

DIGITAL PEDAGOGICAL COMPETENCIES OF PHYSICAL EDUCATION TEACHERS

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Abstract. *The global COVID-19 pandemic has changed the education system. The use of modern information technologies in the educational process and the introduction of distance learning are becoming more and more relevant. These requirements began to apply to academic disciplines, which a priori are difficult to teach online, in a quarantine situation. Physical education is such a discipline. Requirements for teachers are increasing. The teacher must have digital pedagogical competencies in order to successfully teach this academic discipline in modern conditions.*

The purpose of this pilot study was to determine the level of formation of digital pedagogical competencies among physical education teachers working in institutions of higher and secondary vocational education. The research is based on the European model Digital Competence of Educators (DIGCOMPEDU). A questionnaire for identifying the formation of digital pedagogical competencies was developed on the basis of this model and tested in this study. Teachers were asked to assess, on a 5-point scale, the level of skills and experience in the application of information technologies in the educational process and in the organization of distance learning, as well as to provide specific resources with which they work.

44 teachers of physical education from Pskov State University, College of Pskov State University and Velikie Luki State Academy of Physical Culture and Sports took part in this study. It was found that most of all physical culture teachers have formed the ability to work with search engines and knowledge in the field of information security. The skills to produce and use video and graphics content are the least developed. Also an important problem is the lack of experience in the implementation of distance learning among physical education teachers.

Groups of teachers with different levels of formation of digital pedagogical competencies were identified using cluster analysis. Five such levels have been identified.

The conducted research determines the problem that physical education teachers lack competence in the field of information technologies and their implementation in the educational process even with a mixed form of education (full-time form with elements of distance learning).

Keywords: *Digital Competence of Educators (DIGCOMPEDU), digital pedagogical competencies, distance learning, pandemic, physical education, teaching.*

Introduction

Digitalization is the most important characteristic of the development of modern society. Digital technologies are entering all spheres of life rapidly. Education is a sphere that is also being transformed under the influence of modern information technologies. The COVID-19 pandemic is a critical moment in this process. All academic disciplines are taught distance or mixed during a pandemic. The need to conduct classes online has also affected physical education. The teachers faced a big problem of translating the lessons in the gym into lessons conducted through video conferencing and distance learning systems. The teacher must have digital pedagogical competencies in such a situation.

The aim of the study is to identify the level of formation of digital pedagogical competencies among physical education teachers working in institutions of higher and secondary vocational education.

The research aims to find answers to the following questions:

What is the level of formation of digital pedagogical competencies among modern teachers of physical education?

Are there significant differences in the level of formation of digital pedagogical competencies among teachers with different experience in teaching the discipline "Physical Education"?

The questionnaire method and methods of mathematical and statistical data processing (frequency, cluster, and factor analysis) were used to solve the tasks.

The obtained results are interesting, as they show the weakest spots in the development of digital pedagogical competencies among physical education teachers.

Literature Review

The problem of digital competence and, in particular, digital pedagogical competencies is relevant for modern psychological and pedagogical research, in connection with the transformation of the education system and the introduction of digital technologies into the educational process.

K.V.P. Pérez, O.M. Torelló point out that the analysis of the European Higher Education Area allows formulating a new educational paradigm. It reflects fundamental changes in the professional tasks of teachers of institutions of higher professional education. These changes are expressed in the fact that teachers need not only to master and implement modern information technologies in the educational process, but also to adapt their professional and personal profile, forming digital pedagogical competence (Pérez & Torelló, 2011).

J. From defines digital pedagogical competence as the ability to consistently apply the attitudes, knowledge and skills required for planning and behavior, as

well as for assessing and revising on an ongoing basis information and communication technology learning based on theory, ongoing research and proven experience with a view to support student learning in the best possible way (From, 2017). The author emphasizes that digital pedagogical competence is not limited to a simple set of knowledge and skills in the field of information and communication technologies. It also includes the ability to incorporate these technologies into the educational process without prejudice to its implementation.

According to research by I. Ryhtä et al., competencies in digital pedagogy include pedagogical, digital and ethical skills and awareness (Ryhtä et al., 2020).

S. Santoveña-Casal, M. Dolores Fernández Pérez emphasizes the importance of preserving the social component in the implementation of digital technologies in education, which is based on maintaining personal interaction between the teacher and students. Only a distance learning model, devoid of interpersonal contacts, can hinder the perception of students of current knowledge and the development of joint competencies, in contrast to a more interactive model (Santoveña-Casal & Pérez, 2020).

Studies show that modern teachers find it difficult to self-assess the level of formation of digital pedagogical competencies, although they have experience in implementing elements of distance learning (Tomczyk, 2020).

The European Digital Competence of Educators (DIGCOMPEDU) model is the basis for this study (Redecker & Punie, 2017). According to this model, digital pedagogical competences include the following skills and abilities:

- Skills in the field of digital resources (selection, creation, modification, management and protection of digital resources).
- Skills in the application of digital technologies in the teaching process (teaching, mentoring, reflective practices, independent learning management).
- Assessment skills in education (assessment strategies, evidence analysis, feedback, planning).
- Skill in student empowerment (accessibility, inclusiveness, personalization, engagement).

Thus, digital pedagogical competence requires from the teacher not only the possession of modern information technologies, but also the possession of strategies for their implementation in the teaching process, which would contribute to the effective assimilation of educational material and the all-round development of the student's personality and the teacher himself.

Methodology

The questionnaire was developed to diagnose the formation of digital pedagogical competencies among physical education teachers based on the DIGCOMPEDU model. The questionnaire includes two sections. The first section contains a list of various knowledge and skills in the field of digital technology applications in the educational process. Physical education teachers had to assess this knowledge and skills on a 5-point scale, depending on the level of their formation. The first section of the questionnaire contains 26 questions.

Teachers were asked to indicate specific digital resources that they use at various stages of the educational process in the second section of the questionnaire (stages of developing educational content, assessment and feedback, implementation of distance learning, including in the discipline "physical education"). The second section of the questionnaire contains 24 questions. The content analysis method was used to process the results for the second section of the questionnaire.

Several statistical reliability testing procedures were carried out during the development of the questionnaire:

Internal consistency check: Alpha-Cronbach coefficient is 0.760.

Reliability of the equivalent halves of the test: the correlation coefficient between the total scores on even and odd questions is 0.892 at a significance level of 0.000.

The substantive validity of the questionnaire was assessed by the method of an expert survey (experts: 2 employees of the chair of Psychology and Child Development Support, Pskov State University, PhD, with more than 250 hours of advanced training on the use of digital technologies in education). The experts made minor adjustments to the text of the questionnaire, which were taken into account in its further development.

Determination of the internal structure using factor analysis.

Mathematical and statistical data processing consisted of frequency analysis to determine the level of formation of individual knowledge and skills, as well as cluster analysis to identify groups of teachers with different levels of formation of digital pedagogical competence.

Physical education teachers of Pskov State University, College of Pskov State University and Velikie Luki State Academy of Physical Education and Sports took part in the study in the amount of 44 people. The respondents' pedagogical experience in teaching physical education ranges from 8 to 30 years (They are divided into two groups for comparison: 18 people with experience from 8 to 19 years; 26 people with experience of 20-30 years).

Research Results

Four factors were identified (factor analysis described 81% of the variance) based on the results of the first part of the questionnaire. These factors describe the digital pedagogical competencies that are most significant for physical education teachers:

Factor 1 (factor described 32% of the variance): "Competence in the use of digital technologies in organizing communication with students" includes the following indicators: "experience in using graphic material in the process of lectures and practical classes in an online environment" (.859), "experience in organizing an individual approach to students in a distance learning environment" (.855), "the ability to use graphic material in the development of classes in an online environment" (.848), "experience in the use of techniques and means of increasing the cognitive interest and activity of students in the process of distance learning" (.820), "experience in providing information safety in the process of distance learning" (.778), "knowledge about the possibilities of organizing an individual approach to students in a distance learning environment" (.770), "knowledge of techniques and means of increasing the cognitive interest and activity of students in the process of distance learning" (.762), "knowledge in the field of information security" (.741), "knowledge of online resources, allowing to organize joint work of students in an online lesson" (.700), "experience in organizing joint work of students in a lesson through online resources" (.664), "knowledge in the field of opportunities for organizing feedback from students in a distance learning environment" (.620), "experience in organizing communication with learners in an online environment" (.619), "experience in organizing feedback from learners in a distance learning environment" (.497), "ability to organize communication with learners in an online environment" (.423).

Factor 2 (factor describes 24% of the variance): "Competence in the development and implementation of distance learning." The factor includes the following indicators: "experience in implementing online courses" (.833), "experience in the development and application of assessment systems in an online environment" (.801), "skills in the development of assessment systems in an online environment" (.793), "experience implementation of distance learning in its pure form" (.783), "ability to develop an online course" (.669), "knowledge in the field of platforms for the development and implementation of online courses" (.633).

Factor 3 (factor describes 18% of the variance): "Competence in the field of technically complex content creation". The factor includes the following indicators: "the ability to create video content for a lecture or practical lesson"

(.903), "experience in developing and using video content for lectures or practical classes" (.878), "the ability to develop a knowledge control test in an online environment" (.659), "experience of testing students in an online environment" (.614).

Factor 4 (factor describes 7% of variance): "Competence in the field of information retrieval." The factor includes the following variables: "knowledge of online resources for information retrieval" (.921), "ability to use information resources to find information" (.917).

Table 1 shows the percentage distribution of physical education teachers by the levels of formation of these competencies.

Table 1 Percentage Distribution of Physical Education Teachers by Levels of Formation of Digital Pedagogical Competencies

№	Indicators of digital pedagogical competence	High level	Above average level	Average level	Below average level	Low level
1	Competence in the use of digital technologies in organizing communication with students	23	5	36	22	14
2	Competence in the development and implementation of distance learning	2	8	63	18	9
3	Competence in creating technically complex content	30	4	35	17	14
4	Information retrieval competencies	14	18	41	13	14

n=44

The average level of severity of all competencies prevails among teachers of physical education. But it should be noted that 22% of teachers have a below average level and 14% have a low level of severity of competence in the use of digital technologies in the field of organizing communication with students. Such teachers have difficulties in creating the social side of distance learning, namely: in providing feedback, implementing an individual approach, increasing the activity and cognitive interest of students, as well as conducting seminars that require discussion.

31% of teachers (17% - below average of severity of the variable and 14% - low level of severity of the variable) have insufficiently formed competence in the field of technically complex content creation. This means that they do not know how to create video materials and tests. Although it should be noted that 30% of respondents have a high level of development of this competence.

Consequently, they have the knowledge and skills in the technical ability to record of instructional videos and also have experience in developing video lectures.

Ability to use information resources to search for information (27.3% of teachers have a high level of severity of a variable), knowledge of online resources to search for information (18.2% - high level of severity of the variable) and knowledge in the field of information security (18.2% - high level of severity of the variable) are the most developed among individual knowledge and skills within the framework of these competencies among teachers of physical education. The knowledge and skills that teachers are not sufficiently developed are experience in implementing online courses (31.8% - below average level of severity of the variable, 22.7% - low level of severity of the variable), experience in developing video content (36.4% - below average level of severity of the variable, 22, 7% - low level of severity of the variable); knowledge of teamwork resources (31.8% - below average of severity of the variable, 22.7% - low of severity of the variable), experience in organizing collaboration (36.4% - low of severity of the variable), experience in organizing feedback (27.3% - below average of severity of the variable, 22.7% - low level of severity of the variable), experience of using graphic material (45.5% - below average of severity of the variable, 27.3% - low level of severity of the variable). Based on the analysis of the results, it can be concluded that teachers have insufficient experience in using modern digital technologies in the educational process, although their knowledge and skills in this area are moderately formed.

The following results were obtained by analyzing specific digital resources that teachers use in the educational process:

- LMS Moodle and Stepik are the leading educational platforms where physical educators deliver distance learning.
- Zoom, Skype, Discord are the leading platforms for video lectures and webinars.
- The greatest difficulties for teachers arise in the situation of the need to organize an inclusive approach and adaptive physical education in a distance form. 54% of teachers do not know what technologies they can be used in this case.

Groups of teachers with different levels of formation of digital pedagogical competencies were identified using cluster analysis. There are 5 groups of teachers:

The first group of teachers (14% of the total sample size) is teachers with a low level of severity of digital pedagogical competence formation. This group has a low and below average level of severity in almost all knowledge and skills. They have the least development of such skills as the ability to organize communication with students in an online environment (-1.48), knowledge in the field of

opportunities for organizing feedback from students in a distance learning environment (-1.34) and experience in organizing feedback from students in a distance learning environment (-1.33). Therefore, the weakest side of these teachers is the preservation of the social side of the educational process when using digital technologies.

The second group of teachers (8% of the total sample size) is teachers have moderately developed digital pedagogical competencies, but lack distance learning experience. These teachers know how to design distance learning courses, have the skills to create video content (1.33) and develop tests (.95), have knowledge of search engines (1.08), but do not have real experience in implementing distance learning ("knowledge of platforms for the development and implementation of online courses "(-1.34)," experience in the implementation of distance learning in its pure form "(-1.38)," the experience of organizing the joint work of students in the classroom through online resources "(-1.35)," the experience of organizing individual approach to students in a distance learning environment "(-1.38)," the ability to develop an online course "(-.97)). Consequently, the weak side of these teachers is the lack of experience in the use of digital technologies in the educational process.

The third group of teachers (50% of the total sample size) is teachers with an average level of severity of digital pedagogical competencies. These teachers have an average level of severity of all knowledge and skills. Test design skills are at a slightly below average level (-.52). Such teachers in general can apply digital technologies in education successfully.

The fourth group of teachers (14% of the total sample size) is teachers with a higher than average level of formation of digital pedagogical competencies. These teachers are best at organizing communication with students in an online environment (1.09), experience in testing students in an online environment (1.03), and experience in implementing online courses (1.24). Other knowledge and skills are expressed at the level above the average and average level. The weak side of these teachers is the lack of knowledge in the field of information security (-.25).

Fifth group of teachers (14% of the total sample size) is teachers with a high level of formation of digital pedagogical competencies. Almost all knowledge and skills are formed at a high level. Experience in using graphic material in the process of lectures and practical classes in an online environment (1.98), experience in using techniques and means of increasing the cognitive interest and activity of students in the process of distance learning (1.86), knowledge of the possibilities of organizing an individual approach to students in a distance learning environment (1.84) are the skills that are best formed. These teachers successfully use digital technologies in the educational process.

Significant differences were highlighted in the formation of competence in the field of experience in the development and implementation of distance learning between physical education teachers with different teaching experience ($U=444$; $p=.000$). It was found that teachers with work experience from 20 to 30 years (average rank is 30.58) have a higher level of formation of this competence, in contrast to teachers with work experience from 8 to 19 years (average rank is 10.83). Perhaps this is due to the fact that the introduction of distance learning in the teaching of physical education began only in February 2020 with the onset of the COVID-19 pandemic. Teachers who have more experience were more motivated in this situation. Conducting a small clarifying survey with these teachers allowed us to identify options for explaining the following results: “fear of losing a job”, “ashamed to lag behind young people”, “habit of working continuously and responsibly”. Thus, the main motives for more experienced teachers to master and use digital technologies are competition with younger employees and the desire to keep jobs.

Thus, as a result of this study, four types of digital pedagogical competencies were identified that are significant for physical education teachers; identified five groups of teachers with different levels of formation of these competencies; a comparative analysis of the formation of knowledge and skills in the field of digital technologies among teachers with different work experience was carried out.

Conclusions

It was found that four types of digital pedagogical competencies are characteristic of physical education teachers: competence in the use of digital technologies in organizing communication with students, competence in the development and implementation of distance learning, competence in the creation of technically complex content, competence in the field of information retrieval. There are teachers with a low and below average level of formation of these competencies, despite the prevalence of the middle level. So a significant part of teachers have difficulties in the situation of the need to develop technically complex content (videos, tests), as well as the organization of communication with students in a distance learning environment. The ability to using of information resources to search for information and knowledge in the field of information security are the best formed.

Five groups of teachers with different levels of formation of digital pedagogical competencies were identified: 1 - teachers with a low level of formation of digital pedagogical competencies; 2 - teachers who do not have distance learning experience, but have moderately developed competencies;

3 - teachers with an average level of digital pedagogical competence formation;
4 - teachers with a higher than average level of formation of digital pedagogical competencies; 5 - teachers with a high level of digital pedagogical competence formation.

It was revealed that teachers with work experience from 20 to 30 years have more experience in the development and implementation of distance learning compared to teachers with work experience from 8 to 19 years.

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