

ICT SCAFFOLDING FOR SCHOOL EDUCATION IN COVID-19 LOCKDOWN

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Abstract. *The COVID-19 situation, where the educational process had to be as flexible as possible, revealed that the use of information and communication technologies (ICT) has become a challenge for Lithuanian schools. In early 2021, we conducted focus group discussions in four Lithuanian schools to investigate how educational technology can enable an inclusive educational process. The analysis of the key determinants of pedagogical success and schools' decisions on the unified use of ICT to include all students in learning, the scaffolding of the educational process using ICT revealed the two main factors. These factors ensuring the scaffolding process are: (1) how teachers remove the learning barriers and support students by use of educational technologies; (2) what helps teachers to transfer responsibility to students and enables their participation in the educational process. When we examined the potential of ICT to engage students, we found several differences between schools, namely: technology provision, the teachers' ICT skills, the experience of the school community itself, the readiness of the school, teachers, and students to teach and to learn by distance or blended learning applying new ICT-based educational scenarios. The study results showed that the gains made during the COVID-19 lockdown in Lithuania in combining teaching solutions with the use of technology can become the 'new normal' and can help schools address the issue of inclusion for all students.*

Keywords: *ICT for scaffolding; new educational technologies; school education during COVID-19 breakout; students' inclusion.*

Introduction

Scaffolding could be defined as the support provided by teachers, parents, peers, computer technology, and other internet media to enable learners to participate meaningfully and to acquire the theoretical knowledge and practical skills to perform educational tasks that would be difficult to complete without additional support (Belland, 2014), and gradually to transfer responsibility for learning to the student (Ersani, Suwastini, & Artini, 2021). ICT research during the COVID-19 lockdown has developed in two main directions: (1) the readiness of teachers to work remotely, the desire for work-life balance, the social, psychological, and technological challenges in education; (2) the transition of

schools from face-to-face to distance education, the change in the teaching process, the educational strategies based on a distance or blended learning models, and the challenges of using ICT in the educational process. The research on teachers' readiness to use ICT in the classroom has mostly applied a technological-pedagogical framework of content knowledge (Adipat, 2021; Mishra & Koehler, 2006). This framework explains how the teacher builds the essential knowledge needed to integrate technology into the teaching process and draws attention to this complex, multidimensional, and situational nature of knowledge. According to Mishra and Koehler (2006), the deliberate use of educational technologies (including ICTs and smart environments) requires the mastery of complex and integrated technological-pedagogical, content knowledge, and practical skills. Suryani et al. (2021) analyzed the transition of schools from face-to-face to distance learning. Their studies of science lessons in *Google Classroom* environments showed that students' learning outcomes improve, when blended (or hybrid) learning is possible. These authors stated that *Google Classroom* could be an excellent tool for extending the learning process in STEAM and other subjects. Yu (2021), extending and complementing the results of Suryani et al. (2021), analyzed student-to-student communication, participation in virtual communities, and collaborative learning. The author found that the various tools and capabilities of virtual learning environments help students to understand the lesson material. Moreover, they help to receive full support from the teacher and other members of the group as well as from their classmates. Goodyear (2020) stressed that 'students often play an active role in adapting the learning spaces, tools, and tasks that have been designed for them, to better match their requirements. This highlights that the design of learning space is more complex and its consequences less predictable'.

In our study, we analyzed how schools and teachers used scaffolding techniques to support their students during and after the COVID-19 lockdown, how ICT was used to provide such support and engage all the students in the learning process. This research was a part of the scientific project '*Emotional and educational difficulties pupils encounter under the conditions of inclusive education and coping with them: context of COVID-19*' (Project Reg. No. P-DNR-21-13). The research was conducted at Vytautas Magnus University and was funded by the Research Council of Lithuania in 2021.

Methodology

We conducted focus group interviews (Bitinas, 2013; Vaughn, Schumm, & Sinagub, 1996; Krueger et al., 2001) between March and May 2021, in four schools. The schools were selected as more experienced in application of ICT in urban and rural areas of Lithuania. The aim of this research was to find out how

educational technology could help to ensure an inclusive education process and could be used as scaffolding tool during and after the lockdown.

The number of subject teachers participated in the study, varied between 7 to 12 in the schools. These teachers work with students in grades 5-8. A school principal, a school psychologist, and a social pedagogue as this research participants took part in the one focus group interview. Seeking to identify the willingness of teachers and schools to work remotely and decisions to support all students in their learning, we raised the following research questions: *What processes foster ICT scaffolding during the COVID-19 lockdown? What educational solutions teachers and schools have made in the use of ICT to help all students, whether they are high achievers or those with learning and emotional difficulties, to succeed in their learning?*

The focus group interviews were recorded, transcribed, anonymized, and analyzed using a methodology of qualitative content analysis (Hsieh & Shannon, 2005). The qualitative data analysis procedures were carried out, subcategories and categories were identified, and the study was validated by presenting the results to the participants and their school representatives.

Findings: the activities fostering the process of scaffolding

The qualitative content analysis showed that lessons to combine technology and pedagogical solutions learned during the COVID-19 lockdown, could become the “new normal” and help teachers and schools to address the issue of students’ inclusion. The findings of qualitative content analysis – as solutions for teachers and schools how to apply ICT in a unified way in the distance, blended or hybrid education presented in Table 1.

Table 1 Teacher and school solutions to increase all the student’s participation in learning (created by the authors)

CATEGORIES. Fostering the process of scaffolding	SUBCATEGORIES. Solutions of teacher and school
Teaching activities removing learning barriers through ICT	<ul style="list-style-type: none"> • Selecting digital tools for different teaching/learning activities; • Reducing barriers through the use and complementation of ICT in the educational processes; • Scaffolding for students with special needs to learn in virtual environments; • Differentiated ICT-based educational process.
Students’ engagement through ICT	<ul style="list-style-type: none"> • Developing inclusive ICT-based educational activities; • Promoting self-regulated learning with ICT; • Fostering creativity through ICT.

The analysis of the potential of ICT to enable students with learning or emotional difficulties to participate in learning in different schools revealed variety in the use of technology and the school community's experience of distance or blended learning. The qualitative content analysis revealed also active use of digital learning platforms and different kinds of other tools during the COVID-19 lockdown.

Category: Teaching activities removing learning barriers through ICT

The category *Teaching activities removing learning barriers through ICT* consist of four subcategories (see Table 1). In this section below, we will present each subcategory.

Selecting digital tools for different teaching/learning activities

The findings showed that teachers easily identified ICT-based learning activities that could help to increase student's engagement and participation in learning:

"... I use [various apps] in my lessons a lot, for example, 'Padlet' is a very handy app for lesson reflection." (GD-10-7Mok)

The teachers used universal educational solutions to develop reflection, questioning, repetition, and question selection activities. The research participants used digital platforms when they asked students to check mistakes visually. The teachers noted that the use of visual aids to discuss students' work had a greater effect than oral analysis of the same tasks. The participants reflected that virtual platforms and online learning environments, such as *Moodle*, *Google Classroom*, or *Microsoft Teams*, could offer more versatile activities and opportunities for teaching:

"The possibilities in Moodle tests are huge. You can set it up so that the child can immediately check if he/she got it right." (GD-19-2Mok)

According to the participants, various digital applications support the development of different subjects or subject groups:

"Mosaic. These are lessons in 3D format. It's very interesting, and you could find a lot of interesting materials not only in English but also in Lithuanian." (GD-10-7Mok)

In addition to universal solutions suitable for any subject, teachers often use a range of ICT-specific teaching tools for specific subject:

"As an English language teacher, I liked 'Liveworksheets'. It's a little app that has a huge treasure trove of ready-made exercises. And, as a teacher, I create my tasks there. I assign them mostly on self-directed learning days. <...> The app itself allows the child to solve

the tasks and then check them. The correct answers are given and the grade is written, so the children can see the grade immediately." (GD-10-7Mok)

The foreign language teachers found applications that they believe make classroom activities more engaging:

"You have to start working with all sorts of apps, educational programs, and environments. Because you must do something. Especially in the (German) subject that I teach. The specifics of the subject require you to hear how the child speaks, what he/she has learned, to hear his/her pronunciation. To limit yourself to the lecture when the cameras are off, and the sounds are turned down is difficult. Then you look for some playful ways to get children to learn words, to learn how to say something, an art, a foreign language, over a distance." (GD-5-1Mok)

"To find ways to make it easier and more fun for your children, you explore the whole web, find apps you like, and adapt them to your lessons. Teams environment, Zoom environment, Qizzlett app for learning words, 'Mentimeter' for doing different surveys, Socrative environment for tests - there is a lot of stuff out there, and I can go on and on." (GD-5-1Mok)

Apps for data and text visualization, audio, and play activities also helped teachers to engage students to participate in the learning process. For example, history teachers provided teaching materials and popular science information in a variety of formats. In addition to visual learning aids, audio recordings were also used to give students a break from screens:

"There are a lot of recorded lessons and books. I used to suggest to the children that if they got tired of reading, they could listen to e-books before going to bed. I always told them to listen to e-books. There are special English language e-texts. These texts are divided into levels. The child could read the text and at the same time there is an audio recording attached to the text." (GD-19-6Mok)

These are just a one of the examples of sensory scaffolding identified by our research participants-teachers.

Reducing barriers through the use and the complementation of ICT in the educational processes

The study showed that teachers engaged students with learning and emotional difficulties, special education needs (SEN) students with apps that enable them to learn. The other versatile method used to enable students with learning difficulties was to replace handwriting with text-typing. Sensory scaffolding or changing the format of the task, modality – this was often reported by teachers and demonstrated the skills of organizing inclusive education for students with learning and emotional difficulties. The teachers shared the different tools they have found in teaching students with learning difficulties to enable them to understand the text. The participants who worked with SEN students learned a

lot about special apps. For example, the ‘Reading Comprehension’ page was one of such tools:

“In ‘Reading Comprehension’ educational webpage it is possible to find downloadable exercises for reading comprehension. I found a lot of spelling exercises there too. It's easier for pupils with special needs [to learn].” (GD-19-1Mok)

“Pupils with special needs use ‘Mentimeter’ very well. It's just harder for them to log in, but it's not a very difficult issue either. Of course, it's not always easy for them to mark, rate, or write their opinion... They might find it harder to formulate their thoughts, but when you present their opinion, you still get into the common language and explain. <...> They also really like the way I create mind maps for ‘Coggle’ and ‘Mindmeister’. The kids love it, they say: “How clear it is when you see the image instead of the text”. And then the teacher puts that map, that topic, into a detailed mind map. They, the children, like and understand that visual. They remember it very well and can easily reproduce and explain it afterward.” (GD-5-6Mok)

The findings of the research showed the ability of teachers to recognize the amount and the type of support for students with learning difficulties. The teachers helped until the student mastered a new task or digital tool. This was the example of practical implementation of one of the main scaffolding principles. As Ersani, Suwastini, & Artini (2021) note, *“when students are finally able to do a particular task without assistance, a transfer of responsibility occurs. Support is gradually removed since students can already pass their Zone of Proximal Development”*. The similar processes were observed and applied by our research participants.

Scaffolding for students with special needs to learn in virtual environments

While helping students make their first steps in virtual environments, teachers enabled them to use online tools. These tools provide students with greater opportunities for virtual learning and communication:

“When talking about special needs children, for them learning to connect was a big challenge. When they learn how to connect, everything has become easy and interesting.” (GD-5-1Mok)

The teachers working with special needs students identified criteria for selecting apps to make learning effortless for these students:

“After looking at a wide variety of apps, I aim to choose an app that is free to connect, easy to understand, simple to manage, and calm to use. I look for apps that give feedback to the teacher; that show the child's progress, the number of logins, etc. At the same time, I would like the app to be able to monitor how the children are doing - are they logging in? How are they behaving? What percentage of correct or incorrect answers do they get when completing tasks? How are they navigating? My main criteria for the app are ease of use and accessibility. This is important because I work with children with different needs. Some can understand the material and complete the tasks very quickly, but some find it difficult. These aspects are very important.” (GD-5-1Mok)

Teachers have also been able to address the students' special needs in their transition to virtual learning:

"I'm very happy that in early September ... I started teaching fifth graders how to work with the Teams platform. <...> for SEN students it took at least two months to understand the navigation, login process, and all the technologies. <...> For example, working with a Notebook. How to load tasks from your computer into your homework Notebook? It wasn't really easy. A child needs to remember the password, to login ... It was a problem." (GD-17-5Mok)

"SEN children needed much more help to join Eduka, EMA, Zoom, and other programs what their teachers use." (GD-17-4Soc)

Differentiated ICT-based educational process

The schools' principals and teachers provided us with suggestions on how to organize the distance learning process at school. These suggestions, according to the teachers, could help other teachers and schools to differentiate easier their activities and to devote time to students with special needs:

"I have a lot of children with special needs in my class. And what I liked about my job was that it was possible to send those who could work independently to virtual rooms. I leave special needs pupils in the main room and explain what was not clear to them again and again. There were 7 or 8 of those children with special needs and we work almost individually." (GD-17-1Mok)

Group work in *Zoom* virtual environment was one of the most versatile solutions for managing any lesson and allowing the teacher to focus on special needs students. The teachers gave examples of good practice on how they use digital tools to differentiate the level of tasks and to make learning more playful and gamified. The participants noted that the differentiation of learning tasks was better organizing these in online way than face-to-face. The teachers considered that this was due each student had an individual computer or tablet device to use for learning. The participants mentioned other apps that made learning more engaging and that they used to differentiate learning. Some examples of such apps were *Linoit*, *LearningApps*, *Liveworksheets*. These apps allowed teachers to differentiate tasks for students of different abilities and skills. The teachers shared:

"...I can create tasks for children by differentiating them. This is very useful for initiating tasks for pupils with special needs." (GD-10-7Mok)

Category: Students' engagement through ICT

We found that category *Students' engagement through ICT* consisted of three subcategories (see Table 1). In this section, we will present each of subcategory.

Developing inclusive ICT-based educational activities

To make learning enjoyment and engaging, teachers organized activities for individual and group. These learning activities included more than one assignment and used a variety of ICT tools and resources, such as *Kahoot!*. The app, which became very popular in schools during the quarantine period, and others:

"Students performed 'Kahoot!' quizzes when they were a bit tired and had double lessons. It's more of a game of chance, and engaging learning experience." (GD-19-2Mok)

According to the teachers, the children enjoyed *Kahoot!*. However, it was necessary not only to explain the rules of the quiz, but also to teach self-reflection, to assess one's abilities, knowledge, and skills, and to apply teamwork:

"I suggest to the children to do a test, and I ask them, can we do it using some other app? I suggest- Kids, maybe we will answer the Teams survey? The children answer: -No, teacher! Just Kahoot!. But of course, they were a bit disappointed because they wanted to compete, and I didn't allow that. I took away the scoring. <...> I then say to the children: 'So that you don't get frustrated, but so that you can be very realistic about yourself. I take the scoring off so that you can learn by reading the correct answers.'" After that, we did a few tests without calculating points. As long as they answer, it's calm, and then the feedback pop-up: 'Oh, so that's how it was for me, I was first and now I'm not first anymore. The child was so disappointed... We needed to talk about learning to see ourselves realistically, explain the way things are.'" (GD-5-6Mok)

The research showed that long experience of using digital tools helped teachers to use ICT for enhancing students' intrinsic motivation by fostering awareness and the pursuit of new knowledge rather encouraging competition. Various digital tools and applications helped to stimulate the educational process, to motivate and involve in learning activities all students, including those who were less active or had learning and emotional difficulties. The same apps, used repeatedly, sometimes got boring for pupils, so teachers kept looking for new digital tools. The participants found that their students were engaged and motivated by the instant feeling of success coping with digital apps and tools when completing and checking tasks.

Promoting self-regulated learning with ICT

The findings showed that teachers' enabling instructional activities is associated with students' self-regulated behavior – students like the engaging learning activities offered by the teacher, they willingly participate in the ICT-enhanced learning process, completing the tasks and linking them to their personal learning goals. Students were willingly engaged in learning supported by apps allowing choosing and achieving their own goals. Some of the participants noted that self-regulated learning skills were developed through the common use of *Teams* – virtual platform chosen by the school:

“Each of our classes hosts a self-regulated learning day once a month. All tasks are hosted on the Teams platform. All students know that they have assignments for all subjects of the day that can be found in Teams and nowhere else. And then consultations take place only through the ‘Teams’ at the time scheduled”.

(GD-10-6V/Mok)

Fostering creativity through ICT

The teachers discovered, used, and created a variety of new tasks to handle the strength of ICT tools enabling and developing students’ creativity competence. For example, in music lessons, students chose the pace to complete individual assignments created by the teacher. In distance learning, teachers modeled their lessons considering the best practices of their colleagues and digital materials developed by peers. It was encouraging to understand that teachers have recognized the greater potential of ICT and have rediscovered digital technologies for enabling their student’s creativity. Returning to contact education, teachers developed various ICT-based educational tools, resources, and teaching alternatives for traditional activities in school. The schools have learned how to overcome technological barriers. In overcoming the exclusion barrier, the schools have discovered a variety of ways of helping to raise students’ responsibility for their learning, to motivate them to learn, to set the personal goals and reach them.

Discussion & Conclusions

ICT scaffolding for school education aims gradually delegate responsibility for learning to the student, enabling self-regulated learning. Summing up, we conclude that the skills and the culture of self-regulated learning in schools are not yet widespread. To bring the processes of ICT scaffolding into schools, it is particularly important to disseminate good practices of teachers and schools working with special needs students and students, who have emotional and learning difficulties.

The processes of mutual support, sharing ideas and knowledge, communication, and cooperation were activated during and after the lockdown in the communities of the schools. In addition, teachers were involved in the improvement of the instructional design.

The project-based activities became more popular in Lithuanian schools during the lockdown. After returning to contact teaching, these activities were continued. The teachers’ experiences that are gained working in this way have contributed to the development of students’ intrinsic motivation and the development of self-regulated skills. Moreover, teachers discovered and developed ICT-based alternatives to textbook as a teaching & learning aid. Our research showed that various smart applications increased students’ motivation and stimulated learning in general.

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