scientific Conference. Volume III, May 26th-27th, 2017*, 483-491.

Jędrzejczyk, M. (2017). *Analiza możliwości i zastosowania programów symulacyjnych wspomagających nauczanie elektrotechniki i elektroniki*. Wydział Elektryczny, Politechnika Częstochowska.

Krzywanski, J., Grabowska, K., Herman, F., Pyrka, P., Sosnowski, M., Prauzner, T., & Nowak, W. (2017). Optimization of a three-bed adsorption chiller by genetic algorithms and neural networks. *Energy Conversion and Management 153*, 313–322.

Noga, H. (2009). Sociometric methods in technological and information technology education. In: *Trends in Education. Information technologies and technical education. Olomouc, Vols.*1, 165-169.

Noga, H, Piaskowska-Silarska, M., Depešová, J., Pytel, K., & Migo, P. (2014). Neuro - didactic erspective of creative attitude towards education in the third millennium - examination of individual cases. In: *Emerging eLearning Technologies and Applications (ICETA), 2014 IEEE 12th International Conference on*, 355 – 360.

Migo, P., & Noga, H. (2015). Start-up of SSTC semiconductor tesla coil - an example of an educational project. *Przeglad Elektrotechniczny, Volume 1,* Issue 12, 167-169.

Olesiak, K. (2017). Application of fuzzy logic toolbox for modelling fuzzy logic controllers. *Society, Integration, Education. Proceedings of the International Scientific Conference. Volume III, May 26th-27th, 2017*, 539-546.

Prauzner, T. (2013). Information Technology in Contemporary Education – Individuals' Researche. *American Journal of Educational Research*, *Vol. 1*, No. 10.

Prauzner, T. (2015). Analysis of the results of the pedagogical research and EEG in the aspect of effective modern teaching aids in the technical education. *Society. Integration. Education, Proceedings of the International Scientific Conference, Volume IV*, 480-489.

Prauzner, T. (2017). The effectiveness of school education - featured implications considerations. *Society. Integration. Education, Proceedings of the International Scientific Conference, Volume III, May 26th-27th 2017*, 558-564.

Prauzner, T. (2012). Zakłócenia elektromagnetyczne w elektronicznych systemach alarmowych. (The electromagnetic interferences in the electronic alarm systems). *Przegląd Elektrotechniczny*, *88* (2012), nr.12b, 205-208.

Prauzner, T. (2016). Interactive computer simulation as a response to contemporary problems of technical education. *Society. Integration. Education, Proceedings of the International Scientific Conference*, *Volume II*, *Rēzekne, Latvia, May 27th – 28th 2016*, 579-588.

Ptak, P., & Prauzner, T. (2010). Wykorzystanie pakietu DasyLab w nauczaniu podstaw elektroniki. *Edukacja. Studia, Badania, Innowacje, NR 02/2010*, 159-164.

Ptak, P., & Prauzner, T. (2013). Badanie czujników detekcji zagrożeń w systemach alarmowych. *Przegląd Elektrotechniczny, NR 10/2013*, 274-276.

Ptak, P., & Prauzner, T. (2014). Analiza parametrów pracy wybranych czujników pola magnetycznego. *Przegląd Elektrotechniczny, R. 90 NR 12/2014*, 273-276.

Ptak, P. (2014). Software package dasylab supporting research and teaching. *E-Technologies in Engineering Education eTEE'2014, Zeszyty Naukowe Wydziału Elektrotechniki i Automatyki PG, Nr 37/2014*, 71-74.

Ptak, P. (2015). Application of DasyLab in Teaching Electrical Engineering. *Society, Integration, Education. Proceedings of the International Scientific Conference, Volume IV, May 22nd-23rd, 2015*, 490-499.

Ptak, P. (2016). Application of software packages in research and didactics. *Society, Integration, Education. Proceedings of the International Scientific Conference, Volume II, May 27th-28th, 2016*, 589-597.

Ptak, P. (2017). Application of computer programmes in research projects and teaching. *Society, Integration, Education. Proceedings of the International Scientific Conference. Volume III, May 26th-27th, 2017*, 565-574.

University of Evansville LTSpice IV Library and Tutorials, (2009). *Transient Analysis, With Time Varying Sources*, University of Evansville, web site: https://csserver.evansville.edu/~richardson/courses/Tutorials/LTspiceIV/04_TimeVaryingSources/html/04_TimeVaryingSources.html

Zloto, T., Ptak, P., & Prauzner, T. (2012). Analysis of signals from inductive sensors by means of the DasyLab software. *Annales Universitatis Mariae Curie-Skłodowska Sectio AI Informatica XII, NR 1/2012*, 31-37.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 420-429

МОДЕЛИ ИНТЕГРАЦИИ ИНФОРМАЦИОННЫХ СИСТЕМ ВЫСШИХ УЧЕБНЫХ ЗАВЕДЕНИЙ

Models of Integration of Information Systems in Higher Education Institutions

Marat Rakhmatullaev

Uktam Karimov
Tashkent University of Information Technologies named
after Muhammad al Khwarizmi, Uzbekistan

Abstract. *At present a lot of automated systems are developing and implementing to support the educational and research processes in the universities. Often these systems duplicate some functions, databases, and also there are problems of compatibility of these systems. The most common educational systems are systems for creating electronic libraries, access to scientific and educational information, a program for detecting plagiarism, testing knowledge, etc. In this article, models and solutions for the integration of such educational automated systems as the information library system (ILS) and the anti-plagiarism system are examined. Integration of systems is based on the compatibility of databases, if more precisely in the metadata of different information models. At the same time, Cloud technologies are used - data processing technology, in which computer resources are provided to the user of the integrated system as an online service. ILS creates e-library of graduation papers and dissertations on the main server. During the creation of the electronic catalog, the communication format MARC21 is used. The database development is distributed for each department. The subsystem of anti-plagiarism analyzes the full-text database for the similarity of texts (dissertations, diploma works and others). Also it identifies the percentage of coincidence, creates the table of statistical information on the coincidence of tests for each author and division, indicating similar fields. The integrated system was developed and tested at the Tashkent University of Information Technologies to work in the corporate mode of various departments (faculties, departments, TUIT branches).*
Keywords: *integrated system, e-library, plagiarism, database, information library system, cloud technologies, communicative format.*

Введение
Introduction

В последнее время во всем мире осуществляются ряд международных проектов по совершенствованию высшего образования путем внедрения инновационных идей, обогащения материально технической базы, внедрения новейших информационно коммуникационных технологий в

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3308

процесс образования. Осваиваются передовые опыты по подготовке кадров, сопоставляются учебные планы и учебные программы с ведущими учебными заведениями мира.

Методы, системы и программные средства оценки знаний и контроля образовательного процесса играют большую роль, при подготовке конкурентоспособных кадров. Одним из таких систем является информационная система обнаружения заимствования текстов, которая нужна не только для обнаружения плагиата, но и для поиска типовых текстов, тем, аналогов. В настоящее время существует достаточно большое количество сервисов и программ, позволяющих каким-либо образом выявить заимствования. В числе таковых можно назвать: систему АПЛИС, Антиплагиат (Dygilev et al., 2011), Advego Plagiatus (Johnston, 2008), miratools.ru (Aushra, 2006), istio.com (Benno& Moshe, 2011), Praide Unique Content Analyser II (Spiteri & Grima 2011), Plagiatinform (Monostori et al., 2000), Copyscape (Bouville, 2008)

Особую популярность представляют системы антиплагиата в учебных заведениях, университетах. Базовые принципы систем обнаружения заимствования текстов были предложены давно, но технологии совершенствуется и развиваются непрерывно. Процесс проверки текста на уникальность основан на математических моделях и алгоритмах, все программы антиплагиата взаимодействуют с поисковыми машинами для ранжирования web страниц или определения заимствований в курсовых и дипломных работах и диссертациях. Сегодня активно развивается шингловый и корреляционный метод проверки уникальности. Актуальные версии программ умеют распознавать стоп-знаки. Поэтому, меняя пунктуацию, расставляя союзы, предлоги и вводные слова, обмануть антиплагиат не получится. Алгоритм безошибочно определяет “вес” слова и сравнивает хэш-функции.

Система ***Антиплагиат*** разработана компанией Форексис. (Dygilev et al., 2011) Система осуществляет онлайн поиск по большому количеству документов, хранящихся в собственной базе. Обладает рядом недостатков, таких как: отсутствие осуществления поиска по документам, доступным в сети Интернет; ограничение проверяемого текста 3000 символами и 5000 символами после регистрации и ограничение возможностью проверки только по базе имеющихся работ.

Программа ***Advego Plagiatus*** осуществляет онлайн проверку с использованием поисковых систем (Bouville, 2008). В отличие от аналогичных систем, Advego Plagiatus не использует Яндекс.XML (бесплатный сервис, предоставляющий возможность производить автоматические поисковые запросы к “Яндексу” и публиковать его выдачу у себя на ресурсе). Программа выдаёт процент совпадения текста и выводит

найденные источники. Программа не преобразует буквы, то есть нет преобразования регистра, нет обработки и изменения латинских букв в русских словах на аналогичные буквы русского алфавита для текстов на русском языке. Также отсутствует поддержка поиска по собственной базе; из-за особенностей работы возникают ситуации, когда результаты проверки отличаются от раза к разу.

Сервис ***www.miratools.ru*** позволяет осуществлять онлайн проверку текста на плагиат (Aushra, 2006). Система использует результаты выдачи поисковых систем. К достоинствам можно отнести возможность замены английских букв на русские. Также имеется возможность изменения длины и шага шингла, используемых для проверки. По результатам проверки выдаётся процент совпадений и найденные источники. Недостатком является то, что система не работает с собственной базой, существует ограничение на длину текста в 3000 символов и ограничение на число проверок в течение суток.

Сервис ***www.istio.com*** осуществляет проверку текста на наличие заимствованного контента с использованием поисковых систем Яндекс.XML и Yahoo.com (Benno & Moshe, 2011). Возможности сервиса несколько слабее по сравнению с Miratools. По результатам проверки выдаётся сообщение о том, является ли текст уникальным или нет, и выдаётся список подобных страниц сайтов. Сервис предоставляет дополнительные средства для анализа текстов, например, проверку орфографии, анализ наиболее частотных слов и т. д. У системы отсутствует преобразование букв и поиск по собственной базе.

Программа ***Praide Unique Content Analyser II*** имеет широкие возможности по проверке текстов с использованием поисковых систем (Spiteri & Grima 2011). Имеется возможность выбора используемых поисковых систем, содержит средства добавления новых поисковых систем. Проверка осуществляется шинглами, длину которых можно изменять. Можно задавать количества слов перекрытия шинглов. Выводится подробный отчёт по проверке в каждой поисковой системе. В программе отсутствует замены букв, обработка стоп-слов и нет поддержки работы с собственной базой.

Система ***Plagiatinform*** проверяет документы на наличие заимствований как в локальной базе, так и в сети Интернет (Monostori et al., 2000). Система умеет находить плагиат в виде документов, скомпонованных из “перемешанных” кусков текста нескольких источников. Проверка может осуществляться с использованием быстрого или углублённого поиска. Результаты проверки выдаются в виде наглядного отчёта. Недостатком является отсутствие преобразования букв. Также авторы не предоставляют

возможности свободного использования или тестирования системы, и оценить качество её работы невозможно.

Сервис ***Copyscape*** позволяет осуществлять поиск копий веб-страниц в Интернете (Bouville, 2008). Система возвращает список веб-страниц, у которых есть похожий по содержанию текст. Сервис осуществляет проверку на наличие заимствованного контента с использованием поисковых систем Google и Yahoo!. Проверяется только контент веб страницы, то есть, для выяснения уникальности текста необходимо опубликовать текст на сайте и ввести в системе адрес страницы. Без регистрации существует ограничение на количество проверок в месяц и на количество отображаемых результатов – 10 сайтов. Для зарегистрированных пользователей нет ограничений на количество проверок и выводимых результатов, но каждый запрос стоит 5 центов.

По результатам сравнительного анализа вышеуказанных систем можно указать на следующие общие проблемы данных систем:

- Отсутствует поддержка поиска по собственной базе;
- Отсутствия преобразования регистра, нет обработки и изменения латинских букв в русских словах на аналогичные буквы русского алфавита для текстов на русском языке;
- Существует ограничение на длину проверяемого текста в 3000-5000 символов;
- Нет возможности интеграции баз данных с электронными библиотеками.

Целью данного исследования является на основе сравнительного анализа существующих информационных систем определения заимствования текстов, разработка оптимальной информационной модели проверки дипломных работ и диссертаций путем интеграции анти плагиатных систем и электронных библиотек в процесс образования.

Вклад
Contributions

С 2013 года в Ташкентском университете Информационных технологий имени Мухаммада аль-Хоразмий (далее – ТУИТ) и его региональных филиалах запущена система определения заимствования текстов в дипломных работах. В базу данных системы введено защищённые дипломные работы и магистерские диссертации с 2013 года по настоящее время. С 2014-2015 учебного года проверяется каждая работа студентов и магистрантов ТУИТ. Для проверки работ студентов и магистров была разработана несколько экспериментальных моделей проверки диссертаций

и дипломных работ на наличия плагиата (Fig-2, 3). На основе двух предыдущих экспериментальных моделей была разработана третья модель проверки диссертаций и дипломных работ на наличия плагиата.

Данная статья написана на основе выработанного практического опыта, результатов экспериментов, анализа документов реализованных проектов по созданию корпоративных сетей библиотек и литератур по созданию электронных библиотек.

В периоде 2018-2021 годах в Узбекистане будет реализован проект под названием “Интегрированная система управления образовательным процессом ТУИТ” с корейскими партнёрами. В рамках которого будет разработана интегрированная система управления учебным процессом на основе современных программно-технических средств (рис. 1).

1.Рис. **Информационная модель проекта “Интегрированная система управления образовательным процессом ТУИТ”**

Figure 1. ***Information model of the project “Integrated learning management system of Tashkent university of information technologies”***

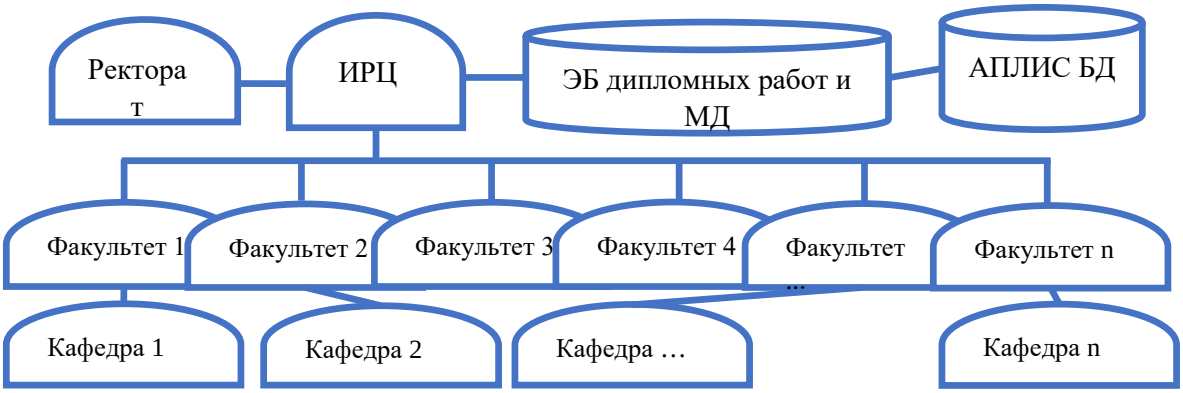
ARMAT++ – *система, предназначенная для автоматизации основных библиотечных процессов и формирования базы данных электронной библиотеки. Данной системой организована корпоративная сеть всех информационно-ресурсных центров (библиотек) при вузах Узбекистана. В базе данных данной системы существует более 1 млн. библиографических записей в MARC21 формате и более 50 тыс. полнотекстовых научно образовательных ресурсов.*

Система АПЛИС (система определения похожих текстов) разработан преподавателями Ташкентского университета информационных технологий. Данная система отличается от других, тем что она интегрирована с базой данных электронной библиотеки ARMAT++.

Ниже рассмотрены экспериментальные подходы и результат модели интеграции систем для решения задач определения заимствования текстов, предназначенная для использования в вузах и для работы в корпоративных информационных сетях. Подход предполагает формирование электронных библиотек дипломных работ, диссертаций, научных статей и др., в режиме корпоративного взаимодействия кафедр, факультетов и даже филиалов одного вуза. А программный комплекс использует эту базу для определения заимствования текстов, их авторов, формирования статистической информации.

Эксперименты
Experiments

В данных экспериментах использована организационная структура Ташкентского университета Информационных технологий и его региональных филиалов. Первая модель проверки магистерских диссертаций (далее – МД) и дипломных работ (далее – ДР) студентов разработана в 2013 году (рис. 2).

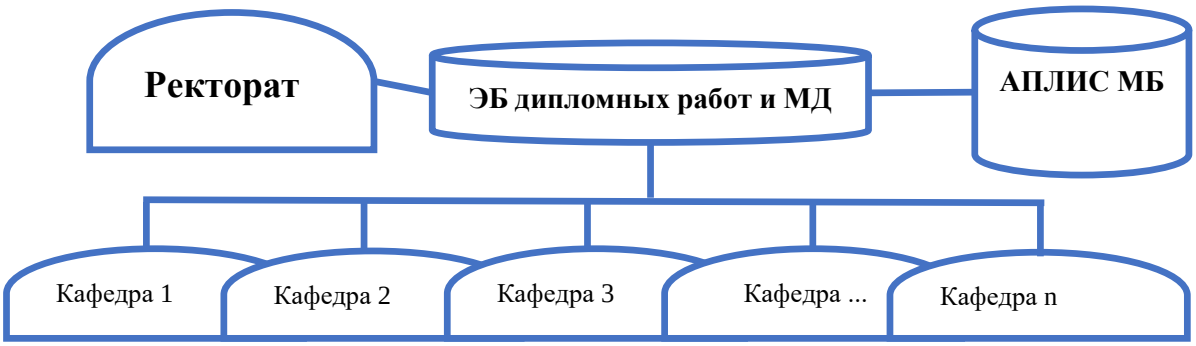


2.рис. **Первая модель проверки магистерских диссертаций и дипломных работ**
Figure 2. ***The first information model of checking for plagiarism of diploma works and master's dissertations***

После предварительной защиты все работы собираются в информационном ресурсном центре (библиотека вуза), вводятся в базу данных электронной библиотеки и проверяются на наличия плагиата в системе АПЛИС. Требуется много времени для подготовки базы данных.

Так как промежуток между предварительной защитой и предоставления заключения государственной аттестационной комиссии (ГАК) очень короткий. Проверка и каталогизация 1500 работ за короткое время не легкая задача. В некоторых случаях из-за поспешного заключения, пропускаются “похожи” работы и отозвания таких работ создают много проблем.

Вторая информационная модель проверки МД и ДР на наличия плагиата разработана в 2014 году (рис. 3).

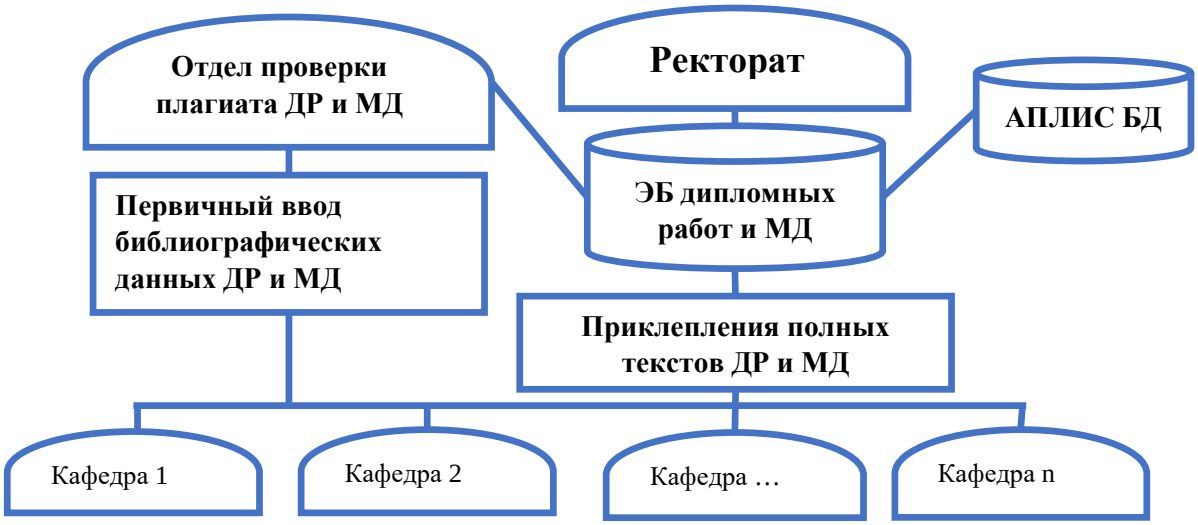


3.рис. **Вторая модель проверки магистерских диссертаций и дипломных работ**
Figure 3. ***The second information model of checking for plagiarism of diploma works and master’s dissertations***

Подготовленные работы рассматриваются научными руководителями, рецензентами и рекомендуются на предварительную защиту. После предварительной защиты, электронные версии работ вводятся в базу данных электронной библиотеки находящегося на сервере ИРЦ. Работы проверяются на наличии плагиата в самой библиотеки с помощью системы АПЛИС. Заключения допуска на защиту выдаётся кафедральной комиссией.

Результат
Results

В качестве результата двух предыдущих моделей была разработана третья информационная модель проверки МД и ДР на наличия плагиата в 2016 году (рис. 4). Организовывается отдел для сбора, хранения, систематизации, каталогизации и проверки на повторения тем, дипломных работ и магистерских диссертаций. Отдел собирает первичные данные о работах с деканатов.



4.рис. **Третья модель проверки магистерских диссертаций и дипломных работ**
Figure 4. ***The third information model of checking for plagiarism of diploma works and master's dissertations***

После утверждения тем, сотрудники отдела вводят первичные данные (научные руководитель, автор и другие библиографические элементы) в электронный каталог системы. Процесс формирования электронного каталога работ не продлится позже чем ноябрь месяц, что предотвращает суету перед защитой. Создаётся группа экспертов по направлениям обучения для проверки на наличия плагиата. Отдел предоставляется группе экспертов для выполнения работы. Определённые результаты предоставляются группе экспертов для окончательного заключения. Качество выполненных работ определяет группа экспертов. Председателем группы предлагается проректор учебного заведения по учебным делам. Новый организованный отдел ведёт мониторинг выполнения работ и проверяет на наличия рекомендации производства для данной темы.

Анализ моделей
Analysis of the models

Если организовать работу по первой модели, то, все работы университету собираются в одном месте, для каталогизации и дальнейшей проверки. В этом случае 4 сотрудника ИРЦ освобождаются от повседневных обязанностей для каталогизации и проверки всех работ.

Организация работ на примере второй модели проявляется огромное доверия кафедрам выпускающих специалистов. В таких случаях, наблюдается ошибки в процессе каталогизации и не попадания работ в саму базу данных. В некоторых случаях студенты сдавали работы с опозданием.

Организация работ на примере третей модели, процесс каталогизации дипломных работ и магистерских диссертаций выполняется вовремя и качественно, так как оно начинается на начале учебного года и появляется возможность проверки тем на наличия повторения, относительно работам выполненных в прошлых годах. База данных электронной библиотеки МД и дипломных работ формируется вовремя в результате чего, появляется возможность своевременной выдачи заключения экспертной группы на наличия плагиата ГАК.

Summary

Organization of the work by the first model does not yield significant results, since in a short time it is necessary to collect a huge amount of information, catalog and check all the work on the presence of plagiarism. The certification commission does not receive the results of the examination of master's dissertations and diploma theses on time. As a result, plagiarism may arise after the award of diplomas to students.

Organization of work on the example of the second model shows great confidence in the departments of graduates. In such cases, there are many mistakes in the process of cataloging and not getting the work into the database itself. In some cases, students were late in their work. This all leads to the routine work of the departments in which even without this many responsibilities. Checking the work on the presence of plagiarism does not facilitate, but increases the scope of duties of the departments. In this model, too, there is not enough time, as a result of which information is not provided in time by the state attestation commission.

Organization of works on the example of the third model, the process of cataloging the theses and master's theses is carried out on time and qualitatively, since it begins at the beginning of the academic year and it becomes possible to check the topics for the existence of a repetition, with respect to the work done in previous years. The database of the electronic library of master's dissertations and diploma works is formed on time, as a result of which, it becomes possible to issue the expert group's opinion on the availability of plagiarism of the attestation commission in time. After the completion of the cataloging of this year's work, the department's employees begin to enter the work (annotation, titles, content and output data) in the chronological order of the last years thereby enriching the database of the e-library of diploma works and master's theses. After the creation of the e-library of diploma works and master's theses, it is possible to integrate the database of e-books related to the study areas for determining the scope of the study and the degree of analysis of the teaching aids for the work. It will be possible for the supervisor of a fair evaluation for the recommendation of the student's work.

Литература
References

Aushra, A. (2006). Scientific e-library as instrument for detecting plagiarism. *Educational Technology & Society 9 (3).*

Benno, S., & Moshe, K. (2011). *Plagiarism Analysis, Authorship Identification, and Near-Duplicate Detection PAN'07* (pp. 68-71). ACM SIGIR Forum. http://sigir.org/files/forum/2007D/2007d_sigirforum_stein.pdf

Bouville, M. (2008*). Plagiarism: Words and ideas. Science and Engineering Ethics.* Science and Engineering Ethics. Downloaded from https://arxiv.org/pdf/0803.1526.pdf

Doreen, S., & Grace, G. (2011). *ACT BSSS What is plagiarism?* (pp. 12-19) South Australia: ACT Board of Senior Secondary Studies. Downloaded from https://www.um.edu.mt/__data/assets/pdf_file/0018/261324/avdplagiarism.pdf

Dyagilev, V., Say, A., & Butakov, S. (2011). *The architecture of service of detecting plagiarism*. Moscow: Vestnik NGU.

Johnston, B. (2008). *The concept of plagiarism.* UK: Learning, Teaching unit. Downloaded from http://www.celt.mmu.ac.uk/ltia/issue4/johnston.shtml

Leong, A., Lau, H., & Rynson, W. H. (1997). *Check: A Document Plagiarisment Detection System* (pp. 70-77). Hong Kong: The Hong Kong Polytechnic University. http://www.cs.cityu.edu.hk/~rynson/papers/sac97.pdf

Monostori, K., Zaslavsky, A., & Schmidt, H. (2000) *Document Overlap Detection System for Distributed Digital Libraries.* South Korea: Chung-Ang university. School of computer science & Engineering. Downloaded from https://link.springer.com/chapter/10.1007%2F11846406_83

Sharapov, R. V., & Sharapova, E. V. (2011) *Checking system for detecting of loan from other sources.* Russian scientific conference. E-libraries: Perspective methods and technologies of the e-collections.

Sorokina, D., Davis, J., & Garcia-Molina, H. (2014) *Plagiarism detection in arXiv*. USA: Cornel university

Ushakin, S. (2001) *Plagiarism? About scientific ethics.* Science and contemporaneity.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 430-435

ANALYSIS OF CRITERIA FOR ENSURINGINFORMATION SECURITY OF SCIENTIFIC AND EDUCATIONAL RESOURCES

Marat Rakhmatullaev

Sherbek Normatov
Tashkent University of Information Technologies
named after Muhammad al-Khwarizmi, Uzbekistan

Abstract. *At present, information and knowledge in the field of science and education are strategic resources. From their formation, renewal, distribution depends not only the scientific and educational spheres, but also the socio-economic development of the country. Therefore, the confidentiality, integrity and accessibility of databases of a scientific and educational nature are an important subject of research. The purpose of this article is to conduct an analysis of methods, criteria for assessing units of scientific information in terms of ensuring information security. Classification of criteria for the evaluation of scientific and educational information (SEI), their systematization, analysis of problem of ensuring the security of information resources are given. Also, the information infrastructure development indicators and projects implemented in the field of information security are outlined. Evaluation of SEI units is carried out by experts who themselves have a weighting factor and are dependent on their qualifications. The results of the research are the basis for the creation of an automated system for ensuring information security in the corporate library system of academic libraries. The corporate network forms an electronic public library, distributes the SEI between resource users. The information security system will ensure the regulation of access to resources.*
Keywords: *information security, information assets, value of information scientific and educational information, digital library, corporate network.*

Introduction

The spread of the Internet caused a sharp increase in the worldwide volume of digital information and the number of users to them. According to IDC (International Data Corporation), if in 2011 the total amount of digital information amounted to 1.8 trillion GB, now its volume for every two years is doubled. The increase in the volume of information with such a speed even further strengthens the requirements for the allocation of reliable information and ensuring their safety. At the same time, the problems of protecting the most valuable scientific, educational and scientific-technical information are most relevant. This is due to the fact that this kind of knowledge has the greatest impact on the development

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3264

not only of science, education, but also of economics and business, and society as a whole.

The object of this research is information resources related to science and education, and from the point of view of information security, an evaluation of the methods of their analysis is accepted as the purpose of the research. When we say scientific and educational information (SEI), we mean libraries, centers of information resources, information relating to patents and inventions in information networks, all kinds of scientific and educational resources subject to licensing.

In some cases, not all information resources are free, some are offered to information users for a fee. Such resources require protection against "hacking", that is, it is necessary to ensure their confidentiality. If the information resource is free, it is still necessary to ensure its integrity. In addition, maybe some resources are only for certain groups of users.

Due to the large number of users of information resources for science and education, a number of requirements are placed on their safety. Therefore, the trusted input of users into the content of information resources is considered to be important, as important is the protection of information resources from their unauthorized access.

In the effective protection of information, it is advisable to choose the means and means of protection corresponding to the value of information. Therefore, from the point of view of information security, the evaluation of SEI analysis, factors affecting the price of information and the task of identifying SEIs are the focus of this article.

There is a lot of modern literature on the evaluation of information assets, on the systematization of SEI, on the security of electronic libraries. First we need to find the answer to the following question: Is it possible to look at SEI as an asset of information? To answer this question, we refer to the following literature: Alex Woodie (2016) points out that you can look at information as an asset and you can change it for money. Chris Higson and Dave Waltho (2009), Antonio Lerro at all (2012), Daniel Moody and Peter Walsh (1999) in their studies point to information as a strategic asset. In fact, if the information for the organization matters, then you can look at it as an asset.

Indeed, large scientific and technical information centers (like Web of Science, Ebsco), scientific and analytical information bases or information resources of digital libraries are of financial importance. From this point of view, the SEI can be viewed as an active information.

Until now, a number of researches on the evaluation of information assets have been carried out. Nicole Laskowski (2014) gives six ways to assess the information assets, these methods are divided into economic and non-economic

categories. In this article we will consider the issue of SEI assessment in terms of non-economic information security.

Daniel Moody and Peter Walsh (1999) mentioned the cost and price of information. If the cost of information depends on its acquisition, preservation and processing, the price is measured by how much it costs for the organization. Thus, it is possible to divide the information and the information service. Wilco Engelsman (2007) divides the cost of information into the cost of using information and the cost of information exchange. And also he shows a close connection of the price of information from the purpose of its use.

If in some literature information is evaluated from an economic point of view, in others it is judged from the point of view of safety. In the works of Chris Higson and Dave Waltho (2009), aimed at the security of information, it is said about coming to the forefront the activity of technical specialists. The organization that adopted this approach limits the number of personnel authorized to get acquainted with this information.

When evaluating an information asset, the time factor is important. The price of some information may decrease over time (for example, dissertations or scientific articles). Therefore, it is possible to divide the strategic and dynamic forms of its evaluation. Daniel Moody and Peter Walsh (1999) argue that information can be important, but the lack of reading skills reduces its price. That is, if you do not use the information, then its evaluation, by itself, can not be high.

Identification and classification of scientific and educational information

Lerro at all (2012) shows the process of evaluating an information asset consisting of its identification, classification and measurement. In this article SEIs are divided into scientific, educational and inventive documents and are structured on the basis of the cognitive model.

In the study of this work, we considered several literatures on the evaluation of information assets. But it was not possible to get acquainted with the literature having sufficient, detailed content on the evaluation of the SEI.

Usually, from the point of view of information security, the price of information, if its security is violated, is measured by the value of the loss incurred. K. Turkhanovskaya and Yu. Orlova in their works (2016) in determining the cost of information, relying on the degree of loss incurred for confidentiality, integrity and the possibility of using information, share losses at a higher, medium and low level. But in the proposed model, without entering the time parameter, it is impossible to determine the price of information effectively. Y. Maliy and V. Alexandrov (2015) write about the absence of a universal methodology for assessing the information asset and the need for its determination by experts.

I. Mashkin also (2009) in his works, the information assets are divided into higher, middle and low categories.

In the proposed SEI estimation model, in the interval [1.10], numerical, α, β, γ expert coefficients on the confidentiality, integrity and availability of the information resource are introduced first. Also taken into account are indicators such as the initial cost *BC* (Basic coast) consisting of acquisition or production costs, reproduction, preservation of the information resource and the frequency of use of information in the time interval *T*. Proceeding from the foregoing, the cognitive model identifying, structuring and determining the degree of importance of SEI can be described in the following form:

Table 1 **Cognitive model identifying, structuring and determining the degree of importance of SEI**

№	**Type of resource**					
№ Resource elements	***Name of resource***	***BC***	***ECC***	***ECI***	***ECA***	***AP***
1	***Scientific information***					
1.1	Monograph	c_1^1	α_1^1	β_1^1	γ_1^1	a_1^1
1.2	Scientific paper	c_2^1	α_2^1	β_2^1	γ_2^1	a_2^1
1.3	Tezis	c_3^1	α_3^1	β_3^1	γ_3^1	a_3^1
. . .		$c_{n_1}^1$	$\alpha_{n_1}^1$	$\beta_{n_1}^1$	$\gamma_{n_1}^1$	$a_{n_1}^1$
2	***Educational information***					
2.1	Textbook	c_1^2	α_1^2	β_1^2	γ_1^2	a_1^2
2.2	Lecturenote	c_2^2	α_2^2	β_2^2	γ_2^2	a_2^2
2.3	Training materials	c_3^2	α_3^2	β_3^2	γ_3^2	a_3^2
. . .		$c_{n_2}^2$	$\alpha_{n_2}^2$	$\beta_{n_2}^2$	$\gamma_{n_2}^2$	$a_{n_2}^2$
3	***License documents***					
3.1	Invention	c_1^3	α_1^3	β_1^3	γ_1^3	a_1^3
3.2	Useful model	c_2^3	α_2^3	β_2^3	γ_2^3	a_2^3
3.3	Industrial designs	c_3^3	α_3^3	β_3^3	γ_3^3	a_3^3
. . .		$c_{n_3}^3$	$\alpha_{n_1}^3$	$\beta_{n_1}^3$	$\gamma_{n_1}^3$	$a_{n_3}^3$

Here,

BC – Basic Coast, acquisition or production costs of information;
ECC – the expert coefficient for confidentiality;
ECI – the expert coefficient for integrity;
ECA – the expert coefficient for availability;
AP – Access periodicity.

Information Asset Valuation

The level of importance of the LI (Level of importance) information is equal to the average arithmetic value of the expert coefficient set for confidentiality, integrity and availability of information. I.e:

$$LI_i = \frac{\alpha_i + \beta_i + \gamma_i}{3}$$

Therefore, the price of information in general terms, from the point of view of security SP (Security Price), is calculated by the following formula:

$$SP_i = \frac{LI_i * AP_i * BC_i}{T}$$

If we consider the number of all SEIs equal to: $n = n_1 + n_2 + n_3$, then the total price of the price of considered SEI will be equal to the following:

$$S = \sum_{i=1}^{n_1} SP_i + \sum_{i=1}^{n_2} SP_i + \sum_{i=1}^{n_3} SP_i = \sum_{i=1}^{n} SP_i$$

The value of α, β, γ are set by the expert commission. It should be noted that it is necessary to ensure the level of availability of scientific and educational resources. That is, most of the information does not have a high level of confidentiality. For example, electronic catalogs require not confidentiality but integrity and accessibility of information. But, at the same time there are data with high confidentiality, such as paid resources or personal data of the user. Based on the above, you can estimate the cost of resources of a certain type, or concerning a certain department.

Conclusion

Thus, the result of the analysis of the issue of ensuring the information security of scientific and educational resources shows worthy of the significance of these data and requires protection from unauthorized access. Effective protection of information from scientific and educational resources depends to a large extent on the methods and means of protection in accordance with the value of resources. Present time, there are many ways and methods of protecting information, such as software, technical, cryptographic, etc. But at the same time, the evaluation of scientific and educational resources from the point of view of information protection is still not fully understood. In fact, the evaluation of the protection of information resources provides an opportunity for information owners to seriously pay attention to issues related to the protection of information,

allocate funds or save costs. Despite the low level of efficiency, the proposed model of protection of scientific and educational resources can be used in identifications, classifications and revealing the importance of information resources in scientific and educational corporate information networks and in library networks.

References

Alex, W. (2016). How Do You Value Information. *Datanami Whitepaper*. Retrieved from https://www.datanami.com/2016/09/15/how-do-you-value-information/

Antonio, L., Francesca, I., & Giovanni, S. (2012). Knowledge assets assessment strategies: organizational value, processes, approaches and evaluation architectures. *Journal of Knowledge Management, Vol. 16 Issue: 4,* 563-575.

Chris, H., & Dave, W. (2009). Valuing Information as an Asset. *EURIM Value of Information Subgroup*. Retrieved from http://www.eurim.org.uk/activities/ig/InformationAsset.pdf

Daniel, M., & Peter, W. (1999). Measuring the Value of Information - An Asset Valuation Approach. *European Conference on Information Systems (ECIS'99).* Retrieved from http://si.deis.unical.it/zumpano/2004-2005/PSI/lezione2/ValueOfInformation.pdf

Maliy, Y., & Alexandrov, V. (2015). Rekomendatsii po provedeniyu analiza i otsenki riskov narusheniya bezopasnosti informatsii v bankovskoy sfere. *International scientific and theoretical journal "Herald of the Belgorod University of Cooperation, Economics and Law", 2015 (1),* 395-399. Retrieved from http://vestnik.bukep.ru/en_index.html

Mashkin, I. (2009). Upravleniye zashchitoy informatsii v segmente korporativnoy informatsionnoy sistemy na osnove intellektual'nykh tekhnologiy. (0520.0 901095)

Nicole, L. (2014). *Six ways to measure the value of your information assets*. Retrieved from http://searchcio.techtarget.com/feature/Six-ways-to-measure-the-value-of-your-information-assets

Turkhanovskaya, K., & Orlova, Y. (2016). Fuzzy model for inference in determining the class of security of information systems management now. *Journal Volgograd State Technical University, 2016 (7).* Retrieved from https://elibrary.ru/item.asp?id=26322491

Wilco, E. (2007). Information Assets and their Value. *6th Twente Student Conference on IT, Enschede, 2nd February, 2007,* University of Twente.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 436-444

CONTRIBUTION OF TECHNOLOGY ENHANCED LEARNING TO THE INCLUSION OF STUDENTS WITH SPECIAL EDUCATION NEEDS

Ausra Rutkiene

Rasa Greenspon
Vytautas Magnus University, Lithuania

Abstract. *Students with special educational needs (henceforth, SEN) are usually separated from traditional educational settings; thus, risk of being completely excluded from educational activities due to their physical or mental limitations is increased and access to education can be reduced significantly. Thus, a problem arises that students with SEN have restricted possibilities to participate in study process and to obtain desired qualifications together with non-disabled students; therefore, they may feel excluded from education system. The aim of the research is to evaluate how technology enhanced learning (henceforth, TEL) contributes to reducing exclusion of students with SEN. In order to achieve the aim, qualitative research methodology has been applied. Data has been selected during semi-structured interviews and analyzed by applying a qualitative content analysis. Research participants are graduate students with SEN who are currently engaging themselves in study process fostered by TEL at U.S. universities. The research has provided the following findings: TEL increases accessibility of education by eliminating social and physical barriers, enabling constant movement, and helping students with SEN cope with their impairments. TEL can be the only way for learners to complete their education. The research has not indicated that TEL can ensure inclusion. However, TEL enables students with SEN to receive qualifications and degrees in a much more convenient way.*
Keywords: *Qualitative Content Analysis, Technology Enhanced Learning, Special Education Needs, Accessibility of Education.*

Introduction

Students with SEN are often separated from traditional face-to-face educational settings by placing them to special education schools and they also are at higher risk of being completely excluded from any educational activities due to their physical or mental limitations. Even more, it has been known that such students usually have difficulties studying together with non-disabled students (Sobel & Knott, 2014). Students with SEN face challenge if they have to focus for a long period of time: “The special needs of some students leave them unable to focus for long periods of time in the classroom. They might be engaged,

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3159

intelligent and keen to learn, but they find it difficult to maintain focus during a normal class" (Sobel & Knott, 2014). In addition, students with SEN often have temper tantrums that can easily disrupt classroom activities (Sobel & Knott, 2014). Furthermore, researcher D. Sobel and W. Knott (2014) note some students with SEN may find difficulties in translating verbal information into written form; thus, this may result in poor performance in the classroom. Consequently, a problem arises that students with SEN have restricted possibilities to participate in the study process and to obtain desired qualifications together with non-disabled students; therefore, they may feel excluded from education system. Luckily, technologies have provided such students with more options and possibilities to study and complete their education together with traditional students. As a result, the aim of this paper is formulated as follows: to evaluate how TEL contributes to reducing exclusion of students with SEN from education system. The research object is a process of inclusion of students with SEN fostered by TEL. The research questions are being formulated as follows: firstly, it is important to find out how TEL contributes to inclusion processes of students with SEN, and secondly, what opportunities TEL provides students with SEN to receive education?

Methodology

Qualitative Approach: To begin with, it is necessary to mention the fact that this research will be using qualitative research approach because this methodology is considered to be more beneficial in providing more delicate information on the subject. According to scholars Corbin and Straus (2008), a qualitative research methodology has several benefits because it may enable a researcher to find out more about personal experiences of the research participants as well as provide information on how these experiences are being affected by different settings, i.e. social environment or cultural background (p. 5). A researcher Creswell (2007) agrees and adds that a qualitative research is usually done when a complex and very detailed explanation of a phenomenon is required.

Considering the fact that the aim of this research is to find out whether TEL gives students with SEN more opportunities to get desired degrees and qualifications as well as to determine how TEL helps to promote social inclusion of students with SEN, it is quite useful to use qualitative research methodology. By using such research approach, some personal experiences and opinions of students with SEN on TEL and their feelings about inclusion may be received. Also, it is necessary to mention the fact that in this case, quantitative research would not be able to provide an in-depth overview of students' with SEN personal experiences about TEL.

Creswell (2012) points out that a data collection process consists of the following steps such as identification and selection of research participants, getting their permission to conduct a research, and finally, getting some data by interviewing research participants or observing their behavior. For this research described, a semi-structured interview has appeared to be a very useful tool for qualitative data selection. The reason why semi-structured interview is considered to be beneficial in this case is because the respondents may share some unexpected information that may be relevant to the research. In meantime, structured interview may make the respondents feel restricted. Also, considering the fact that all the respondents will be students with some kind of special needs, semi-structured interview may seem to be more delicate approach to communicating with the respondents.

However, a fact should be mentioned that there have been two types of interviews, i.e. semi-structured and structured interview, applied while gathering data. The main reason behind this is that the research participant has insisted on having a very structured interview because it has been crucial for the research participant to know everything what they may expect in order to avoid any stressful situations that may cause panic or anxiety attacks. Such request has been fulfilled because there has been no intention to put research participants into any kind of discomfort or stressful situations that would have a direct effect on their mental or physical health.

Research participants have been asked approximately ten questions regarding the following topics: TEL and inclusion. Research respondents have had to answer to 9 questions that are considered to be main ones and have formed a basis for the structured interview and 7 additional questions that have been frequently asked while performing semi-structured interviews. The main purpose of all these questions has been to get information on TEL and its benefits, promotion of inclusion, and research participants' individual experiences in TEL settings and their thoughts and feelings regarding a process of inclusion.

Due to physical limitations and boundaries, it has been impossible to perform face-to-face interviews. Consequently, it has been decided to use software that would enable communication with research participants and eliminate all the restrictions. Therefore, interviews have been done using the following online communication tool: Skype Version 7.58. All the Skype sessions have been recorded using the software called ECAMM Call Recorder for Skype. As it turns out, research participants (especially the ones who are diagnosed with autism or have social anxiety) prefer such way of taking interview because they have not been forced to encounter unfamiliar people or settings. The recorded interviews have been transcribed.

The main qualitative research method that is being used while conducting the research is qualitative content analysis. Again, having in mind the aim of the

research and its delicacy and sophistication, it has been necessary to choose a method that would allow a researcher to extract the key issues and show the main trends. A qualitative content analysis is supposed to help to analyze the transcripts in more systematic way. Additionally, it should be noted that this method is considered to be more inductive because it mainly focuses on new phenomena that emerges from qualitative data ("Inductive and deductive approaches to research", 2017). Also, qualitative content analysis allows establishing system of main categories in a very systematic manner (Miles & Huberman, 1994). This systematic and inductive analysis of the transcripts should reveal useful information on TEL and social inclusion process.

Data will be coded in a very sophisticated manner, i.e. sentence-by-sentence, in that way, all the dominant themes will be highlighted. Coding is very important because it emphasizes the importance of dominant themes (Burton, 2000; Priest, H., Roberts, P. & L. Woods, 2003). As a result, a system of categories and presumably subcategories will be established. In next stage, connections between categories and subcategories will be established. And finally, to ensure reliability and logic behind those categories, it will be necessary to take a final look at research material, taking into consideration research aim and questions. Therefore, qualitative content analysis is considered to be quite beneficial for this research.

Research participants

To begin with, it should be noted that there have been several participant treatment principles applied such as respect for the participants and justice (Creswell, 2012). Such participant treatment has contributed ensuring ethics of the research as well.

Considering the aim of the research and the research questions, a decision upon population and sample has been made. As researcher Creswell (2012) explains, population is as a large group of people that share common features which can be easily identified. For the purpose of this research, population has been considered to be all graduate level students that have special educational needs and engage themselves into technology enhanced learning. A purposeful sampling has been applied and, to be more specific, criterion sampling which is a strategy of purposeful sampling has been performed. The reason why such type of sampling has been applied is that such type of sampling is rather useful in identification and selection of possible research participants that are familiar with, or have a lot of knowledge and experience of the phenomenon of study (Creswell & Plano Clark, 2011). A remark should be made that a sample that has been drawn from four respondents that have agreed to participate in this study voluntarily and

the selection criteria (i.e. having special educational needs, studying at graduate level, engaging in TEL) has been applicable to them.

The main characteristics of the research participants are provided in the table below:

Table 2 **Characteristics of Research Participants**

	Sex	**Age**	**Method of TEL**	**Type of SEN**
Respondent No. 1	Female	26	Online Learning	Autism, Dyslexia, Social Anxiety
Respondent No. 2	Female	25	Blended Learning	Dyslexia, Speech Disorder, Orthopedic impairment
Respondent No. 3	Male	25	Blended Learning	Asperger's Syndrome, Social Anxiety
Respondent No. 4	Female	28	Online Learning	ADHD, Depression, Social Anxiety
Respondent No. 5	Female	25	Online Learning	Cerebral Palsy, Social Anxiety, Depression
Respondent No. 6	Male	26	Blended Learning	Orthopedic impairment, Depression
Respondent No. 7	Female	25	Online Learning	Hearing impairment

Findings

Accessibility of Education. The research has provided the following findings. It has been discovered that TEL can ensure and provide access to education. Analysis has indicated that accessibility of education can be understood in several different ways. Access to education can be granted by eliminating location and time limitations, overcoming particular social and physical barriers, or simply allowing completing studies in a way that is considered to be appropriate for individual learners.

Enabling Constant Movement. The research has revealed the fact that TEL provides access to education by simply enabling learners to travel without having to worry that some important classes will be missed or a learner will have to continue with their studies in different higher educational institution. The possibility to change location without experiencing any difficulties in proceeding with studies has been indicated by several respondents:

> Respondent No. 1: *I move frequently and online learning enables me to learn no matter where I am.*
>
> Respondent No. 2: *Ability to travel is very important to me <…> once a month, I'm going to different state to get my treatment. <…> But I don't miss any classes <…> as long as I have internet connection.*

> Respondent No. 5: *I like travelling despite it always means a lot of stress, as I have to figure out to get from A to B with the wheelchair and limited upper body/arm movement as well, and, more importantly, have to get used to a completely foreign environment very quickly. From time to time, I challenge myself to do that, as I am always striving for growth and personal development, however I felt that it wasn't a good idea in combination with studies, as studying itself was hard enough already. In addition, I would have needed personal assistance in order to manage my everyday life away from home, and would have been required to finance it on my own, which was way out of my budget.*
>
> Respondent No. 7: *It is definitely empowering to do things. Yes, I can't hear well but that doesn't stop me. <…> I love reading and I read fast so to go through study material online, it's fun for me. I can't participate in regular classroom with normal students. But online is different. <…> Sometimes nobody even ever finds out about my disability.*

On the evidence of the quotations, it is obvious that TEL plays a very important role to increasing access to education by allowing learners to change their location. Increasing learners' mobility is a rather distinctive feature of TEL.

Eliminating Social and Physical Barriers. As the research suggests, TEL acts as an actor that eliminates any social or physical barriers. This has been mentioned by several research participants. They have emphasized the importance of TEL when it comes to coping with their emotional or physical state. TEL makes education quite accessible because it helps students with SEN cope with their impairments. To illustrate that, several examples are provided below:

> Respondent No. 4: *I am closer to a computer than I am to campus. It can be challenging to go outside some days, though online feels easier, safer, and calmer than dealing with the day-to-day. It not only calmed me to be able to absorb information when I wanted, but it also helped me feel safer from things like harassment, unwanted advances, and embarrassment. Online, it's just me and the work, and it makes it much easier to focus.*
>
> Respondent No. 2: *It increases the accessibility to education a lot. Any person with medical issues, jobs, children, or a busy lifestyle in general can access education online.*
>
> Respondent No. 5: *Besides, through virtual learning, it is less likely to judge a book by its cover. For instance, when I meet people for the first time in person, they're almost always focused on the wheelchair and connect it with "inability" in general, rather than really getting to know me as a person, and discovering my actual abilities before making a conclusion about who I am. This is less likely to happen if you're a virtual student only. People don't see your outer appearance but the results you produce, and as a result, the grading process is more fair and inclusive, too.*

The respondents provide several reasons to prove how TEL has helped them to concentrate on their study process rather than fearing to go to classes because of their physical impairments or mental state. TEL has provided students with SEN

with opportunities and instruments to complete their education and avoid unnecessary stress.

Providing a Way to Graduate. Sometimes TEL can be the only way for a learner to complete their education. Having in mind that learners with SEN are more sensitive and sometimes requires a very sophisticated treatment, a traditional way of learning may be too problematic and stressful. Thus, TEL can be the only possibility for such students to study and become a productive part of the society.

> Respondent No. 4: *Without it, I would not have graduated high school, nor gone to college. When I stopped attending high school, it was not because I didn't want to learn, it was because I physically could not bring myself to go. I could drive to the campus, but not get out of the car. TEL literally provided a way for me to graduate.*
>
> Respondent No. 7: *I can't study together with normal students, I mean, healthy students. <…> I couldn't participate in any activities. Even hearing aid wasn't working well for me. In couple years, my hearing worsened to the point that I'm completely deaf now. I learnt sign language but that didn't help me study together with normal students. I thought I'd quit school. I felt depressed. But my friend suggested taking online classes <…> I finished high school; then did my Bachelor's and now about to finish my Master's <…> and all of that was done online.*

As demonstrated in the quotation above, in a traditional classroom, the respondent has been dealing with a lot of stress which eventually has affected their educational activities in a rather negative manner. TEL, here, plays a key role in granting access to education by satisfying all the delicate needs of the learner.

Discussion

As stated in the *Universal Declaration of Human Rights*, education is considered to be one of the fundamental human rights (UN General Assembly 1948); thus, every individual should have an access to a proper education regardless their physical and mental state or other social or cultural reasons. Unfortunately, there are many examples showing that people are being excluded from the society due to social, physical and mental conditions. Exclusion can have hazardous effect on individuals because it leaves them without any possibility to self-expression, being part of the community, and getting desired degrees and qualifications. Eventually, this may expose certain groups of people to social discrimination (UNESCO, 2005). As a result, a lot of people may get limited opportunities to study and obtain degrees and qualifications. Consequently, this may result into illiteracy and low skills in adults, especially in adults with disabilities or special educational needs; eventually, this may be the reason of poverty and unemployment (UNESCO, 2005). Thus, it can be assumed that it is important to avoid exclusion and to give equal rights to education to everyone.

As the research has indicated, sometimes traditional classroom settings are not enough to grant access to education to everyone. In this case, TEL is considered to be very effective tool for educators and students with SEN. As research participants have indicated, TEL provides them with opportunities to overcome their physical and mental state and to get the desired degrees and qualifications. However, research has indicated that hat online courses can prepare specialists like administrators or office employees who do not need any specific practical skills. In addition, it has been noted that online learning settings are not capable of providing necessary skills that are needed to prepare highly-qualified healthcare or engineering specialists because these fields of study require a huge amount of practical training which is not possible in online setting ("What are the Disadvantages of Online Schooling for Higher Education", 2003-2017). However, a claim can be made that despite the limited opportunities to get more practical degrees and qualifications, learners willingly engage into TEL activities because it may be convenient for them or it may better suit their health condition or provide more options to fulfill their special educational needs.

Conclusions

The research has demonstrated the fact that TEL is very beneficial to students with TEL because it helps to receive education. Therefore, it can be claimed that TEL contributes to promoting inclusion of students with SEN by granting them access to receive education in the first place. TEL eliminates physical restrictions and ensures a better fulfillment of individual special educational needs. Thus, TEL definitely provides better opportunities for students with SEN to receive the desired qualifications and degrees in a much more convenient way. In this way, TEL provides many economic benefits as well. Unfortunately, the literature review has indicated some issues that there is a limited number of study fields that students who have decided to engage in online learning can choose from because online setting cannot provide any adequate practical training; thus, students with SEN have a little bit restricted opportunities to choose their career pathway if they study online.

References

Burton, D. (Ed) (2000). *Research Training for Social Scientists*. London: Sage.

Corbin, J., & Straus, A. (2008). *Basic Qualitative Research* (3rd ed.): Techniques and Procedures for Developing Grounded Theory. London: Sage Publications, Inc.

Creswell, J. W. (2012). *Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research* (4th ed). Boston: Pearson Education.

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed.). Thousand Oaks, CA: Sage.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed method research*. (2nd ed.); Thousand Oaks, CA: Sage.

"Inductive and deductive approaches to research" (2017). Retrieved from http://deborahgabriel.com/2013/03/17/inductive-and-deductive-approaches-to-research/

Miles, M., & Huberman, A. (1994). *Qualitative Data Analysis* (2nd ed). Thousand Oaks, Sage.

Priest, H., Roberts, P., & Woods, L. (2003). An Overview of Three Different Approaches to the Interpretation of Qualitative Data. *Nurse Researcher. Vol. 10, No. 1*, 30-42.

Sobel, D., & Knott, W. (2014). *Differentiation for SEN students: tips for boosting attainment.* Retrieved from https://www.theguardian.com/teacher-network/teacher-blog/2014/apr/09/special-educational-needs-tips-boosting-attainment

UN General Assembly. (1948). Universal declaration of human rights (26 A). Paris. Retrieved January 18, 2018, from http://www.un.org/en/universal-declaration-human-rights

UNESCO (2005). *Guidelines for Inclusion: Ensuring Access for All.* France.

What are the Disadvantages of Online Schooling for Higher Education (2003-2017). Retrieved from http://study.com/articles/What_are_the_Disadvantages_of_Onlin e_Schooling_ for_Highe_Education.html

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 445-454

AN ALGORITHM OF FUZZY INFERENCE SYSTEM FOR HUMAN RESOURCES SELECTION TOOLS

Krasimir Slavyanov
"Vasil Levski" National Military University, Bulgaria

Abstract. *This article offers an original Human Resources selection procedure based on Mamdani fuzzy inference system (FIS) dedicated to compute multiple results each from different type of analyzing criterions. The modeling and information analysis of the FIS are developed to draw a general conclusion from several results each produced by Human Resources selection basic criterion. Simulation experiments are carried out in MATLAB environment.*
Keywords: *human resources, fuzzy inference system, membership function, fuzzy rule, ranking score.*

Introduction

For every Human Resource (HR) Selection tool, high performance technologies are vital for fast and accurate decision after calculations with a specific sophisticated criteria set. These technologies can include a Fuzzy Inference System for implementation of fuzzy rules over a fuzzy variable (Vasileva, 2008; Zadeh, 1973: 28-44; Zadeh, 1988: 83-93). For that purpose, can be used a neuro-fuzzy based agent approach for automatically determining the key skill characteristics defining each expert's preferences and ranking decisions, while handling the uncertainties and inconsistencies in group decisions of a panel of experts (Doctor, 2009b; Hosseininezhad, 2011). The main purpose for these technologies and to this paper is to automate the processes of requirements specification and each applicant's ranking. In this paper, a Fuzzy Inference System has been designed in Matlab environment with considering main effective variables on performance assessment as Inputs variables and level of performance as output. If the system rules are extracted from a specific selection criterion set of a dedicated HR selection methodology the applicant evaluation and ranking can be faster easier and justified process (Doctor, 2008).

Preconditions and means for resolving the problem

Preconditions

Due to the high number of applicants, it is necessary to short-list and rank submitted CVs based on their suitability for the job requirements. To reduce costs,

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3311

error and time there is a strong desire from companies towards automating the two processes of: specifying the requirements criteria for a given job (experience, skills, etc.) and matching between the applicants' profiles and the job requirements; to produce an applicants' ranking policy that gives consistent and fair results which can be legally justified (Doctor, 2009a). A specific experimental arrangement is developed for the proposed algorithm of fuzzy inference system for HR selection tool. The arrangement consists of nine key skills that can be produced from an applicant form or site with additional applicant's documentation needed. The HR selection FIS used for example is dedicated in IT sector recruiting. One criterion is designed to classify the applicant's education necessity (computer science, some engineering science or other). Another - analyzing the recommendations for the position (excellent, good or not specific), third – comparing the proper language comprehension level (English, Latin or not proper). Fourth comparison is made for the applicant's job experience (programming, math engineering, computers or other). The fifth criterion from the set is evaluating the level of the corresponding job requirements for the specific job position (full compliance, more important, less important, similar and none). Another criterion is made to be the score from an IQ test (high, above average, average, below average and poor). The same levels are defined and for a psychological test's score. Team work history evaluation (excellent, very good, good, sufficient and poor) and appearance (good and not good) also take part in the FIS. Each applicant criterion indicators can be valued between zero and one. The final result for an applicant is made to be one of five levels: best suitable, suitable, good, average and inappropriate.

The linguistic variable is a main term in the fuzzy logic and is described a variable, witch value defines a set of verbal characteristics of a feature (Doctor 2009b).

Building a system for making a final decision based on fuzzy logic

The tools of fuzzy logic allow the use of two approaches to implement a system for decision. Various membership functions - functional relationships that determine the way in which each point of entrance area (input variables) form the baseline background (degree of affiliation) within the range of zero to one for the membership functions of the output variables.

In this fuzzy inference system, the use of membership functions of Gaussian type is chosen, subject to the following factors: the specificity of level classification; universality of application of Gaussian functions; availability of similarity in many applicants; evenness of the form; pronounced maximum; values other than zero for all points. Gaussian curves are subdivided into two types according to their form: a simple Gaussian curve and the two-way combination of two different Gaussian curves. Similar to them is the function of belonging of type "bell" defined by three parameters (Fig. 1).

The degree of membership of an applicant to the structure of fuzzy membership functions is determined by the value of membership ranging from zero to one. Thus the membership function associated with a fuzzy set of inputs, is used to position the output value in the corresponding area of the membership (Slavyanov, Minchev, 2017: 154-158).

Mamdani's method is commonly used method for decision-making of FIS (Mamdani & Assilian, 1975: 1-13). The method is based on the classic staging of Lotfi A. Zadeh (Zadeh, 1973: 28-44; Zadeh, 1988: 83-93). In Mamdani the output membership functions are expected to be fuzzy sets. After a merging of the different results is necessary fuzzy set for each output variable to be converted to a number. To form a ranking decision for each applicant in the FIS for HR selection tool, the method of Mamdani is chosen.

The aggregation function for the results is selected to be one that would seek the maximum value in each membership function to the input fuzzy variables. Given that demand maximum compliance to a job requirement is characteristic, each of the criterion is selected to form the final result of the type “largest of maximum” as a defuzzification. The Described parameters of demand system for decision making with fuzzy logic are applied in the implementation of fuzzy logic summarizing the results of the nine input variables described before as the key skills evaluated. The system is built with the tools of Matlab and is depicted in Fig. 2.

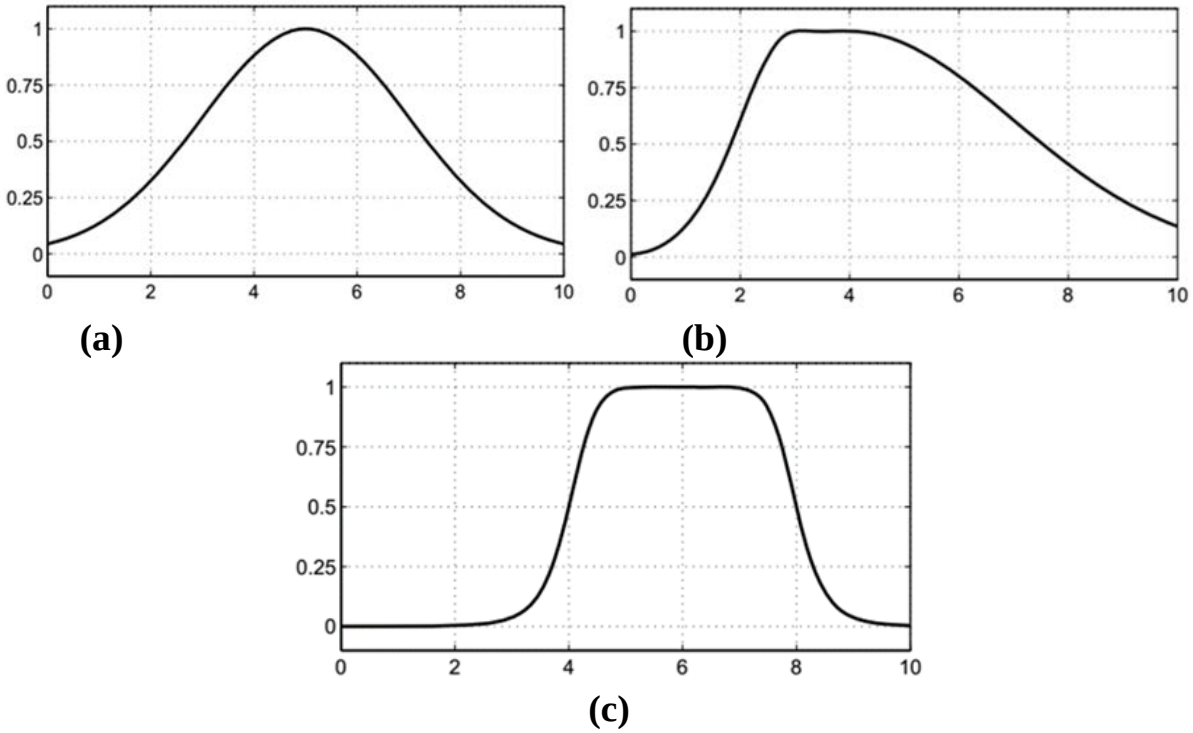


Figure 1. **Graphical description of the functions of belonging to the Gaussian distribution - plain (a) combination (b) and type “bell” (c)**

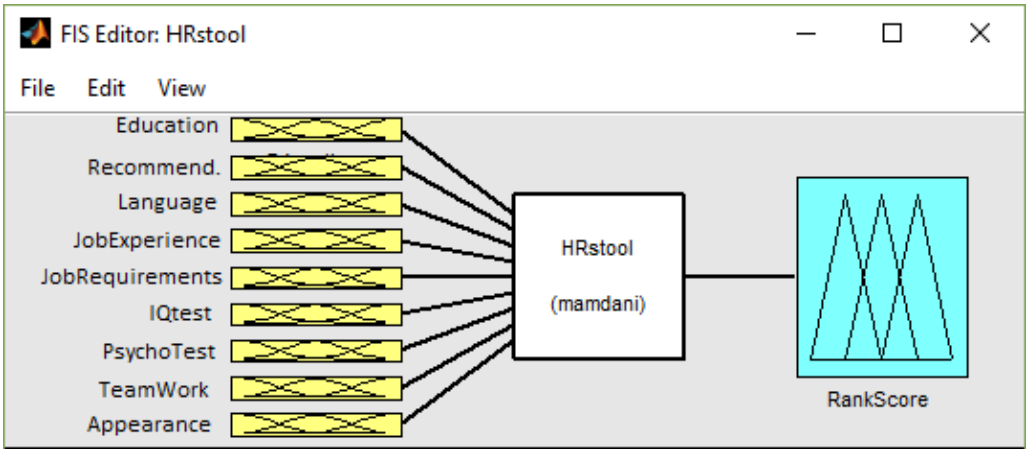


Figure 2. **Block diagram of the system for HR selection decision making by means of the Mamdani method, built in Matlab**

The input variables on the left side of the system are nine, corresponding to each of the criterions used to rank the applicant in the resulting rank score of the HR selection. Each of these input variables is made of membership functions (Fig. 3) named as the levels of the key skills of the applicant form. The output variable is a synthesis of all the rules applied to the input variables and is the rank level that best satisfied these fuzzy rules.

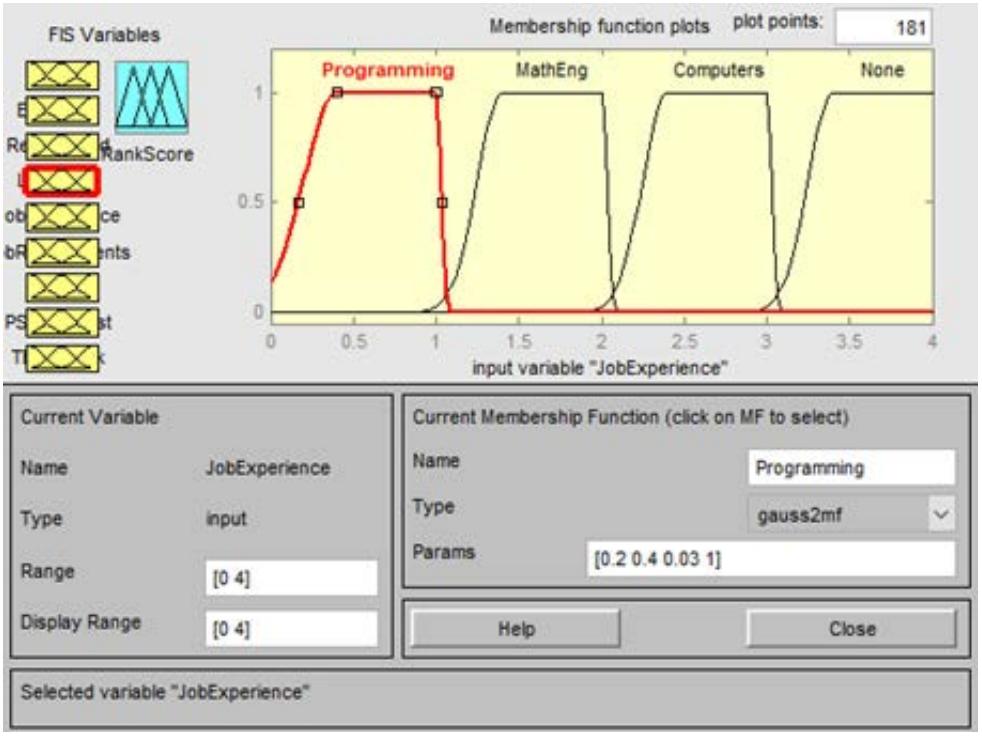


Figure 3. **Graphical expression of membership functions of fuzzy sets corresponding to criterion Job experience**

The chosen shape of the curve membership function to each fuzzy set is Gaussian combination membership function. The results for the key skills *Education* (computer science, some engineering science or other), *Recommendations* (excellent, good or not specific) and *Language* (English, Latin or not proper) should fall within three fuzzy sets defined by the functions of belonging in the range of 0 to 3. Sectors 0-1, 1-2 and 2-3 are distributed in the same sequence as the output values of the criterion indicators.

The specific form of these functions is tailor made to take maximum space in the range 0-3 to fall into the fuzzy sets higher percentage results from the input value. The shape responds to the need with the increase of the coefficient of the indicator to increase the degree of belonging to the elements of the fuzzy set (Fig. 3).

Similar are the parameters of input variable for the results of the other criterion, analyzing the Job Experience (programming, math engineering, computers or other) but here the result is designed to have four values (indicators). In this scientific work they are not described in detail. For input variables with the results of the criterion Job requirements (full compliance, more important, less important, similar and none), IQ test and Psychological test (high, above average, average, below average and poor) and Team work (excellent, very good, good, sufficient and poor) five fuzzy sets are created corresponding to the number of levels in the criterion. For the criterion Appearance, the fuzzy membership functions are only two as mentioned before (Fig. 4).

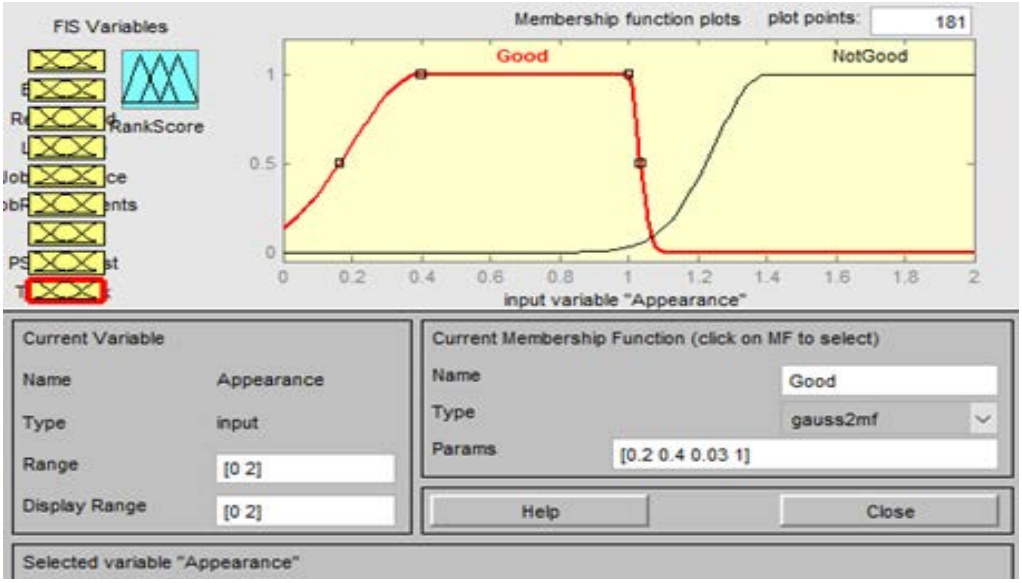


Figure 4. **Diagram describing the membership functions of fuzzy sets corresponding to the variation in criteria Appearance**

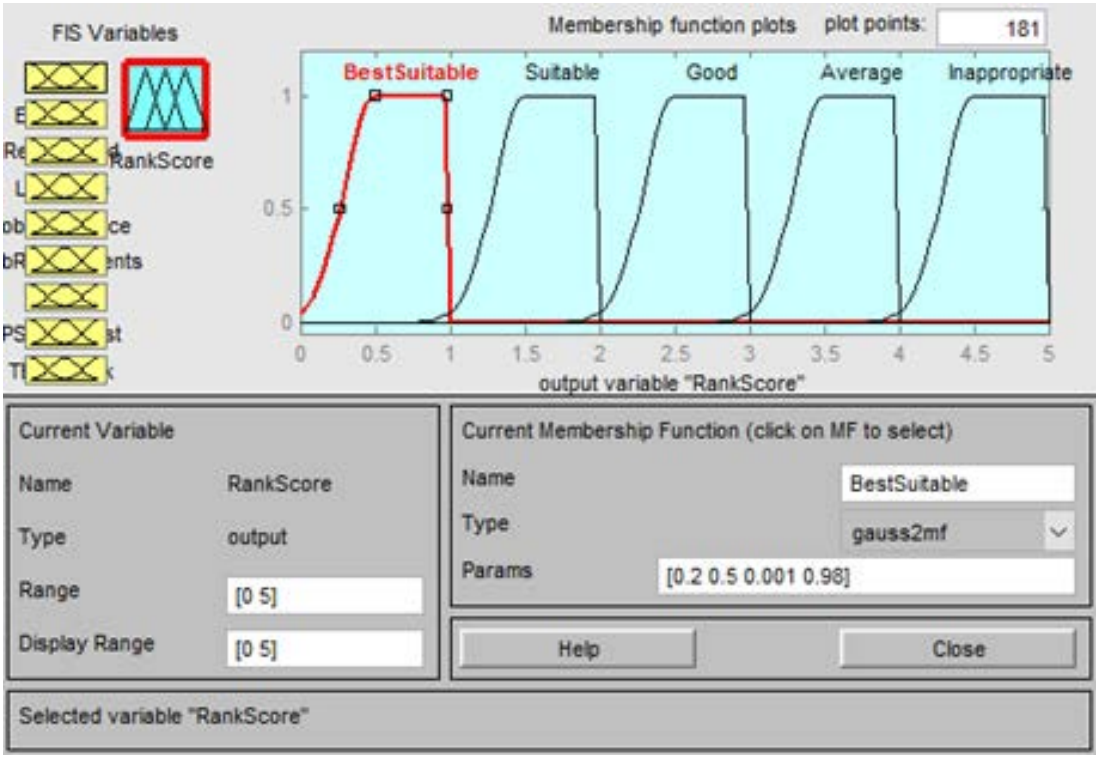


Figure 5. **Diagram of membership functions with Gaussian distribution type "bell" fuzzy sets of the output variable corresponding to the applicant's rank score used in the fuzzy inference system for HR selection tool**

The same logic is applied with Gaussian combination membership function and spaces with a maximum surface area, respectively, membership functions results in ranges 0-1 on the outcome of the first level, 1-2 - the second, etc. filling the interval 0-5 for the criteria with 5 levels (Fig. 5).

The output fuzzy variable is made up of fuzzy sets, broken again in the range 0-5, given the rank of the applicant in order to be placed in a descending list. The membership functions with the Gaussian distribution of type "bell" are aimed to summarize at maximum the results of the input variables, classified by the rules. Membership functions for the fuzzy sets of the output variable are shown on Fig. 5. The particular form aims to distinguish in maximum the membership functions of each criterion indicators for analysis. The shape is consistent with the selected function to summarize the results that is formed by the maximum value in each membership function of the input fuzzy variables.

The set of rules necessary for the operation of the system is composed of 10 rules divided into 2 groups, the weight of every rule of the groups is equal to one (Table 1).

Table 1 **FIS rules for the HR selection tool. Each of the criterion levels are represented with a digit from best to bad indicator in ascending order**

Education	Job Requir.	Job Exper.	Lang.	Recomm.	IQ	Psycho	Team	Appear.	Rank
1	1	1	1	1	1	1	1	1	1
1	1	1	2	2	2	2	2	1	1
2	2	2	2	2	2	2	2	1	2
2	2	2	2	2	3	3	3	1	2
2	2	2	3	3	3	3	3	1	3
2	2	2	3	3	3	4	4	1	3
3	3	3	3	3	3	3	3	1	4
3	4	3	3	3	4	4	4	2	4
3	4	4	3	3	4	4	4	1	5
3	5	4	3	3	5	5	5	2	5

For the first set of rules for each applicant are selected functions of fuzzy sets of input variables that describe it in its relevant characteristics (education, recommendations, language, job experience, job requirements, IQ test, psycho test, team work and appearance) as described classes at the output of each of the criteria (Fig. 6). The operation used for the various fuzzy sets which are obtained for each criterion for evaluation is a logical “AND” to reflect the intersection of these fuzzy sets and to comply thus with the most corresponding result of each rank level. Rules are 5 in number and one of them is used for example:

(1.) (Education==CompSc) & (Recommend==Excellent) & (Language==English) & (JobExperience==Programming) & (JobRequirements==FullCompliance) & (IQtest==High) & (PsychoTest== High) & (TeamWork==Excellent) & (Appearance==Good) => **(RankScore=BestSuitable)**

The second group of 5 rules are designed to treat the results of the applicant form that specify not strong but acceptable results for each rank level. In the rules the logical operator “AND” is used for operation between the selected fuzzy sets, thereby to address potential pass level exceptions allowed by HR selection methodology for applicants with different characteristics in the various indicators of calculation. According the description, the set of 5 rules adopted in that group can be explained, with the example:

(2.) (Education==CompSc) & (Recommend==Good) & (Language==Latin) & (JobExperience==Programming) & (JobRequirements==FullCompliance) & (IQtest==AboveAverage) & (PsychoTest==AboveAverage) & (TeamWork==VeryGood) & (Appearance==Good) => **(RankScore=BestSuitable)**

The described fuzzy inference system is aimed to summarize the results of nine criteria that have output variables of different nature, to put fast result as a digital value corresponding to the combination of degrees of matching the applicant's skills with the different ranking classification levels (Fig. 6).

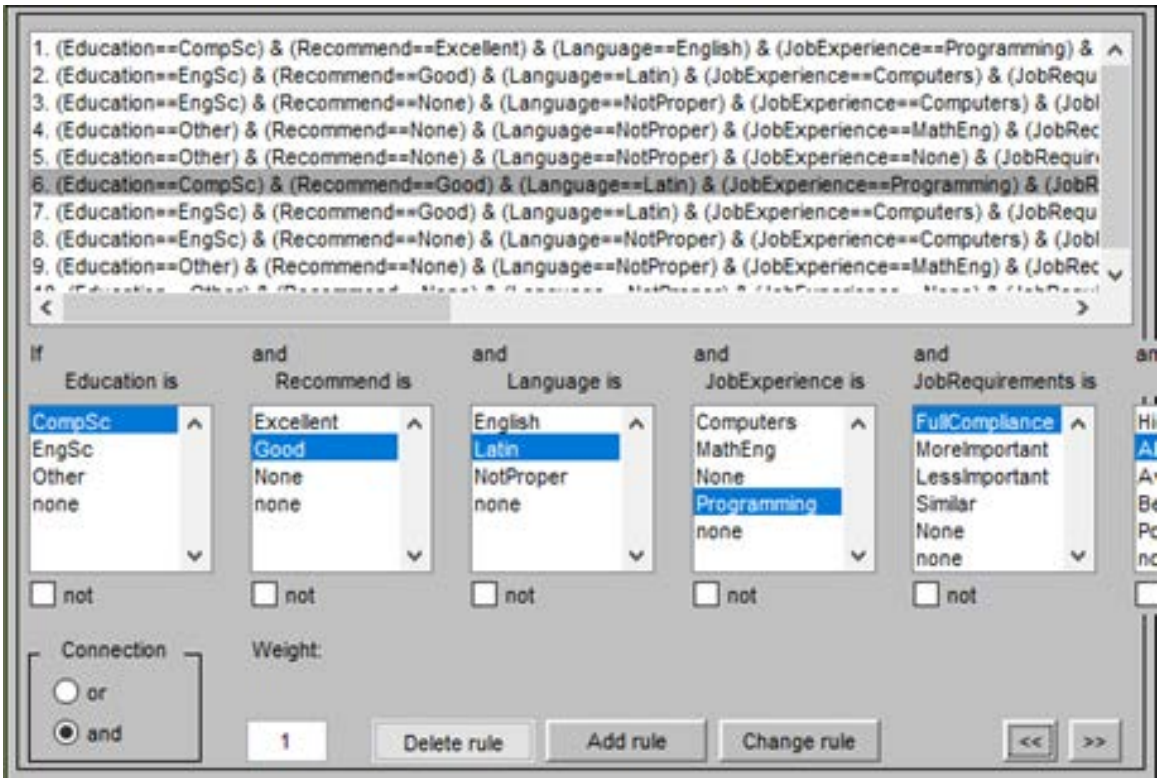


Figure 6. **Fuzzy system rules for HR selection decision-making process of a system with fuzzy logic simulated in Matlab**

Results and discussion

Numerical experimental results in applicant's score assessment on nine criterions. The job applicant placement in the ranking scale is decided upon its classification using fuzzy logic. The results of numerical simulation experiment of applicant placement in the rank scale with FIS result *RankScore* = 0.95 is depicted on Fig. 7.

The result of applicant classification process with FIS is produced with the nine criterion levels as a fuzzy sets and the value of the parameter *RankScore* is used to describe the number corresponding to the FIS decision - 0.95. The result is related to the output variable with this number even if not relevant to any of the defined rules. The applicant is classified as best suitable for the job and is situated in the top of the HR selection ranking scale.

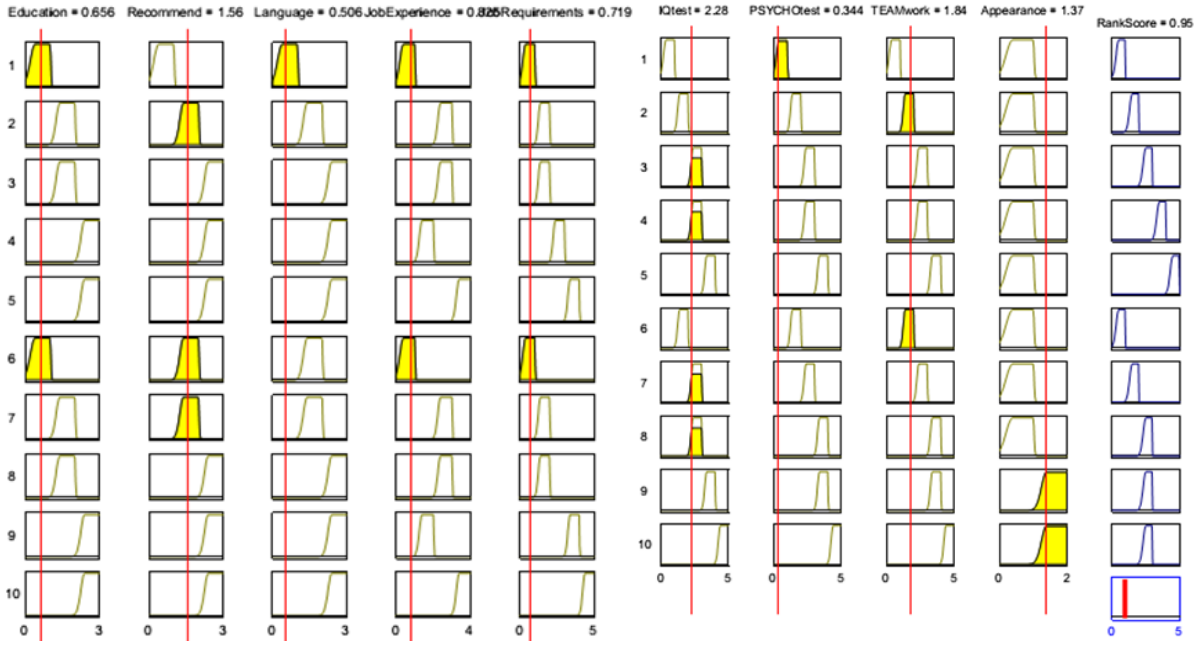


Figure 7. **Graphically expressed results of the procedure (parts "a" and "b") for applicant ranking. The score 0.95 (blue column) is connected to the output variable with the number 1. The applicant in that case is assessed as best suitable**

Conclusion

The fuzzy logic aimed to summarize the results of all predefined criterions in accordance with a system of logical rules is established in MATLAB environment. The membership functions of all input variables are used to formulate a reasoned conclusion, despite the different nature of their dimensions. One of the problems in the summarization of many criterions is permitted. They are able to produce a satisfactory result, but not to formulate a conclusion. The flexible approach in formulating decisions is of particular importance for the possible implementation of the developed HR selection ranking system.

By the implementation of the combination of rules for the operation of the system with fuzzy logic the computational and logical analyses burden in making the final ranking is reduced and the rapid adaptation to changes in the composition and nature of each criterion is allowed. The system can be modified for applicant ranking in HR selection tool processing.

References

Doctor, F., Hagras, H., Roberts, D., & Callaghan, V. (2008). A type-2 fuzzy based system for handling the uncertainties in group decisions for ranking job applicants within Human Resources systems, Fuzzy Systems, *FUZZ-IEEE 2008*.

Doctor, F., Hagras, H., Roberts, D., & Callaghan, V. (2009a). A fuzzy based agent for group decision support of applicants ranking within recruitment systems, Intelligent Agents, *IA '09. IEEE Symposium*.

Doctor, F., Hagras, H., Roberts, D., & Callaghan, V. (2009b). A neuro-fuzzy based agent for group decision support in applicant ranking within human resources systems, Fuzzy Systems, *FUZZ-IEEE 2009.*

Hosseininezhad, F., Hosseininezhad, F., & Balalpour, M. (2011). A Fuzzy Expert System for performance evaluation of HRM with 360 degree feedback approach (Case study: An Iranian IT company), *Computer Sciences and Convergence Information Technology (ICCIT), Sixth International Conference.*

Mamdani, E. H., & Assilian, S. (1975). An experiment in linguistic synthesis with a fuzzy logic controller, *International Journal of Man-Machine Studies, Vol. 7, No. 1*, 1-13.

Slavyanov, K. O., & Minchev, C. N. (2017). An Algorithm of Fuzzy Inference System for ISAR Image Classification, *"Environment. Technology. Resources", 11Th International Scientific and Practical Conference, Volume II*, 154-158.

Vasileva, M. V. (2008). *Fuzzy sets. Theory and practice*.

Zadeh, L. A. (1973). Outline of a new approach to the analysis of complex systems and decision processes, *IEEE Transactions on Systems, Man, and Cybernetics, Vol. 3, No. 1*, 28-44.

Zadeh, L.A. (1988). Fuzzy logic, *Computer, Volume: 21, Issue: 4*, 83 – 93.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 455-464

PRETEEN AGE: THE ANALYSIS OF THE MULTILEVEL PSYCHO-DIAGNOSTIC DATA BASED ON NEURAL NETWORK MODELS

Elena Slavutskaya
Chuvash State Pedagogical University, Russian Federation

Leonid Slavutskii
Chuvash State University, Russian Federation

Abstract. *The use of the artificial neural network (ANN) models for vertical system analysis of psycho-diagnostic data is suggested. It is shown that the ANN training, as the problem of nonlinear multi-parameter optimization, allows to create effective algorithms for the psycho-diagnostic data processing when the results of psychological testing for the different level's characteristics have different numerical scales. On the example of processing the author's data of psycho-diagnostics (preadolescent schoolchildren), it is shown that neural network models can be used to estimate latent (hidden) connections between psychological characteristics. The proposed algorithms are based on a statistical assessment of the quality of such models, do not require a large sample of respondents. The quantitative statistical criteria for evaluating the quality of the models are estimated. The approach is sufficiently clear for practical use by psychologists who do not have a special mathematical preparation.*
Keywords: *preadolescent schoolchildren, psychodiagnostic data, vertical system analysis, artificial neural networks.*

Introduction

For the psychological researches, it is important to assess the presence of indirect (latent, hidden) links between the diagnosed traits. Vertical system analysis in psychology implies, as a rule, finding connections between the psychological characteristics of different levels (Hebb, 1961). That is, at the same time, data processing can include solving the problem of classifying or the constructing of a hierarchical model. The traditional for psychology the correlation and factor analysis (Glass & Stanly, 1970), as the mathematical tools, allow to evaluate statistically the presence of only linear connections between psychodiagnostic data and do not give a result in the event that such connections are nonlinear. These tasks can be solved using artificial neural networks (ANN)(Haykin, 1999).

In this paper, the task is not to find the numerical meanings of psychological traits, but only to establish links between them (Baxt, 1994). This makes it possible to use the itself analyzed data for ANN training. In this case, the sample

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3348

can be quite limited (up to 50-100 subjects), the main thing is that the number of neurons in each ANN layer should be much smaller than the sample size (Grossberg, 1974). The numerical dimension of the initial psychological characteristics is not of fundamental importance, the signs can even have symbolic meanings (for example, a sex sign). Thus, the use of ANN makes it possible to establish latent and nonlinear links between psychodiagnostic data, even if they are obtained by tests with different numerical scales. To assess the relations between the characteristics of different levels, it is proposed, in particular, to evaluate the quality of the training of the corresponding ANN models. Training of the neural network requires professional skills, and the overwhelming majority of psychologists prefer to use the traditional statistical methods of analysis (Glass & Stanly, 1970). Most often, the ANN is used to automate the procedure itself of medical and psychological diagnosis (Reznichenko et al., 2013) or for creating the models in psychophysiology (Usher & Zakay, 1993).

Preadolescent age is quite complex and saturated from a psychological point of view. J. Piaget defines this period as the time of transition from the stage of concrete to the stage of formal operations of thinking (Piaget, 1972). Reflexive abilities of 10-12-year-old schoolchildren are manifested in the ability to deeper generalization, analysis, the ability to explain abstract concepts. It was revealed that by the age of ten, schoolchildren can analyze complex emotions, understand the ambivalence of feelings and the relativity of moral judgments (Harter, 1990). Many researchers note the peculiarities in the development of the personality of children 9-12 years old. The development of moral consciousness of children aged 10-13 is at the conventional level. By the end of this period, their judgments are made on the basis of established order, with respect for norms and rules, and subordination of authority (Kohlberg, 1984). From the point of view of the psychoanalytic theory of S. Freud, the age from 5 to 10 years is a latent stage in the child's psychosexual development. E. Erikson, focusing on the social stages of development, considered the age of 6-12 years as the period of transfer to the child of systematic knowledge and skills. In children at this age, the ability to master the environment surrounding it most intensively develops (or does not develop). With a positive outcome of this stage of development, the child develops an experience of his own skill, with an unsuccessful - a sense of inferiority and inability to be on a par with other people (Erikson, 1950). W. Collins argues that between 9 and 12 years there is such a serious crystallization of personality structures that many psychological and social characteristics of schoolchildren of this age give a basis for reliable predictions of his behavior for 4-6 years ahead. Data on a child up to grade 3 do not have predictive power (Collins, 1984). Thus, the study of the multilevel psychological

characteristics of children and the interrelationships of these characteristics in preadolescents are of considerable interest.

Sample and Psychodiagnostic Data

The study used the standardized methods of psychodiagnostics, the choice of which was determined by the following criteria: the identification of a variety of different levels psychological indicators of schoolchildren, a sufficient number of signs for the intellectual analysis of data and for the subsequent system analysis of the characteristics of mental development in this age segment.

The investigation involved 90 schoolchildren of the 5th grade (age 11-12).

The psychodiagnostics of the following multilevel psychological characteristics of schoolchildren was carried out:

- the highest, personality level is represented by the indicators of relations: R1 - the relation to immediate family- the father, the mother; R2 - relationships with peers; R3 - attitude towards the school, teachers; R4 - attitude to yourself (test ”Unfinished Sentences” by V. Mikhal for children aged 7-12) and motivational characteristics (”Need for Achievements”(NA) by Yu.M. Orlov);
- the properties of the second level were tested using the R. B. Cattells 12-factor questionnaire (twelve personal traits for children 8-12 years old (Cattell, 1990));
- the level of mental processes and states was determined through the free cultural intellectual test by R.B. Cattell (”fluid intelligence”, expressed in the form of an IQ (Cattell, 1990));
- the type of the nervous system according to the psychomotor parameters (the tapping T- test of E.P. Ilyin) was considered as the basic lower level of innate (biological) characteristics and the physiological support of mental processes.

Creating the free cultural test of intelligence, R.B. Cattell suggested that it would identify a biologically predetermined intellect, formed on the basis of the architectonics of the cortex of the cerebral hemispheres. Therefore, in our study we combined the indicators of biological capabilities and the characteristics of providing mental processes and states to one level.

Method of Neural Network Analysis

Based on the theoretically and empirically established rules for the use of ANN in analyzing the data, we will rely on the following general provisions:

1. An adequate ANN learning implies the presence, structure and certain stability of the connections between the input and output data of a neural network, even if these links are indirect and nonlinear.

2. The quality of the ANN model can be estimated from the scattering diagram, the statistical distribution of errors in the training and testing of the ANN.
3. It is better to use several ANN with one ”output” than one ANN with several ”outputs”.

ANN is a network of single neurons connected to each other. The number of neurons and the scheme of their connections can be different. We use the most common type of ANN - direct propagation (feed forward), in which neurons are combined into layers (Figure 1). The ANN scheme consists of one input layer, one ”hidden” layer and one output layer. Neurons in the layer are not connected to each other, but they are connected to the neurons of the previous and next layer according to the principle ”every with each”.

The analytical program ”Deductor” was used, which contains tools for assessing the quality of data, cleaning them from duplicates and contradictions and ”anomalous” values, preliminary analysis of data (partial processing, factor and correlation analysis), Data Mining, including ANN, various means of visualizing the results of analyzed models.

An example of the evaluation of the ANN training quality is shown in Figure 1. In the network input values are personality traits (Cattell, psychological characteristics of the second level). IQ in the output of ANN refers to the psychological characteristics of the baselevel (individual psychological, biologically determined characteristics).

Interpretation of the personality traits in Cattells 12-factor questionnaire (CPQ): A - gregariousness - isolation; B - abstract-concrete thinking; C - emotional stability -instability; D – excitement - balance; E-independence - obedience; F - carefree - concern; G - high-low discipline; H - boldness-shyness; I - softness-hardness; O - anxiety-calmness; Q3 - high-low self-control; Q4 - tension-relaxation.

During ANN training, various input data (in this case, Cattell’s personality traits) are fed to the ANN input level, and the obtained IQ OUT values are compared with the known IQ IN target values from the psychodiagnostic data. The ”Synaptic Weights”, that contribute the most to the error, are modified (using the backpropagation error algorithm). This cycle is repeated many times until an acceptable accuracy of displaying the input information in the output (or - the error ceases to decrease) is achieved. The number of cycles can reach 10000.

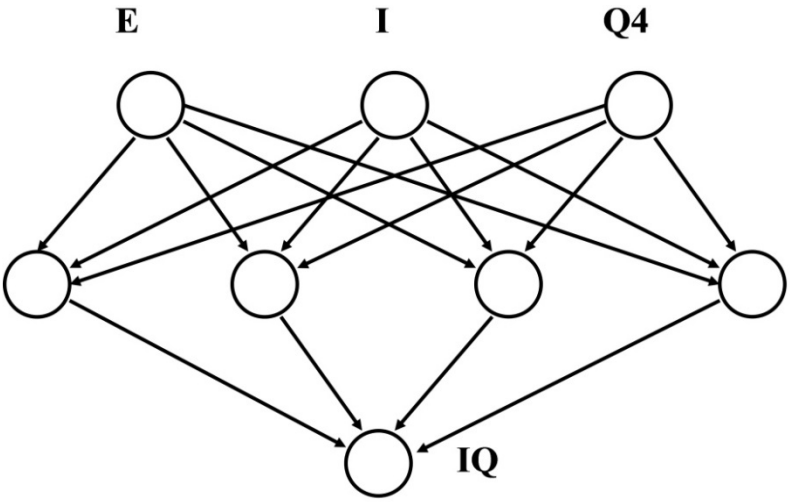


Figure 1. **Example of ANN**

Figure 1 shows a neural network model, created separately for boys. In this case, the input of the neural network is consistently given values of three personality traits (three neurons in the input layer). The number of neurons in the "hidden" layer (4) is chosen empirically. It corresponds to the best quality of training by the criteria, which are further described in this article. The one neuron in the output layer of the network, in this case corresponds to the intelligence coefficient.

The quality of the neural network model can be estimated from the scattering diagram, which presents the spread of the values IQ OUT during the network learning. In the ”ideal” training of ANN, all points must ”fit” the shown straight line (see Figure 2). The quantitative criteria can be the root mean-square deviation (error) and the percentage of recognizable links for a given error.

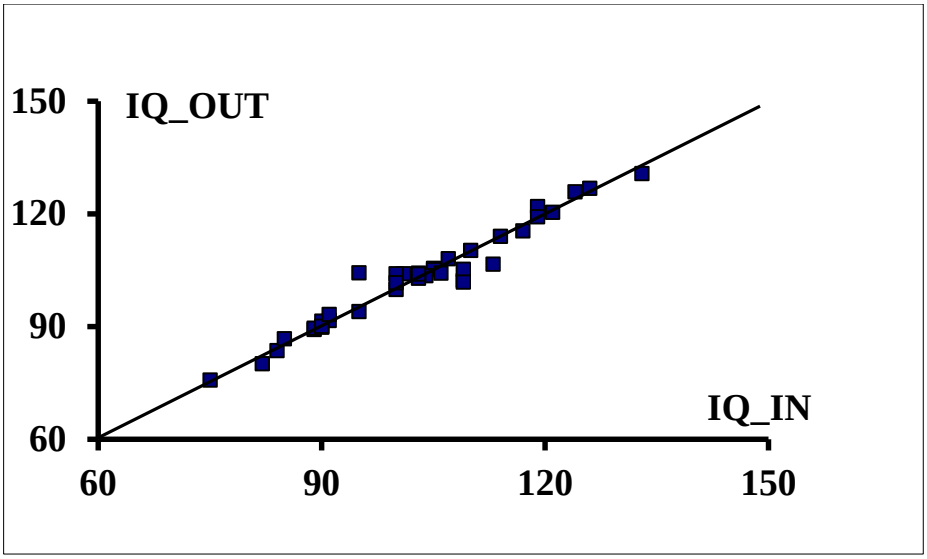


Figure 2. **Example of the scattering diagram (boys)**

An example of the root-mean-square error distribution over the intervals is shown in Figure 3. Comparing such histograms for different models, you can choose the best one, i.e., the model with the most preferred kind of distribution function (distribution density) of errors.

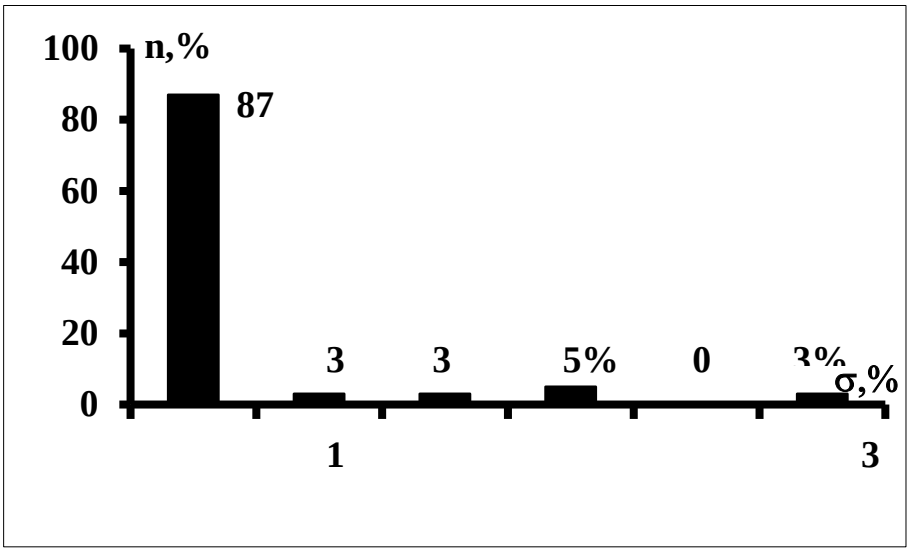


Figure 3. **Example of the root-mean-square error distribution**

Numerical criteria can be the maximum of the root-mean-square error $\sigma_м$ (in this case $\sigma_м$=2,6%), and the number of examples N (in absolute units or in percentages) that have an error of 5% (0.05) or 1% (0.01) (in this case N_5=100% and N_1=90%). Thus, the quality of the ANN model and the percentage of connections recognized in the training of the network lends itself to a traditional statistical description with a confidence interval and a significance level. In order to assess the presence of latent links, one can change the number of input parameters of the network (traits) and, after evaluating the quality of the model, draw conclusions about those input parameters (psychological attributes) that are most important. The above example of analysis and numerical criteria for evaluating ANN models allow, by changing the structure of ANN, input characteristics and output function, to carry out a vertical system analysis of level psychological characteristics.

Results and discussions

For the system analysis of gender differences, the ANN apparatus can be used after the separation of the respondents based on gender. For example, Figure 2 shows the results of ANN training for boys separately (corresponds to the model of figure 1). In the case when the values of all 12 Cattell's personality

traits (girls with boys) were submitted to the neural network input, the quality of the ANN model, according to the statistical criteria, was much worse ($\sigma_м$ =7,8%, N_5=97% and N_1=80%) . This allows us to draw a preliminary conclusion about more structured connections of personality traits with IQ for the boys than for the girls (Slavutskaya & Slavutskiy, 2012). It turns out that in order to obtain a qualitative ANN model for boys, it is sufficient to use at the input of a neural network the only 3 of the 12 Cattell's personality traits. For the girls the corresponding result can not be achieved. For them, with a decrease in the number of input attributes (in any combination), the quality of ANN training deteriorates. The percentage of recognizable connections is lower than in the general sample ($\sigma_м$=13,6%). This confirms the earlier conclusion about more similar links of psychological signs for boys at this age.

The ANN model to evaluate the inderected (latent) connections of level psychological characteristics was constructed. To the input of ANN the values of biologically determined characteristics of the baseline level (sex, IQ, the results of the T test, characterizing the type of the nervous system) was given, and the output of the neural network consisted of personal characteristics of the highest level (the NA, the system of relations: in the family-R1, with peers - R2, in school - R3, to yourself-R4) (see Figure 4).

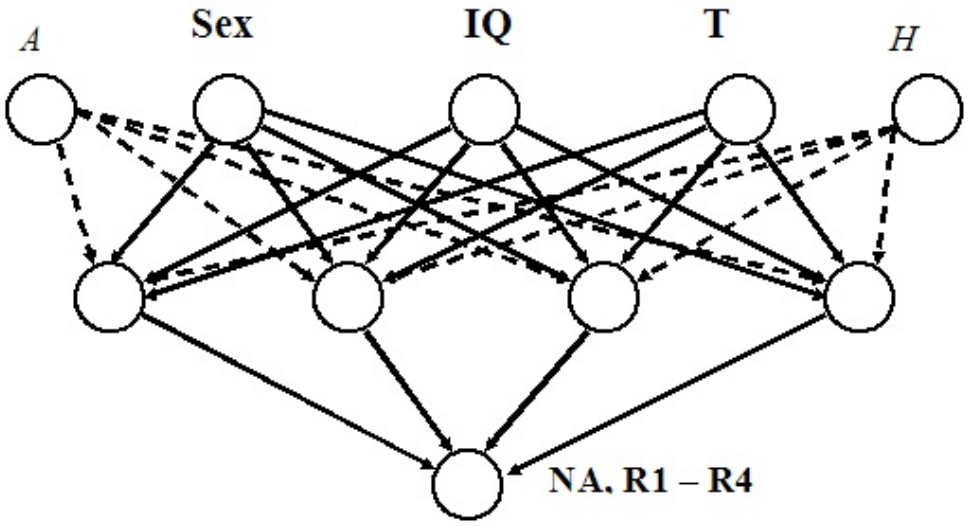


Figure 4. ANN **for the latent connections analysis**

Based on the results of a consistent analysis of the links between the psychological characteristics of the lower (base level) and upper personal level , it is established that the quality of the ANN model in Figure 4 is significantly dependent on the objective function - the highest level personal characteristic. For

R4 and R2 network training allows us to talk about the existence of a stable connection between the input and output characteristics ($\sigma_м$=0,77%, N_1=100% and $\sigma_м$=6,2%, N_5=95%, N_1=80%, respectively). For the NA, R1, R3, the quality of network training is very low. For NA $\sigma_м$=12%, N_5=86%, N_1=0%; for R1 $\sigma_м$=16%, N_5=72%, N_1=0%; for R3 $\sigma_м$=20%, N_5=76%, N_1=0%.

Thus, it can be assumed that there is a significant relationship between the characteristics of the base lower level - the intelligence (IQ) and the type of the nervous system (T) with such higher-level indicators as attitudes toward oneself (R4) and peers (R2). Motivation, attitude to the family and to the school depend on more factors.

To assess these factors, it is necessary to take into account the psychological characteristics of the middle level. It was found that such characteristics can be communicative features in a 12-factor Cattell's questionnaire (CPQ): A - gregariousness - isolation; H - boldness-shyness in communication (see Figure 4). If the values of these attributes are fed to the input of the ANN model together with the characteristics of the lower level, then
the quality of the training of the neural network is significantly improved for the objective functions, the quality of the ANN models with which turned out to be low for the structure of the neural network with three input neurons. For NA $\sigma_м$=4,8%, N_5=100%, N_1=86%; for R1 $\sigma_м$=16%, N_5=87%, N_1=0%; for R3 $\sigma_м$=5,7%, N_5=81%, N_1=62%. In addition, to obtain a qualitative ANN model, one of the communicative features A or H can be replaced at the input of the network of Figure 4 by the volitional characteristic G (observance of norms and rules of behavior, strong-willed indicator).

Thus, it can be considered that the relationship of psychosocial characteristics of the upper level of NA, R3 and R1 with the basic characteristics of the lower level is mediated by communicative and volitional personality traits A, H, G.

If the quality of the ANN model is sufficiently high by statistical criteria, then the dependence of the output characteristic of the neural network on the value of each of the input attributes can be constructed for each respondent (Slavutskaya & Slavutskiy, 2014). For example, such dependencies can be NA(H), NA(G), NA(A).

In general, the statistical evaluation of the quality of neural network models allows to solve the following system analysis tasks during the psychodiagnostic data processing:

1. To assess the existensy (in principle) of the links between psychodiagnostic data, to what extent these are stable and structured.

2. Selectively to identify the links between the psychological traits for each respondent. To determine in what degree these dependences are nonlinear.
3. If the values of psychological signs are submitted to the ANN input, and gender is on the output, then according to statistics, feminine and masculine characteristics can be established.
4. System analysis in psychology involves mandatory classification of psychological characteristics. The finding of mediated links between them and the grouping of psychological attributes by certain properties is in fact the task of data classifying. The evaluation of gender characteristics (the previous paragraph) can also be considered as the classification task.

Conclusions

On the example of the psychodiagnostic data processing for the children of preteen age (Collins, 1984) it is shown that the evaluation of the quality of ANN models training, as problem of non-linear multi-parameter optimization, allows solving some tasks of vertical system analysis in psychology. The detection and evaluation of the latent nonlinear relationships between the psychological characteristics is a problem that is difficult to solve by traditional statistical methods. The proposed approach allows psychologists to solve this problem with a fairly limited sample of respondents.

Acknowledgements

The authors express their deep gratitude to professor V.S. Abrukov for fruitful discussions.

References

Baxt, W.G. (1994). Complexity, chaos and human physiology: the justification for non-linear neural computational analysis. *Cancer Lett, 77(2-3)*, 85-93.

Cattell, R.B. (1990). *Advanced in Cattelian Personality Theory. Handbook of Personality. Theory and Research*. New York: The Guilford Press.

Collins, W.A. (1984). *Development during middle childhood: The years from six to twelve.* Washington, DC: Natl. Acad. Press.

Erikson, E.H. (1950). *Childhood and Society.* New York: Norton.

Glass, J. V. & Stanly, Y.C. (1970). *Statistical methods in education and psychology*. New Jersey.

Grossberg, S. (1974). Classical and instrumental learning by neural networks. *Progress in theoretical biology, Vol. 3*. (pp. 51-141). New York: Academic Press.

Harter, S. (1990). *Self and identity development. At the threshold: The developing adolescent.* Cambridge, MA: Harvard Univ. Press.

Haykin, S. (1999). *Neural networks: A comprehensive Foundation*. New York: Prentice Hall.

Hebb, D. (1961). *Organization of behavior*. New York: Science Edition.

Kohlberg L. (1984). *The psychology of moral development: The nature and validity of moral stages*. B. Y.: Holt, Rinehart and Winston.

Piaget J. (1972). Intellectual evolution from adolescence to adulthood. *Human Development, 15,* 1-12.

Reznichenko, N.S., Shilov, S.N. & Abdulkin, V.V. (2013). Neuron Network Approach to the Solution of the Medical-Psychological Problems and in Diagnosis Process of Persons with Disabilities (Literature Review). *Journal of Siberian Federal University. Humanities and Social Sciences, 9 (6),* 1256-1264.

Slavutskaya, E.V. & Slavutskiy L. A. (2012) Using artificial neural networks for analysis of gender differences in younger teenagers. *Psikhologicheskie Issledovaniya, 5(23),* 4. http://psystudy.ru (in Russian, abstr. in English).

Slavutskaya, E.V. & Slavutskiy L. A. (2014) Neural network analysis of the relationship between verbal and nonverbal intelligence in younger adolescents *Psychological Journal, 35(5)* 28-36.

Usher M. & Zakay D. (1993). A neural network model for attribute-based decision processes *Cognitive Science, 17,* 349-396.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 465-474

A RELATIONSHIP BETWEEN COGNITIVE INFORMATION PROCESSING IN LEARNING THEORY AND MACHINE LEARNING TECHNIQUES IN COGNITIVE RADIOS

Zhaneta Tasheva
Department of Computer Systems and Technologies, National Military University, Faculty of Artillery, Air Defence and Communication and Information Systems, Shumen, Bulgaria

Rosen Bogdanov
Department of Communication Networks and Systems, National Military University, Faculty of Artillery, Air Defence and Communication and Information Systems, Shumen, Bulgaria

Abstract. *The relationship between cognitivism as learning theory in education and machine learning is characterized in this survey paper. The cognitivism describes how learning occurs through internal processing of information and thus leads to understanding and retention. Cognitive information processing plays an active role to understand and process information that learner receives and relates it to already known and stored within learner's memory. Thus, the cognitive approach defines learning as a change in knowledge which is stored in learner's memory, and not a change in learner's behaviour. In regard with importance of various learning problems to designing cognitive communications systems the two main classification categories of learning techniques are explained. Furthermore, the cognitive radio learning algorithms that have been proposed are described. Finally, the similarities and differences among the principles of learning theories and machine learning are discussed.*
Keywords: *Cognitive Information Processing, Cognitive Radio, Cognitive Radio Learning Algorithms, Cognitivism, Learning Theory, Machine Learning.*

Introduction

One of the most indispensable components of a human and artificial intelligence is the ability to learn. As the paper intend to characterize a relationship between Cognitive Information Processing in Learning Theory and Machine Learning Techniques in Cognitive Radios, one need to have a definition of intelligence and learning. There are several definitions of these terms that have been proposed in the past. For the purposes of this paper, the terms learning, human intelligence and artificial intelligence will first be defined.

Learning is the process of acquiring new or modifying existing knowledge, behaviours, skills, values, or preferences (Gross, 2015). This definition shows the general characteristics of the learning process and can be applied to both human

© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3191

and machines. The term “Machine Learning” is defined first by Arthur Samuel, an American pioneer in the field of computer gaming and artificial intelligence, in 1959. Machine learning is a field of computer science that gives computers the ability to learn without being explicitly programmed (Samuel, 1959).

Human intelligence is the intellectual prowess of humans, which is marked by complex cognitive feats and high levels of motivation and self-awareness (Tirri & Nokelainen, 2012). Through their intelligence, humans possess the cognitive abilities to learn, understand, reason, form concepts and ideas, plan, solve problems, make decisions, retain information, and use language to communicate.

Artificial intelligence or machine intelligence is a possession of intelligence by machines. In computer science artificial intelligence is defined as the study of intelligent agents, which is any device that perceives its environment and takes actions that maximize its chance of success at some goal (Poole et al., 1998).

The cognitivism as learning theory describes how learning occurs through internal processing of information and thus leads to understanding and retention. Cognitive information processing plays an active role to understand and process information that learner receives and relates it to already known and stored within learner’s memory.

To understand the relationship between cognitivism and machine learning, in section two, the principles of three main learning theories how human acquire, retain, and recall knowledge are explained. Next, the machine learning techniques in cognitive radio are examined in section three. Finally, the similarities and differences among the principles of learning theories and machine learning are discussed in the conclusion.

Cognitive Information Processing as Learning Theory

The most comprehensive theory about the nature and development of human intelligence during the 20th century is a Piaget's theory of cognitive development (Ginsburg & Opper, 1988). As a biologist, Piaget was interested in human intelligence, i.e. how an organism adapts to its environment. According to his theory, behaviour (adaptation to the environment) is controlled through mental organizations called schemes. Individual uses these schemes to represent the world environment and to select an appropriate action. This adaptation is driven by a biological drive to obtain balance between schemes and the environment (called equilibration).

Piaget hypothesized that infants are born with schema operating at birth that he called “reflexes.” In other animals, these reflexes control behaviour throughout life. However, in human beings as the infant uses these reflexes to adapt to the environment, these reflexes are quickly replaced with constructed schema. Piaget

described two processes, assimilation and accommodation, used by the individual though is life as he increasingly adapts to the environment. Jean Piaget also is a founder of Constructivism, which is the theory of knowledge that argues that humans generate knowledge and meaning from an interaction between their experiences and their ideas.

To understand how learning occurs one must know learning theories that are an organized set of principles explaining how individuals acquire, retain, and recall knowledge. Three are the learning theories: Behaviourism, Cognitive Information Processing (Cognitivism) and Constructivism (Figure 1).

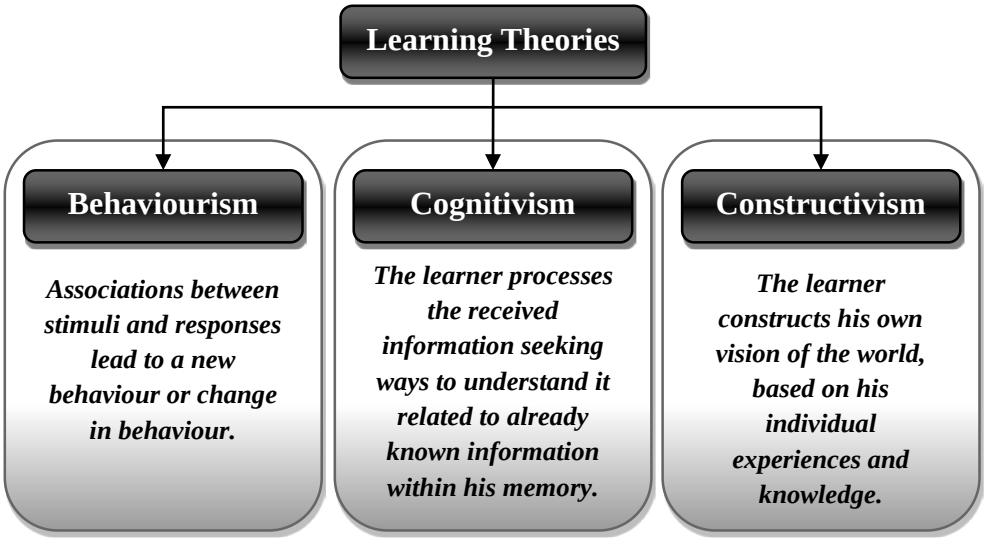


Figure 1. **Behaviourism, Cognitivism and Constructivism as Learning Theories**

Behaviourism defines learning as the acquisition of a new behaviour or change in behaviour. According to the behaviour theory the learning process begins with some stimulus from the environment and then the learner reacts with some type of response. The responses are so arranged to follow the desired behaviour. The new behavioural can be repeated so it becomes automatic. Thus, associations between stimuli and responses lead to a change in behaviour.

Unfortunately, behaviourism does not learn for creative thinking or problem solving. The students only recall some basic facts, automatic responses or performing tasks and do not take the initiative to change or improve things. Some examples of behaviourist learning theory are rote work, repetitive practice, participation or bonus points, verbal reinforcement, and so on.

Cognitive information processing is based on the idea that learner processes the received information, rather than simply responds to stimuli. Thus, the changes in behaviour are observed, but only when the learner plays an active role in seeking ways to understand received information related to already known and stored information within his memory.

Some examples of cognitive learning theory applications are classifying information, associating new content with something known, providing structure in efficient and meaningful ways, discussions, problem solving, analogies, imagery, mnemonics, and so on. As one can see, cognitive learning involves some reorganization of knowledge and experience, either by achieving new ones or changing old ones. Thus, cognitive learning is a change in knowledge stored in memory and not just a change in behaviour.

Constructivism is based on the fact that learner constructs his own vision of the world, based on his individual experiences and knowledge. Since the learning process depends on how the individual interprets the meaning of his perceptions, experiences and knowledge, the learning is unique and different for each person. Thus according to constructivist theorists, the learning is a process where individuals construct new ideas or concepts based on their prior knowledge and/or experience.

According to constructivism theorists the learning is a process of adjusting the learner's mental models to provide his new experiences. Because the learner needs a significant amount of knowledge to interpret and create new ideas, the constructivism focuses on preparing students to problem solve. Thus, the outcomes from constructivism are not always predictable because every learner has their own knowledge. Some examples and applications of constructivism are research projects, problem based learning, case studies, collaborative learning and group working, discovery learning, simulations, and so on.

Machine Learning in Cognitive Radios

A cognitive radio is a key technology that allows cognitive wireless devices to dynamically access the available spectral opportunities. The term Cognitive Radio (CR) was introduced by Joe Mitola in 1999 (Mitola & Maguire, 1999) and his PhD thesis (Mitola, 2000). The term CR was intended to describe "a goal-driven framework in which the radio autonomously observes the radio environment, infers context, assesses alternatives, generates plans, supervises multimedia services, and learns from its mistakes." In this way it could be interpreted as "a radio is a particular extension of software radio that employs model-based reasoning about users, multimedia content, and communications context" (Mitola, 2001). Thus, the CR is an intelligent radio or system that senses radiofrequency RF and microwave environment and can dynamically and autonomously adjust its operating parameters making decisions using gathered information, and can also learn and plan according to their past experience. Such a level of intelligence requires the CR to be self-, content- and context-aware.

Due to the complexity of CR technology, the FCC generalizes the CR definition to be "a radio or system that senses its operational electromagnetic

environment and can dynamically and autonomously adjust its radio operating parameters to modify system operation, such as maximize throughput, mitigate interference, facilitate interoperability, access secondary markets" (FCC, 2005). According to this definition, a cognitive radio has two key features, cognition capability and reconfiguration capability, which distinguishes it from traditional radio. These key features of CR are presented at Figure 2. The functional architecture of a cognitive radio illustrates how CR interacts with the radio environment continually while running cognition cycle to observe spectral opportunities, analyze them and decide the best actions to create plans to adapt itself for the best opportunities.

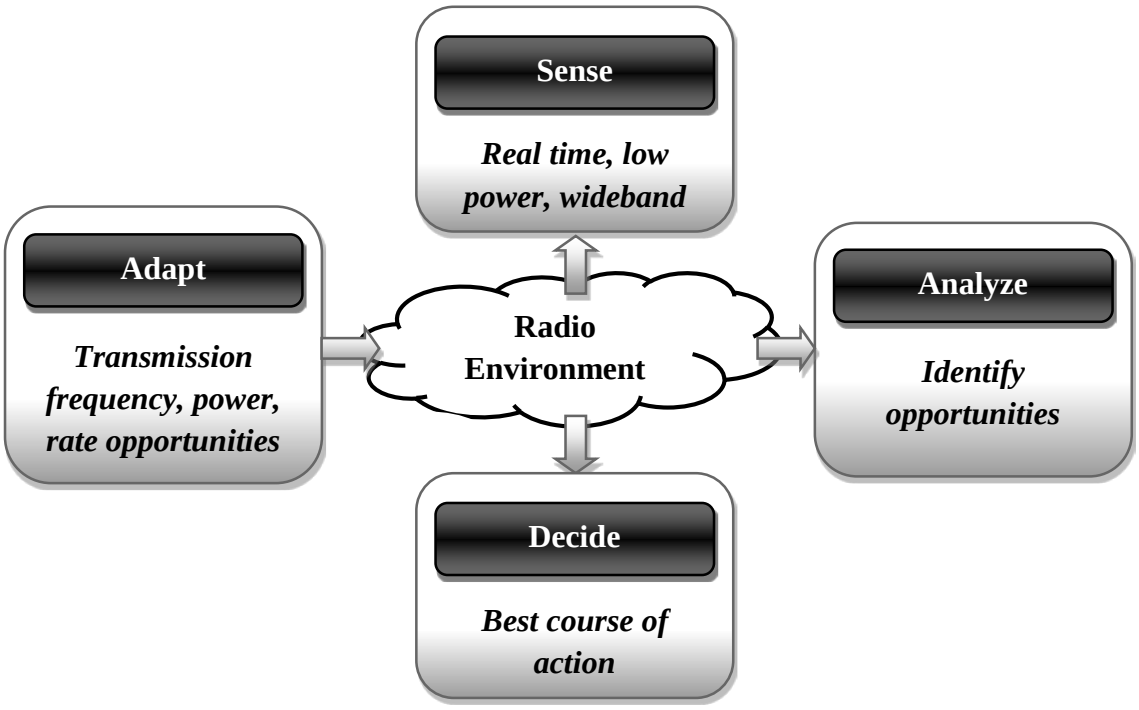


Figure 2. **Functional architecture of a cognitive radio (Khattab et al., 2012)**

Nowadays the CR capabilities are much more complicated and involve advanced technologies ranging from nanoscale electronic devices for system hardware development to artificial intelligence techniques for decision-making algorithms. In this context the term CR identifies the point at which wireless devices and the related software defined networks are sufficiently computationally intelligent about radio resources and related communications to detect user communications needs and to provide available radio resources and wireless services most appropriate to those needs.

As a result, the development of a cognitive radio system uses structured computational models of services and radio protocols to control the delivery of desired wireless services. The computational models include reinforced hierarchical sequences, which organize internal representation of CR, its user, and

its environment, and the cognition cycle (see Figure 2). The structures supporting a cognition cycle are Observe, Orient, Plan, Decide, and Act phases.

The outside world generates stimuli. Cognitive radio analyses these stimuli to recognize the context of communications tasks. Input and output multimedia content is parsed for the contextual metrics needed to infer the context of communications (for example, urgency of the communication). The Orient-stage decides on the urgency of the communications in part from these metrics in order to reduce the delay of the user. Generally, the planning phase generates and evaluates alternatives, including expressing peer or network plans to get advice. The Decide stage allocates computational and radio resources to subordinate conventional radio software. The Act-stage initiates tasks with specified resources over a certain period of time (Mitola, 2000).

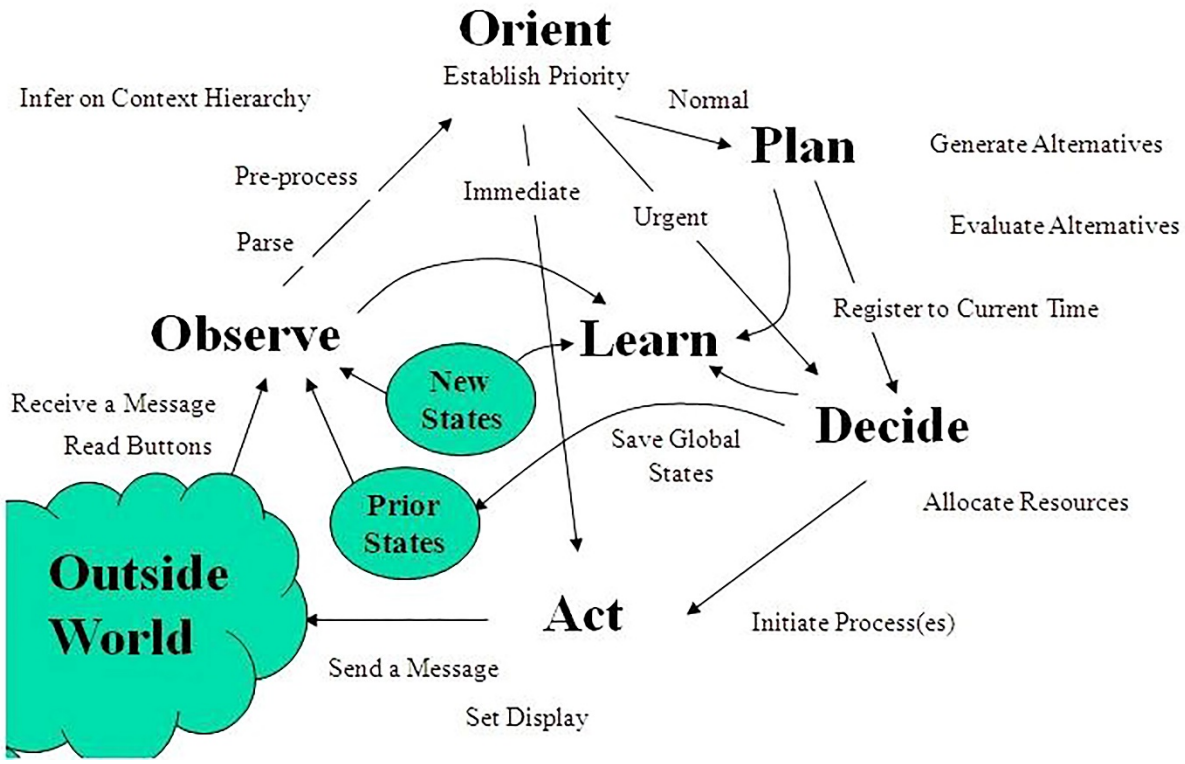


Figure 3. **Simplified Cognition Cycle (Mitola, 2000)**

Machine learning is integrated throughout the CR architecture. Three types of learning are supported by the cognitive behaviour model of cognitive radio: incremental, batch and supervised learning, which are related to three modes of behaviour: waking, sleeping, and praying, respectively.

The waking behaviour is optimized for real-time interaction with the user, isochronous control of software radio assets, and real-time sensing of the environment. Thus, the awake-state cognition maps environment interactions to

the current stimulus-response cases, and incremental machine learning maps these interactions to integrated knowledge.

Cognitive devices detect conditions that permit or require sleep and dreaming. Sleep is intentional inactivity. Dreaming behaviour employs energy to retrospectively process experience from the waking behaviour using non-incremental machine-learning algorithms. These algorithms map current cases and integrated knowledge onto integrated knowledge. A conflict is a context where the user overrode a decision about which the device had little or no certainty. If the conflict can't be resolved, it will be placed in the list of unresolved conflicts.

The prayer behaviour attempts to resolve unresolved conflicts via the mediation of the CR device. Successful resolution maps network responses to integrated knowledge. Alternatively, the CR device may present the conflict sequence to the user, requesting the user's advice during the wake cycle.

After initial training, CR has a capability to be further trained either by the user or by the network. In addition, CR may be initialized to a previously learned starting point, which consists of sets of internal structured models.

For the radio channel, the vector of the energy levels estimated at cognitive radio devices is treated as a feature vector and fed into a classifier to decide whether the channel is available or not available.

Artificial intelligence may be represented to the following learning techniques: fuzzy logic, genetic algorithms, neural networks, game theory, reinforcement learning, support vector machine, case-based reasoning, decision tree, entropy, Bayesian, Markov model, multi-agent systems, and artificial bee colony algorithm (Abbas et al., 2015), (Bkassiny et al., 2013).

A classification algorithm can be categorized as unsupervised and supervised machine learning. The main difference between supervised and unsupervised algorithms is that each training energy vector is labeled with the corresponding channel. As unsupervised are known K-means clustering and Gaussian mixture model (GMM). The K-nearest neighbor (KNN) and support vector machine (SVM) are known as supervised.

The unsupervised K-means clustering algorithm partitions a set of the training energy vectors into K disjoint clusters. Each cluster is mapped to either the channel available or the channel unavailable class.

In the unsupervised Gaussian mixture model we obtain a Gaussian distribution from training vectors to a cluster. A GMM is a weighted sum of multivariable Gaussian probability densities. The parameters in GMM can be estimated by using the maximum likelihood estimation given the set of the training energy vectors.

The support vector machine (SVM) tries to find a linearly separable hyperlane with the help of energy vectors that lie closest to the decision line by

maximizing the margin of the classifier while minimizing the sum of errors. In the SVM a set of training vectors which specify the decision function are obtained by maximizing the margin between separating hyperlanes and featured vectors.

The K-nearest neighbor (KNN) classification technique is a weighted technique based on the majority voting of neighbors. For a given test energy vector, the KNN classifier finds K neighboring training energy vectors among vector based on a particular distance measure. The distance can be calculated in different ways (Thilina et al., 2013).

It is possible for the CR devices to cooperate in order to achieve higher sensing reliability. As one can see the functional architecture of a cognitive radio and its cognition cycle are biologically inspired, based on neural-network-like nodes that respond to external stimuli and that process the resulting internal data structures.

Conclusion

As shown in Section three, the cognitive radio follows the cognition cycle for best resource management and network performance. It starts by sensing the environment, analyzing the outdoor parameters, and then making decisions for dynamic resource allocation and management to improve the utilization of the radio electromagnetic spectrum.

The human learning process is a process of committing the symbolic representations to memory where they may be processed. Thus, the study of learning is primarily approach through the study of memory. The information processing when human learn involves three stages: Encoding, when human collecting and representing information by sensations or observations; Storage, which is holding information in short-term memory for one to three seconds or in long-term memory; and Retrieval which is obtaining the learned information by human when needed. There are three categories of long-term memory. Semantic Memory is for verbal information or meaning. Episodic Memory is for events and for information related to a particular places and times. Procedural Memory is for how to do things. It takes a longer procedure to learn, but once the knowledge is learned, it will be remembered for a long time (Huitt, 2003).

The comparison of two learning processes in Cognitive Radio and Human are shown in figure 4.

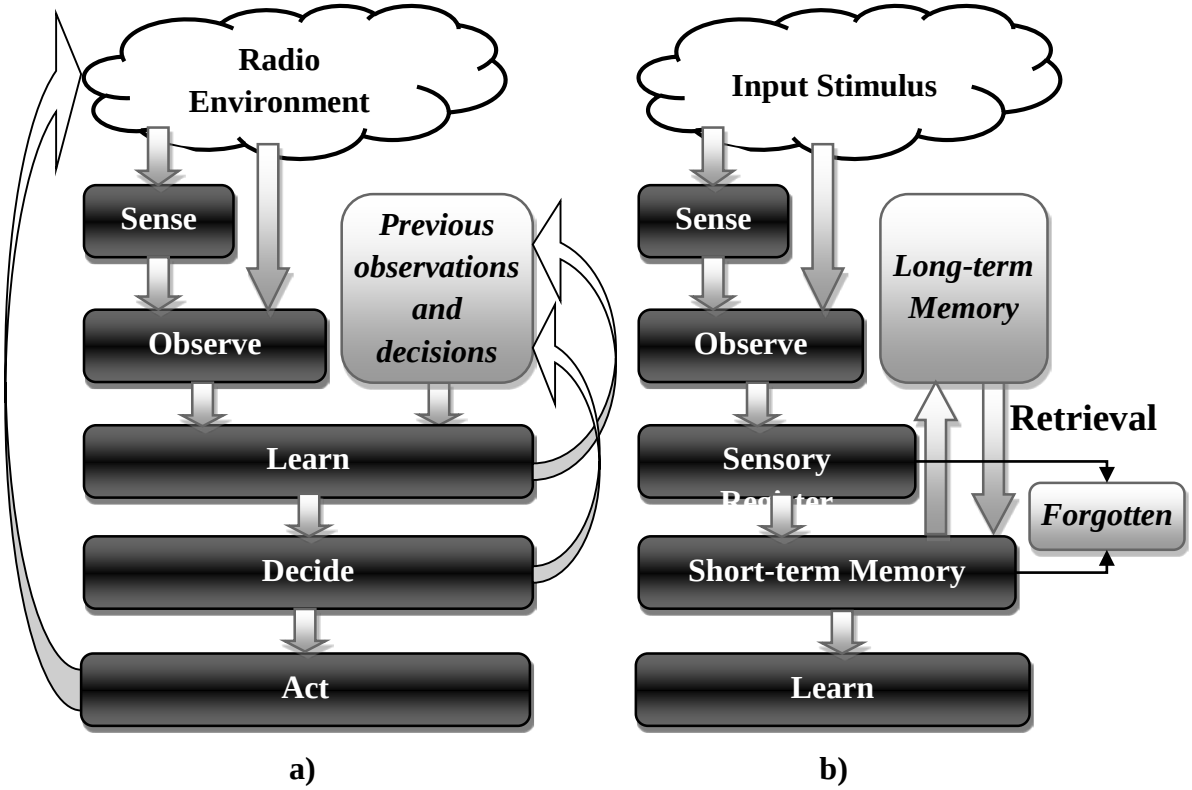


Figure 4. **The Learning Process in Cognitive Radio (a) and Human (b)**

As one can see the two learning processes are very similar because:

1. The learning process is the most indispensable component of a human intelligence and cognitive radio as artificial intelligence system. In both systems the learning is a process of creation knowledge from information, i.e., both systems can classify, organize, abstract, and generalize information obtained from the sensing.
2. Human as biological system and CR as technical system also can perceive and reason, i.e. they are able to obtain information about its environment and its own state, and they can use its knowledge for achieving its goals.

Unfortunately, it is a possibility for people to forget some information, which is the main difference between humans and CR systems.

Consequently, we can conclude that the learning is at the core of any intelligent system including human as biological system and CR as artificial intelligence system. The knowledge is used to achieve certain goals both in humans and in cognitive radio.

Finally, the principles of learning theories, behaviourism, cognitivism and constructivism, can be used as guidelines to select tools, techniques and strategies that promote learning in education. When teacher decides which strategies to use, it is important to consider the level of knowledge of the students, the its thought

processing demands, and the desired outcomes like generation of new ideas or a only a single answer.

References

Abbas, N., Nasser, Y., & El Ahmad, K. (2015). Recent advances on artificial intelligence and learning techniques in cognitive radio networks. *EURASIP Journal on Wireless Communications and Networking, 2015 (1),* 174.

Bkassiny, M., Li, Y., & Jayaweera, S. K. (2013). A survey on machine-learning techniques in cognitive radios. *IEEE Communications Surveys & Tutorials*, *15* (3), 1136-1159.

Federal Communications Comission (FCC) (2005). ET Docket No 03-108: Facilitating opportunities for flexible, efficient, and reliable spectrum use employing cognitive radio technologies.

Ginsburg, H. P., & Opper, S. (1988). *Piaget's theory of intellectual development*. Prentice-Hall, Inc.

Gross, R. (2015). *Psychology: The science of mind and behaviour 7th edition*. Hodder Education.

Huitt, W. (2003). The information processing approach to cognition. *Educational psychology interactive*, *3* (2), 53-67.

Khattab, A., Perkins, D., & Bayoumi, M. (2012). *Cognitive radio networks: from theory to practice*. Springer Science & Business Media.

Mitola Iii, J. (2001). Cognitive radio for flexible mobile multimedia communications. *Mobile Networks and Applications*, *6* (5), 435-441.

Mitola, J. (2000). Cognitive radio---an integrated agent architecture for software defined radio.

Mitola, J., & Maguire, G. Q. (1999). Cognitive radio: making software radios more personal. *IEEE personal communications*, *6* (4), 13-18.

Poole, D., Mackworth, A., & Goebel, R. (1998). Computational intelligence: a logical approach.

Samuel, A. L. (1959). Some studies in machine learning using the game of checkers. *IBM Journal of research and development*, *3* (3), 210-229.

Thilina, K. M., Choi, K. W., Saquib, N., & Hossain, E. (2013). Machine learning techniques for cooperative spectrum sensing in cognitive radio networks. *IEEE Journal on selected areas in communications*, *31* (11), 2209-2221.

Tirri, K., & Nokelainen, P. (2012). *Measuring multiple intelligences and moral sensitivities in education, Vol. 5*. Springer Science & Business Media.

SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume V, May 25th-26th, 2018. 475-483

APPROACHES AND SOLUTIONS FOR SIGN LANGUAGE RECOGNITION PROBLEM

Aleksejs Zorins

Pēteris Grabusts
Rezekne Academy of Technology, Latvia

Abstract*. The goal of the paper is reviewing several aspects of Sign Language Recognition problems focusing on Artificial Neural Network approach. The lack of automated Latvian Sign Language has identified and proposals of how to develop such a system have made. The authors use analytical, statistical methods as well as practical experiments with neural network software. The main results of the paper are description of main Sign Language Recognition problem solving methods with Artificial Neural Networks and directions of future work based on authors' previous expertise.*
Keywords: *Sign language recognition, artificial neural networks, Latvian sign language.*

Introduction

One of very important people's communication components is a gesture (sign language), which allows expressing emotions and provides comprehensible information in addition to spoken language. For hearing majority the gesture is an additional method for communication, for deaf community this is the only way to express themselves. Deaf people are being integrated into society through the sign language, the part of which is the representation of the national alphabet gestures.

There is a lack of computerized Latvian sign language recognition system and there is a strong necessity for it. The goal of the authors is to develop the recognition system of Latvian Sign Language based on Artificial Neural Networks (ANN) to help deaf people to integrate into society.

Numerous applications of Artificial Neural Networks (ANN) exist at the present time with different learning algorithms, topologies etc. It is strongly believed that ANN is built using human brain's functioning principles but still ANN is a tricky way for real problem solving, because in any application should be found answers to the following questions (Fausett, 1994):

Is the network complex enough to be capable to encode a solution?

Is it possible to find solution in a reasonable amount of time?

How can we guarantee that a trained network is matching closely enough our problem domain and hidden regularities in the data?

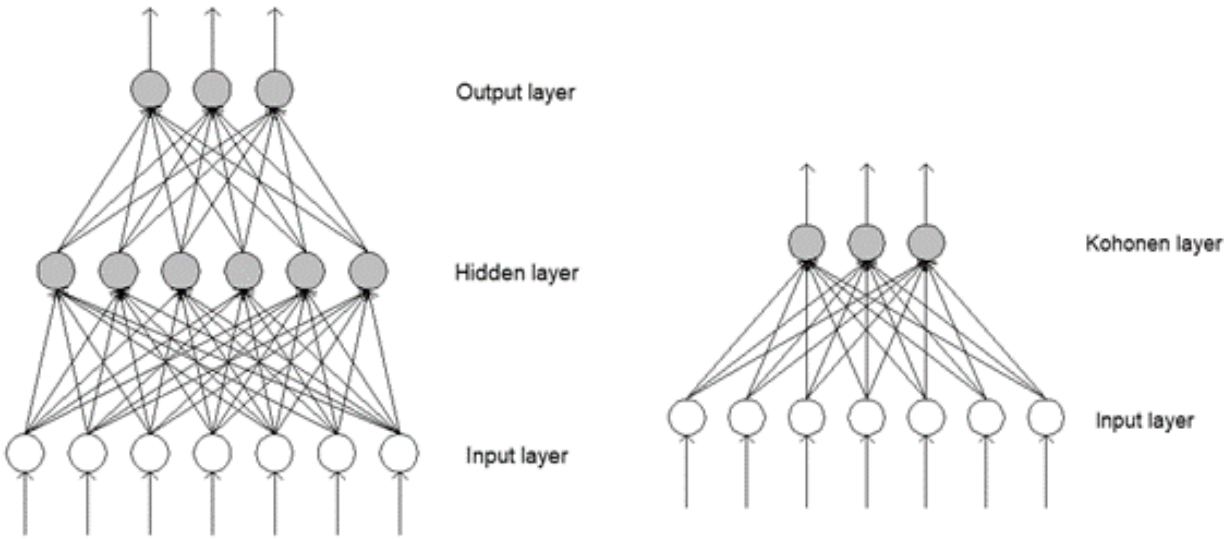
© Rēzeknes Tehnoloģiju akadēmija, 2018
http://dx.doi.org/10.17770/sie2018vol1.3082

In the recent years modern science advanced a lot in understanding human brain functions and structure (Cooper, 2011). Each learning algorithm and each network topology should be carefully developed to solve more or less complex problem in real life. One may say that almost each serious application requires its own network topology, algorithm and data pre-processing. The same case is connected with sign language recognition problem.

The Essence of Artificial Neural Network

A neural network is a set of interconnected simple processing elements, or neurones. Neural networks are potentially useful for studying the complex relationships between inputs and outputs of a system. There are two neural network models investigated in this research: backpropagation networks and Kohonen self-organizing maps.

A multilayer feed forward network with an appropriate pattern of weights can be used to model some mapping between sets of input and output variables. Figure 1a shows an example of feed forward network architecture, with three output units and one hidden layer, which can be trained using backpropagation. The shaded nodes in figure 1a are processing units. The arrows connecting input and hidden units and connecting hidden units and the output units represent weights.



a) Backpropagation network, **b) Kohonen self-organizing map**

Fig. 1. **The architecture of two types of networks.**

The backpropagation learning algorithm (Rojas, 1996) is formulated as a search in the space of the pattern of weights, *W*, in order to find an optimal configuration, *W**, which minimizes an error or cost function, *E(W)*. The pattern of weights will then determine how the network will respond to any arbitrary input. The error or cost function is defined by (1):

$$E = \frac{1}{2}\sum_{i}\sum_{p}(t_{ip} - o_{ip})^2 \tag{1}$$

This function compares an output value o_{ip} to a desired value tip over the set of *p* training vectors and i output units. The gradient descent method is used to search for the minimum of this error function through iterative updates:

$$W(k+1) = W(k) - \eta\nabla E \tag{2}$$

where η is the learning rate, and ∇E is an estimate of the gradient of *E* with respect to *W*.

The algorithm is recursive and consists of two phases: forward-propagation and backward-propagation. In the first phase, the input set of values is presented and propagated forward through the network to compute the output value for each unit. In the second phase, the total-squared error calculated in the first phase is propagated from the output units to the input units. During this process, the error signal is calculated recursively for each unit in the network and weight adjustments are determined at each level. These two phases are executed in each iteration of the backpropagation algorithm until the error function converges.

The main difference between them and conventional models is that the correct output cannot be defined a priori, and therefore a numerical measure of the magnitude of the mapping error cannot be used (Rojas, 1996). However, the learning process leads to the determination of well-defined network parameters for a given application.

The self-organizing networks assume a topological structure among the cluster units. This property is observed in the brain, but is not found in other artificial neural networks (Konar, 2005). There are m cluster units, arranged in a one- r two-dimensional array: the input signals are n-dimensional. Figure 1b shows architecture of a simple self-organizing network, which consists of input and Kohonen or clustering layer. The shadowed units in the figure 1b are processing units. This simplified network may cluster the data into three classes, but in the real problem domains one clustering unit for each class is not enough, therefore we should understand each Kohonen layer neurone in the Figure as a number of units (cluster of neurones).

When a self-organizing network is used, an input vector is presented at each step. These vectors constitute the "environment" of the network. Each new input produces an adaptation of the parameters. If such modifications are correctly controlled, the network can build a kind of internal representation of the environment.

Consider the problem of charting an n-dimensional space using a one-dimensional chain of Kohonen units (Fausett, 1994). The units are all arranged in sequence and are numbered from 1 to m (see figure 2).

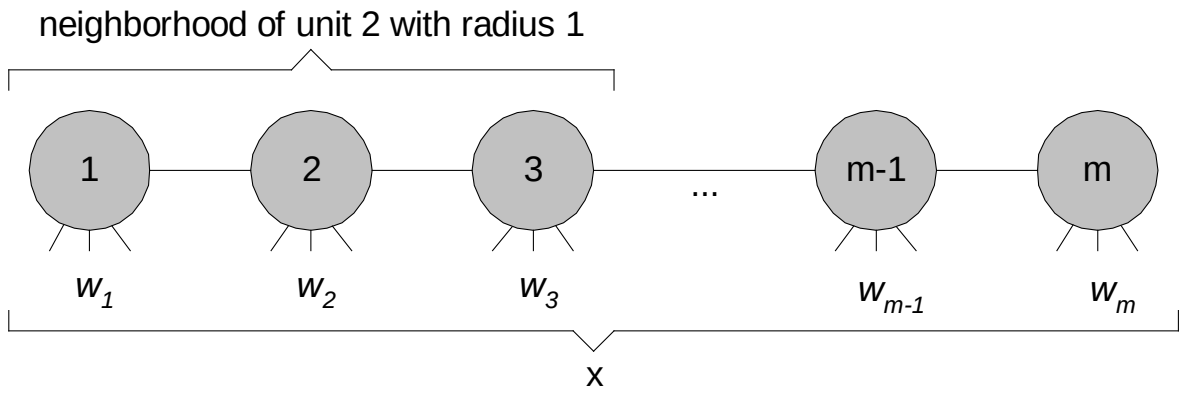


Fig. 2. **A one-dimensional lattice of computing units**

The *n*-dimensional weight vectors *w1, w2, …, w_m* are used for the computation. The objective of the charting process is that each unit learns to specialize on different regions of input space. When an input from such a region is fed into the network, the corresponding unit should compute the maximum excitation. Kohonen's learning algorithm is used to guarantee that this effect is achieved.

A Kohonen unit computes the Euclidian distance (the dot product metric can also be used) between an input *x* and its weight vector *w*. In the Kohonen one-dimensional network, the neighbourhood of radius 1 of a unit at the *k*-th position consists of the units at the positions *k-1* and *k+1*. Units at both ends of the chain have asymmetrical neighbourhoods. Kohonen learning uses a neighbourhood function ϕ, whose value $\phi(i, k)$ represents the strength of the coupling between unit *i* and unit *k* during the training process. The complete description of Kohonen learning algorithm can be found in (Rojas, 1996) and (Fausset, 1994).

Sign Language Recognition Task

Let us consider the sign language alphabet recognition task. These alphabets mainly consist of static signs; however, the Latvian sign language (LSL) additionally has several signs, which are shown in motion (see figure 3).

In Latvia there is a website of Latvian Deaf People Rehabilitation, which has a Sign Language Interpreters' Department. The main goal of this organization is to "facilitate the client's social integration, availability of necessary information and services, provide sign language interpreter's services for communication with other individuals and legal entities according to the client's perception and communication abilities" (*The Latvian Sign Language Development Department*).

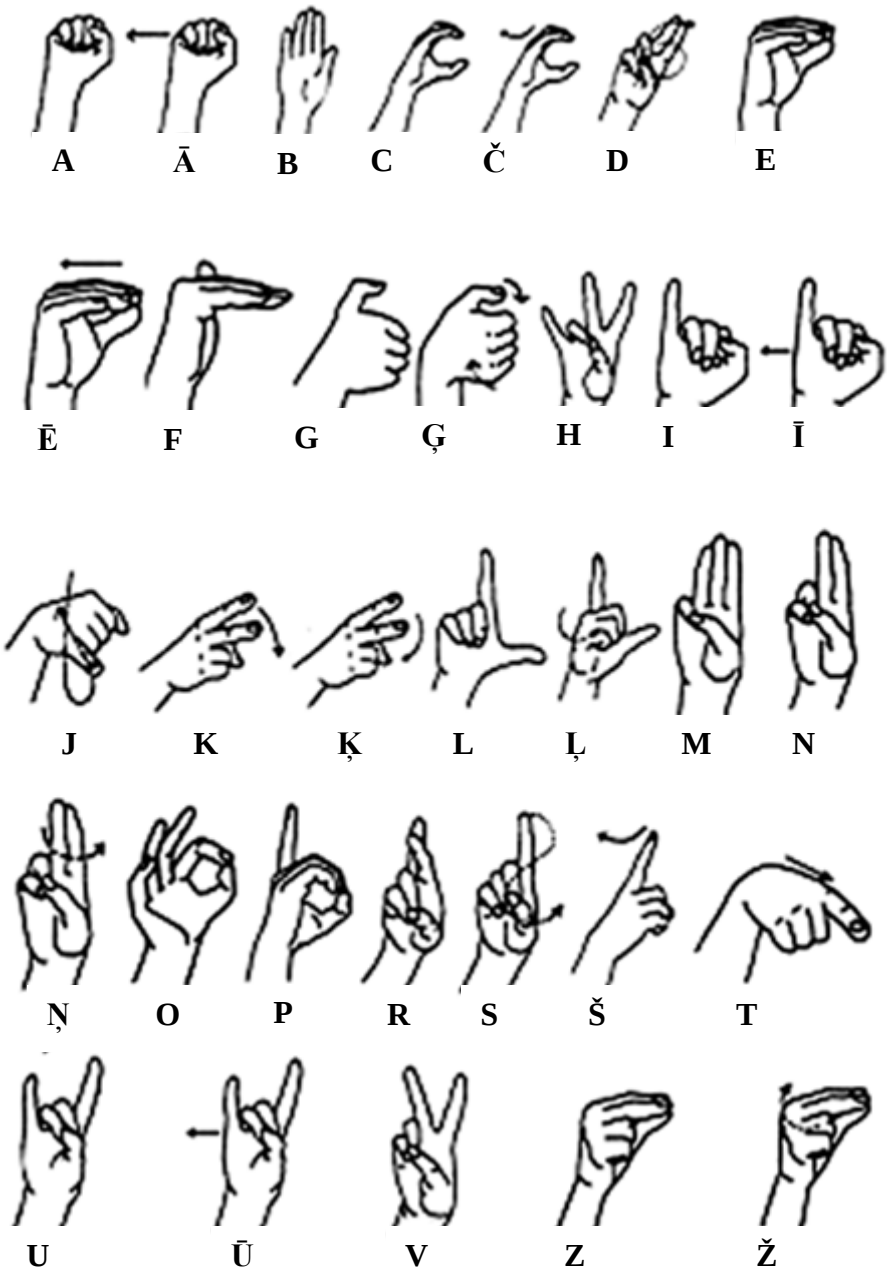


Fig. 3. **The symbols of Latvian sign language**
(*The Latvian Sign Language Development Department*)

There is still a lack of computerized LSL recognition in our country and that is why it is worth developing the recognition system of Latvian Sign Language based on Artificial Neural Networks (ANN) to help people in social rehabilitation and integration into society.

Scientific resources provide us a wide range of sign language recognition (SLR) methods, which could be classified using input data and sensor technology (Cooper, 2011):

- Using different hand markers;
- Specially developed data gloves;
- Infra-red sensor technology;
- Visual (video or photo) methods.

The last two methods allow recognizing the sign language in a real time, for example, through web cameras or Leap Motion technology, which price is now affordable. There is a large number of research works, using mathematical and statistical methods for SLR task and numerous applications with artificial neural networks, genetic algorithms, hidden Markov models etc.

Wide range of classification and recognition algorithms raises difficulties in choosing appropriate method for specific SLR task. The analysis of current situation in the field allows concluding that this issue is still in progress and no final solution has been proposed yet.

The situation is the same with different approaches for SLR in real time, using video streaming data.

Collection and proper pre-processing of the data is a crucial step for successful SLR problem solution. The most popular approach now is the use of web or video cameras due to affordable costs of hardware for this application (Cooper, 2011). The data glove technology has several disadvantages – the low cost gloves provide little information about the gesture while the more precise ones are more expensive, for instance, Myo Gesture Control Armband is two times more expensive than LeapMotion controller. There are also some difficulties with putting on and off this device, which may not be appropriate for fast and easy use in public facilities and organizations.

It should be concluded that the most perspective technologies now are video streaming information for real time language processing, the static pictures for an alphabet only (not appropriate for Latvian alphabet thou) and the LeapMotion technology, which is the most affordable device on the market today. The authors of the paper have not found any information on using LeapMotion for SLR task; therefore, it is one of the most perspective future research directions.

Artificial Neural Network Approaches for Sign Language Recognition

After a proper data preparation the neural network has been trained on the test samples of signs and then this trained network is used for earlier unknown data recognition.

Dogic and Karli have used back-propagation training algorithm with sigmoid activation function and two hidden layers. Their ANN has 15 input neurons and 90 training samples. As a result they obtained 84 % correctly classified patterns with a 40 neurons in a hidden layer (Dogis, 2014).

Byeongkeun Kang used Convolutional Neural Networks consisting of 5 convolution layers, 3 max-pooling layers, and 3 fully connected layers (Kang, 2015). The author extracted 4096-dimensional feature vector and trained the network with 5 different settings and achieved very impressive 99 % correctly classified cases.

Mekala has used combinational ANN which is based on the cache search memory concept of a CPU hen all blocks of a system have dual information exchange bus (Mekala, 2011; Mekala, 2013). The recognition part is also based on error back-propagation ANN. The algorithm detects all letters from A to Z with 100 % accuracy.

Another interesting approach is Modular Neural Networks presented in (Zorins, 2009). An important advantage of modular approach is an improvement of generalization (ability to perform well on the test data) due to decomposition of complex function into simpler ones. The modular neural networks have been proposed to solve this problem. The main idea is a natural decomposition of a function of large complexity into simple functions and realization of each function by a separate neural network (Rojas, 1996).

There are other options to use in recognition part. The authors are going to implement their own ANN learning algorithms and architectures developed earlier.

One of these examples could be Kohonen “freezing” learning algorithm (Zorins, 2007). The standard Kohonen self-organizing maps may be trained in unsupervised (in most cases) and in supervised manner. This type of network uses grid of neurons or a topological structure among the cluster units. The modified “freezing” algorithm developed by the author allows splitting network learning process into some stages, when each part of the network is trained individually. The algorithm flowchart is shown in figure 4.

In the first learning phase, neural network is split into number of clusters of neurons, where each of the clusters is associated with dataset class. In this way, we obtain training with teacher. In the second stage, each cluster is trained accordingly to standard Kohonen learning algorithm. Each of neuron clusters is trained individually, while others are “frozen” and do not take part in the training.

After completion of individual cluster training the network is “de-frozen” and learning process ends.

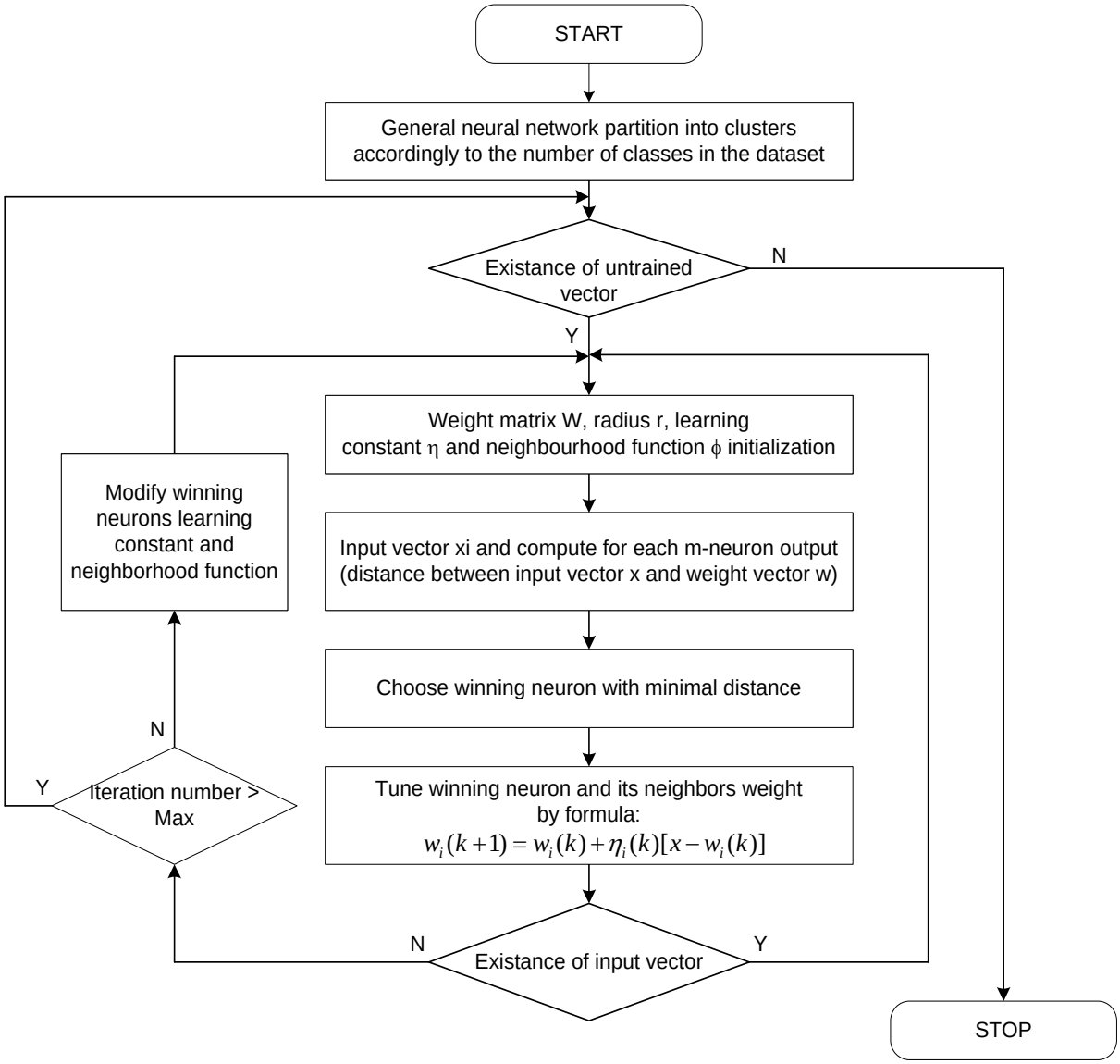


Fig. 4. **Kohonen neural network “freezing” learning algorithm flowchart**

Conclusions

There is a number of successful sign language recognition applications using Artificial Neural Networks, however, not for Latvian sign language. The goal of the authors is to develop Latvian Sign Language recognition system based on artificial neural networks. In order to do that it necessary to:

- Develop a database of Latvian sign language using infra-red sensor technology;

- Develop and implement appropriate data pre-processing method;
- Analyze, choose and implement the most appropriate Artificial Neural Network architecture and training algorithm for the sign language recognition task;
- Design software for Latvian deaf community.

We are in the beginning of our research hoping to help people with special needs to integrate into society and advance in a very interesting field of Artificial Intelligence.

References

Cooper, H., Holt, B., & Bowden, R. (2011). *Sign Language Recognition, Chapter in Visual Analysis of Humans*: Looking at People, Springer.

Dogic, S., & Karli, G. (2014). Sign Language Recognition using Neural Networks. *TEM Journal 3* (4), 296-301.

Fausett, L. (1994). *Fundamentals of Neural Networks. Architectures, algorithms and applications*, Prentice Hall.

Kang, B., Tripathi, S., & Nguyen, T. (2015). Real-time Sign Language Fingerspelling Recognition using Convolutional Neural Networks from Depth map. In: *3rd IAPR Asian Conference on Pattern Recognition, Kuala Lumpur, Malaysia.*

Konar, A. (2005). *Computational intelligence: principles, techniques and applications*. - Springer-Verlag, London.

Mekala, P. etc. (2013). Gesture Recognition Using Neural Networks Based on HW/SW Cosimulation Platform. *Advances in Software Engineering, Volume 2013.*

Mekala, P. etc. (2011). Real-time Sign Language Recognition based on Neural Network Architecture. *IEEE 43rd Southeastern Symposium on System Theory*, 195-199.

Rojas, R. (1996). *Neural networks. A systematic approach*, Springer, Berlin.

The Latvian Sign Language Development Department. Retrieved from http://rc.lns.lv/index.php.

Zorins, A. (2007). *Improvement possibilities of interval value prediction using Kohonen neural networks. Riga Technical University conference proceedings, Vol. 31,* 8.-16.

Zorins, A. (2009). Retail turnover prediction using modular artificial neural networks. *Proceedings of 7th International Scientific Practical Conference "Environment. Technology. Resources"*, Rezekne, Latvia.