

PAPER

Educators' Perspectives on the Main Challenges and Opportunities for Implementing Digital Solutions in Learning and Teaching

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ABSTRACT

The gap between technological progress and education is one of the international issues that needs to be addressed. Further education of educators is considered one of the best solutions [1]. Nevertheless, schools struggle with the requirements set by national and international authorities, lacking guidance and support [2, 3, 4]. This research aims to identify the primary challenges and opportunities for implementing the use of digital solutions in learning and teaching. The research questions are as follows: (1) What are the primary challenges for educators when implementing digital solutions in learning and teaching? and (2) What are the key opportunities for educators when implementing digital solutions in learning and teaching? This study examines the reflections and evaluations of educators' learning experiences in a two-year national-level further education programme aimed at enhancing and advancing their pedagogical digital competence. Throughout the course, educators regularly filled out surveys reflecting on the quality of collaboration in their support groups, their progress towards their professional development goals, their main challenges, and their greatest successes in learning and implementing digital solutions in practice. The study analysed 8,636 responses from educators using a mixed-methods design. Quantitative data analysis was used for the Likert scale questions, while deductive and inductive qualitative analysis was used for the open-ended questions. The results show that many of the factors' educators mentioned as successes in their learning experience were also mentioned as significant challenges, such as learning to use new digital solutions, applying digital solutions in their work, collaborating with colleagues to learn and implement new digital solutions, and effectively managing time to achieve set goals. Educators need dedicated time to experiment with digital solutions, engage in practical and peer-oriented learning approaches, develop a shared vision, foster collaboration, and receive support to enhance their competence and confidence in utilising digital solutions.

KEYWORDS

challenges of implementing digital solutions, digitalization in education, opportunities of implementing digital solutions, technology-enhanced learning

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1 INTRODUCTION

Due to rapid technological development, the education sector is undergoing not only active change and the need to adapt, but also inevitable resistance and differences in opinions about how the change should be promoted [5, 6, 7, 8, 9]. Nevertheless, educators are the ones who carry out most of the digitalization planned and supported by authorities and educational institution management. Educators need guidance, support, new skills, and knowledge to introduce digital literacy and implement digital solutions in schools [2, 3, 4, 5, 10].

The development of digital literacy includes actively and proficiently using digital tools, and it is closely connected to learning, problem-solving, and creating new digital content [2, 11, 12]. Moreover, for educators, the implementation of digital tools in their work requires knowledge about the pedagogically appropriate selection and use of these tools. It also involves introducing and explaining their application to students, as well as assessing the advantages and disadvantages that certain digital tools bring to the classroom [12, 13]. Therefore, an educator needs to have in-depth digital skills to facilitate technology-enhanced learning and teaching [9, 10, 12, 14, 15]. In this study, educator digital competence is defined as pedagogical digital competence. This refers to proficiency, meaning 'proficiency in using information and communication technologies in a professional context, along with good pedagogic-didactic judgement and awareness of its implications for learning strategies and the digital education of students [16, p. 45].

During the COVID-19 crisis, it became clear that many educators were not prepared for a rapid transition to and reliance on digital solutions. It revealed several significant risks, including the difficulty of working with students who have varying levels of digital and self-directed learning skills, the accessibility of support systems, and the readiness of educational institutions and educators to transition to student-centred learning and teaching [17, 18, 19, 20]. Furthermore, educators who tried to directly transfer in-person pedagogies to online teaching spaces experienced struggles and frustration. Many of them also expressed a need for additional training on how to effectively conduct online courses [18, 20, 21]. Nevertheless, educators have recognised the benefits of remote learning. These include the opportunity for individualised learning experiences, the development of self-directed learning and digital skills, access to learning when it would not otherwise be possible, and the introduction of technologies and technological solutions that are widely used by students and often convenient for other activities as effective learning tools [22, 23, 24, 25].

In this study, we focus on the learning experience of educators and their use of different digital solutions to identify challenges and opportunities for implementing technology-enhanced learning and teaching. We utilised data from a professional development course for educators that focused on the digitization of education. During the course, educators routinely reflected on their learning experience and identified aspects that helped them achieve their learning goals regarding technology-enhanced learning. They also identified aspects that they found challenging when implementing digital solutions in their teaching. The aim of the research was to identify the main challenges and opportunities for supporting educators in implementing the use of digital solutions in learning and teaching. The research questions are as follows:

1. What are the main challenges for educators when implementing digital solutions in learning and teaching?
2. What are the main opportunities for educators when implementing digital solutions in learning and teaching?

2 LITERATURE REVIEW

This section analyses aspects that influence the successful implementation of digital technology. Emphasis will be placed on teacher-related factors, such as previous experience with technology, the applicability and ease of use of the tool, and openness to new technology. These factors have a greater influence on successful technology implementation than external factors like students' access to technology, curriculum facilitation or school leadership [26, 27].

2.1 Challenges

Teachers' competence is crucial when considering pedagogical and didactic principles and selecting a digital solution for its effectiveness in promoting learning [12, 14, 28]. Strong technical and communicative competence, without pedagogical competence, can result in digital solutions not being incorporated based on pedagogical benefits or proven methodological principles [14, 29]. In parallel, educators' lack of digital skills prevents them from effectively utilising digital solutions in their teaching [3, 5]. A lack of digital competence reportedly indicates insecurity when it comes to using new technology on short notice, as well as a lack of pedagogical knowledge and difficulty with time-consuming tasks [30]. The development of digital competence is strongly related to educators' openness to new technology and their experience using digital tools [19, 27, 31]. Consequently, it is believed that with sufficient experience and pedagogical digital competence, an educator would be able to effectively utilise digital solutions in the classroom. Nevertheless, the research shows that there is still a lack of a clear vision on how to use digital technologies, how to integrate them into the curriculum, and identify the necessary skills to implement digital solutions in education [4, 5, 6, 7, 19, 32, 33, 34, 35]. In a study where K-12 educators were asked about challenges they faced during the pandemic, educators with varying levels of digital competence consistently reported the need for professional development to improve their ability to implement course content effectively in online settings [21]. Furthermore, another study that examined the experience of preschool educators with implementing digital solutions in learning and teaching revealed that while more competent educators could not reach a consensus on the most suitable methods for implementation, other educators just did not have the necessary skills to do so [36].

Personal factors, such as stress and anxiety, can also hinder the integration of technology [36]. Moreover, the process of searching for, learning about, and implementing new digital tools can be challenging, especially when universities fail to provide students with the necessary knowledge and skills for technology usage [14, 37, 38]. Attitude and motivation to learn and adopt new digital solutions are essential factors in their implementation [4, 23, 31, 39, 40, 41]. According to a

study conducted by M. Johler and R.J. Krumsvik [28], Norwegian primary school educators expressed a common concern that they might become reliant on digital solutions for various reasons. These factors include the ease of using digital tools to differentiate or personalise instruction, the entertainment value of such tools, the perceived preference of students for using digital solutions in class (or a teacher's belief in this preference), and the perception that frequent use of digital technologies is expected of them as professionals [28]. The change is a complex process, and it undoubtedly comes with concerns and even resistance, as some educators seek to preserve traditional teaching settings and methods and view innovation as a replacement [6]. Educators often feel more comfortable using digital solutions that mimic traditional learning experiences rather than embracing more interactive and diverse solutions that would necessitate acquiring new skills [4, 34, 42, 43, 44]. A longitudinal study conducted between 2008 and 2012 by R. Holmgren, U. Haake, and T. Söderström [38] focused on the experiences of 40 firefighter training instructors in pedagogical training programs in Sweden. The study found that instructors perceived digital solutions as an uncertain and challenging environment where their previous teaching knowledge and skills may not be applicable. The instructors experienced a conflict between their traditional teaching approach, which emphasized instructor-led knowledge delivery and control, and an alternative approach that involved instructors facilitating and supporting students' learning [38]. The minimal and deliberate application can also be observed in the implementation of more advanced digital solutions, such as virtual mediums. In these cases, the approach towards minimal application involves removing a significant portion of the potential interactivity provided by digital solutions. As a result, learning becomes more frontal and less engaging [45, 46, 47]. Furthermore, the practice of "protecting" existing learning and teaching strategies extends beyond the individual level. In many digitization initiatives and processes, the change introduced is often limited to the mere implementation of digital technologies, without any modifications to teaching and learning practices or organisational infrastructures [43]. Although a careful and considerate attitude towards implementing digital solutions is ethically important, it also presents challenges in bringing about meaningful change in learning and teaching.

External factors and the broader situation in a country or educational institution can also present challenges to the successful implementation of digital solutions. The availability of digital solutions is a crucial factor in predicting educators' pedagogical digital competence and the implementation of digital solutions in learning and teaching [27, 30, 37, 43]. Economic limitations can hinder the acquisition and utilisation of digital resources and software. As a result, schools located in financially prosperous municipalities are more inclined to employ diverse digital solutions and explore innovative methods [5, 36, 48]. At the same time, digitalization can create additional administrative work for educators [48]. They admit that technical problems and the fear of losing control of the learning process can further hinder the adoption of technology [28]. Consequently, sufficient technological and pedagogical support is crucial for the deliberate and effective implementation of digital solutions in learning and teaching [5, 36, 49].

2.2 Opportunities

As previously emphasised, internal factors play a significant role in predicting educators' pedagogical digital competence and their ability to implement

productive digital solutions implementation in learning and teaching. One of the key opportunities lies in fostering educators' motivation. Motivated educators manage to integrate ICT into their lessons because they believe in its usefulness for learning [29]. However, the implementation of innovation takes time and effort, and the additional workload should therefore be acknowledged [49].

Ongoing training and support, as well as high-quality technological tools, are essential factors for educators to explore and implement digital solutions [49]. Practical approaches, such as skills-based training, modelling, and project-based learning, can effectively develop pedagogical-digital competencies [4, 6, 41]. Educators should learn how to teach using digital technologies while critically evaluating the added benefits of specific solutions [6, 26]. Allocating time for researching ICT solutions is crucial for successful implementation [36]. This can be achieved through the sharing of experiences and ideas, which benefits both educators who share information and educators who receive it. Guided experimentation can be used to address educators' exposure to and experience with different solutions, as well as to support the development of pedagogical digital competence [27].

Collaboration plays a significant role in acquiring new skills and knowledge, as well as implementing digital solutions. Educators often turn to the internet to review existing resources and teaching materials as their primary support mechanism [30]. Nevertheless, schools and educator trainers should seek ways to introduce innovation through mutual support systems for educators. When educators feel motivated to acquire new knowledge and have a sense of responsibility to deliver quality teaching, they are more likely to seek support beyond institutional boundaries [30].

Proactive top management and leadership at educational institutions can have a positive and direct impact on the adoption of digital learning technologies [37]. Firstly, clear guidelines that describe the targeted knowledge, skills, and competencies educators need will guide their development of digital competence to support educators in implementing digital solutions implementation [27]. Much clarity has been achieved through the DigCompEdu framework [12, 50], which elucidates the pedagogical digital competence of educators. Nevertheless, national authorities and schools should clearly define their expectations and the goals that educators are required to implement in the learning and teaching process. Secondly, digital tools should be presented not only as a requirement or necessity but also as an opportunity to provide equal education, accelerate active learning, and promote skill development. A focus on educational and organisational change, along with investments in digital technologies and support for the development of student and educator competence, can effectively introduce digitization processes in school environments [43].

3 METHODOLOGY

Data was gathered during a two-year-long professional development course for educators focused on the digitalization of education. Educators analysed their needs for improving their pedagogical-digital competence, formulated their professional development goals, learned about utilising various digital solutions for education, and planned and implemented the integration of these solutions into their practice. Permanent learning support groups were also formed to provide individualized feedback and learning support through the predominantly remote course activities. The data used in this research was gathered from monthly progress

surveys created using Google Forms. Participants were asked to reflect on several aspects, including (1) the quality of collaboration in their support groups, (2) progress towards their professional development goals, (3) their main challenges, and (4) their biggest successes while working towards their professional development goals. An open-ended field for participants to provide any additional comments was also available.

A total of 8,636 responses were received and analysed. For the purposes of this article, the chosen responses were coded as follows: the first letter represents the learning group corresponding to student age groups (P = preschool, E = elementary school, S = secondary school, H = high school, M = mixed student age group). The second number represents the unique number for a participant in the age group the educator works with, and the remaining letters and numbers represent the learning group the educator was working in during their professional development course.

Quantitative analysis was used for the first two survey questions: "How successful was your collaboration in the learning support group?" and "How successful were you with carrying out your learning goals this month?" A Likert scale from 1 to 5 was used for these questions, with 1 representing 'Very unsuccessful' and 5 'Very successful'. Quantitative analysis using word count and qualitative analysis through categorization were employed for the final two survey questions: (1) "What has been your most significant achievement in pursuing your learning objectives?" and (2) "What has been your greatest obstacle in pursuing your learning objectives?" Both questions were presented in an open-ended format.

NVivo was used for the quantitative analysis of the open-ended question responses. First, all the text was translated into English using Google Translate. This was done to avoid any bias from the author's translation and to make the best use of NVivo's language model capabilities. Word count and weighted percentage were used to determine the most frequently mentioned words for both successes and challenges during the learning experience. A qualitative cross-sectional analysis was conducted on the responses of a selected group of the 108 most active participants. These participants submitted their reflections at least nine times during the learning event. The analysis included eight learning groups, each consisting of educators working with different student age ranges. Specifically, there were two groups from each education level: preschool, primary school, secondary school, and high school. The purpose of this analysis was to cross-examine the results of word frequency analysis and provide additional support for data interpretation. The statements were categorised using the double-blind method. The larger dataset of 8,636 responses was examined using the Google spreadsheet function COUNTIF, and chosen categories were added as descriptive parameters for automated searches in the dataset. To provide further explanation of the results, this article includes quotes from the research participants. The responses of the participants have been translated by the authors of the article.

The research was carried out in compliance with the General Data Protection Regulation (GDPR). Participants were informed that the data collected in this survey may be used for research purposes. The learning event organizers provided written permission for us to use this data in our research. Additionally, the research methodology was approved by the Ethics Committee of the University of Latvia (Riga, 08.03.2023, No. 71-46/55).

4 RESULTS

In order to evaluate participants' perceived progress towards their selected learning goals, regular self-assessment was conducted at the conclusion of each learning module and/or learning support group session. A total of 8,636 responses were collected and subjected to further analysis. The answers are not from unique participants but include several self-evaluations from each participant over time.

Among the received responses, more than 50% indicated a positive outcome, with participants confirming their successful acquisition of the intended content (see Figure 1). Participants recognise the relevance and quality of the provided content, acknowledging that they "appreciated the wide range of digital tools in this month's learning modules" (respondent M1PR4), enjoyed "the materials on differentiation and the other colleagues" (respondent M2K4), and acknowledged that "one of the benefits of these courses is the chance to learn from excellent content creators and advocates of modern education philosophy in Latvia" (respondent H5L1). Educators appreciated the course format and the structure of their learning experience. They stated, "It is great that you can learn when you have time to plan and organise your work yourself." "It suits me" (respondent S2K1). They also appreciated the individual tasks. One of the educators revealed, "So far, I am very satisfied with this course." "Homework is beneficial and helps to achieve the set goals" (respondent H4V1). Participants also appreciated the support offered by the learning group coordinators. One participant stated, "I enjoy the lessons." We have the best class-leader! "She always encourages and motivates us to learn more," stated respondent S4R1. They also expressed enjoyment in the opportunity to practice using digital solutions during learning, saying, "It is interesting to work practically with the digital tools yourself during the online meeting led by our coordinator," according to respondent P1L1.

However, nearly 10% of the responses expressed negativity, indicating challenges in achieving the intended objectives. This observation can be attributed to several factors. The educators may have faced unexpected challenges in meeting their learning goals, whether it was due to the available course content, the level of support, or time constraints. Although the course content was designed to cater to a diverse range of participants by providing varied topics and opportunities for customization, it was not always possible to meet every participant's individual needs within the flexible course format. This was evident in their reflections: "In order to try new tools and achieve tangible results, you need both time and a supportive person by your side who can provide assistance and guidance." "I cannot manage to do it on my own because it requires too much time," said respondent M3PR2. Other educators emphasised that they "would really like someone to teach them instead of searching for the answers on their own (which is probably very unfashionable)." "But our time resources are limited, and motivation starts to dissipate" (respondent S3P3). Some participants felt overwhelmed by the amount of information and tasks, acknowledging that there was a significant amount of information and many unknowns. One participant (respondent E4KV1) expressed a desire for more focused and specific content, stating, "I would like something narrower and more specific." On the other hand, some participants felt that they could benefit from additional content and tasks. One participant (respondent H6L1) mentioned, "I would like the course to provide us with more tasks, materials, and opportunities for self-study." Additionally, external factors could have influenced the participants' ability to achieve their learning goals. For instance, many participants mentioned

that time constraints, such as schoolwork or other commitments, hindered their success in achieving their planned objectives. They emphasised their strong interest in the course material but admitted feeling exhausted from their responsibilities as educators. As a result, they increasingly opted to prioritise rest over preparing for another course lesson. “Unfortunately, this is a reality if we don’t want to end up on the verge of burnout,” stated respondent H3K1. The lack of support and availability of digital technologies in the educational institutions where they worked was also mentioned in some educators’ reflections. One respondent stated, “The level of ICT availability at work is beginning to negatively interfere with my learning” (P3R1). Furthermore, some teachers have raised the issue that neither students nor schools have the necessary technology for technology-enhanced learning. They argue that “It is not possible to implement all the possibilities offered by the wide range of IT in schools if the children do not have access to the required technologies. The school has a limited number of laptops, for which you need to apply in advance. Additionally, the children’s skills and knowledge are weak. What can I, as a teacher, utilise from the ideas presented in the courses if not all the children have access to a mobile phone? “Thanks for the opportunity to educate myself, but I don’t see the possibility of applying it practically” (respondent E6ZP2). Others stressed that educators do not have the time to invest in this matter. One respondent, S1V1, stated, “I could devote more time to supporting educators in IT matters, but many educators are tired and overworked.”

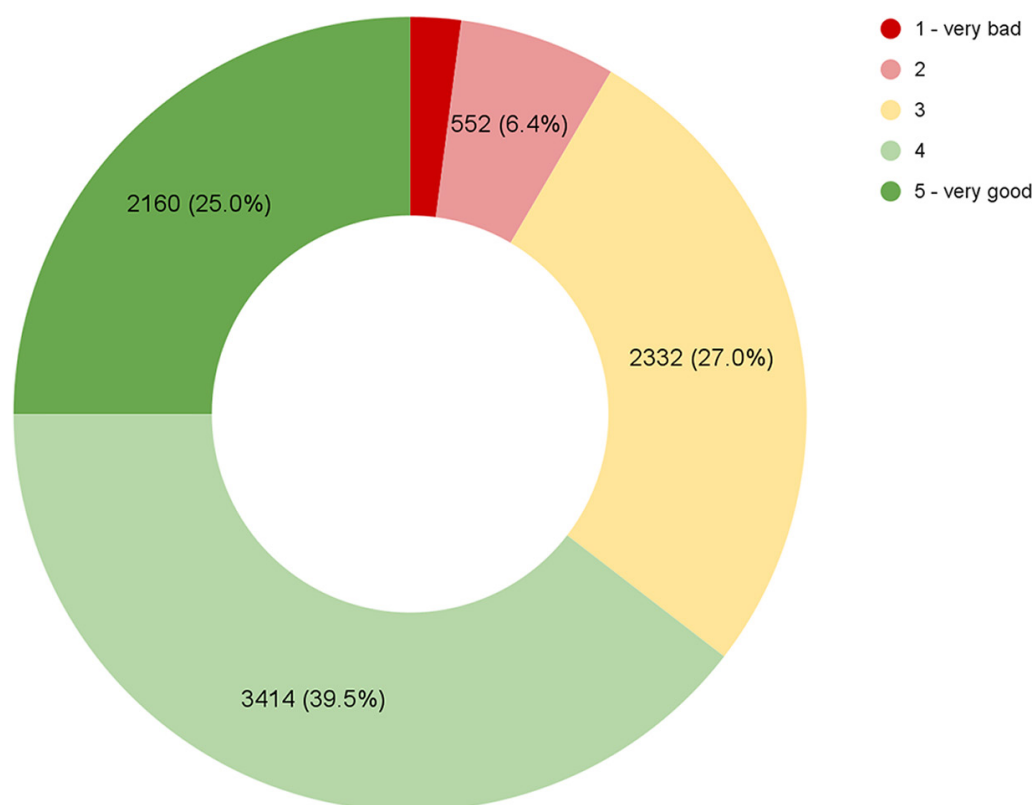


Fig. 1. Participants’ self-perceived success in progressing towards reaching their professional development goals on the course evaluated on a Likert scale (1 = very bad, 5 = very good, n = 8,636)

Participants also evaluated the success of their learning support groups (Figure 2), and over 60% of the responses were positive. Participants reported having either very successful (5 out of 5 on the Likert scale) or successful (4 out of 5) collaboration in their groups. Participants appreciated the opportunity to collaborate and

work together to accomplish tasks and acquire knowledge. Several educators also mentioned support groups as one of the successes in their reflections: “I appreciate the approach of taking small steps and discussing our progress in group work. It’s important to create an environment where we can openly share what we have done without judgement if someone hasn’t completed the task correctly or hasn’t fully understood it.” “I appreciate the ability to communicate with specialists, which would not be possible otherwise,” stated respondent P2PR2. Another respondent, P4L2, added, “Learning independently can be time-consuming, but group work makes everything run more smoothly.” Participants in support groups also helped their peers catch up on missed learning content. Sharing practice was also evaluated highly. Furthermore, several participants mentioned that they stayed in contact outside of learning activities as well. One participant stated, “We communicate with colleagues from the white group in a WhatsApp group that we have created.” “It’s great that colleagues share new resources and express their opinions” (respondent P5L2).

However, 18% of responses stated that their learning support group success was average (3), and in 19% of cases, participants had a negative (2) or very negative (1) opinion on the success of collaboration in their support groups (Figure 2). Participants’ experiences depended to a large extent on the quality of internal relationships established among group participants, common needs and ideas to discuss, experiences to share, participants’ capacity to take part in the learning support group meetings, and other factors. This was summarised in one participant’s reflection: “I participated in another support group this month as usual because I missed my support group meeting. I noticed a significant difference in the way group members cooperate with each other. This plays an important role in fostering a positive attitude towards the course. In one group, the cooperation was slow and complicated, while in the other group, it was the opposite. It’s similar to a class with students—you never know what kind of class will form. “However, it is a critical factor for effective learning to occur” (respondent H6Z1). Some participants felt that they had not found the right support group but did not actively seek the opportunity to change groups, even though it was possible to do so. One participant expressed their perspective by saying, “I don’t really see the point of a support group in this course. We have neither similar work goals nor topics to discuss or communicate with each other. Ideally, I see it as a useful method in a school where colleagues or students can divide into groups with semi-acquainted and like-minded peers. A support group shouldn’t feel like a burden or an obligation; members should genuinely want to share” (respondent E5R2). Furthermore, some participants failed to see the point of support groups altogether. They mentioned that they already had other support communities or felt that the synchronous online meeting work groups were sufficient for their needs. One participant stated, “In my opinion, there’s no need to meet again in small groups before the online meeting. This consumes time, and the same topics are discussed as in the classes” (respondent E1R1). Some participants admitted that they chose not to take part in support groups, saying, “I’m not active enough and haven’t started any communication in the group” (respondent H7Z3), while others admitted to having missed support group meetings due to personal and professional issues, saying, “Unfortunately, I was unable to attend my support group this month. I really hope that everything is settled now and that I’ll be able to fully dedicate myself to studying the course and also participate in group work in the future,” stated respondent H1L1. These results highlight the potential to enhance participants’ experiences by reinforcing the effectiveness of learning support groups. Encouraging participants to utilise the professional support group’s offerings, such as collaborative problem-solving, practical and emotional support, idea exchange,

and brainstorming on relevant topics, presents an opportunity for improvement. Allocating more time to choose support groups based on common interests and goals could be beneficial. Additionally, reminding participants about the option to change support groups if their initial collaboration is not successful can also be helpful.

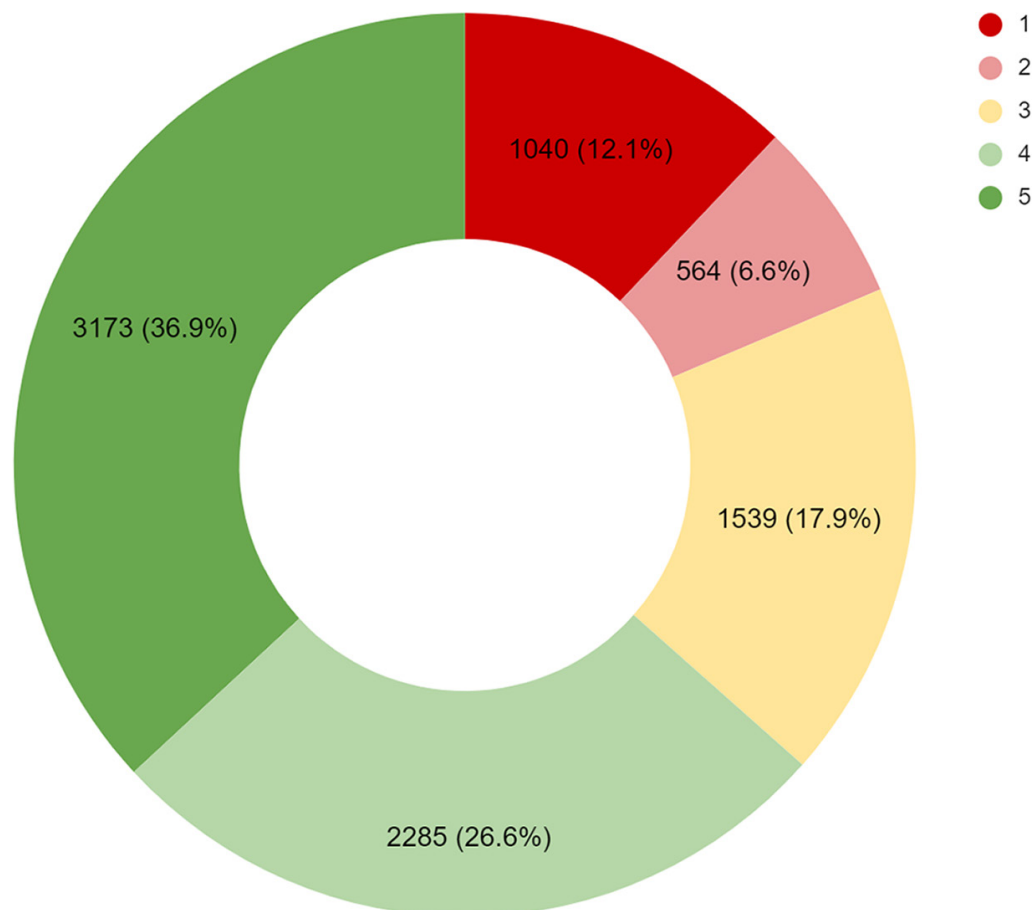


Fig. 2. Participants' self-perceived success in collaborating in learning support groups on the course evaluated on a Likert scale (1 = very bad, 5 = very good, n = 8,636)

As shown in Figure 3, the most frequently mentioned words in response to the question "What were the main challenges during the course?" are "learning" (weighted percentage 3.20%), "colleagues" (2.68%), and "work" (2.56%). This is followed by "tools" (2.35%), "digital" (1.67%), "time" (1.62%), and "lesson" (1.59%). Further analysis of the tree map routes reveals that participants attribute their main successes to learning and implementing digital solutions in their practice. In their reflections, educators mentioned several digital tools that they learned during the course, such as "in-depth use of Microsoft Teams, Zoom, Excel, and Word" (respondent P7R1). They also mentioned that they developed skills to apply these tools in teaching and learning. One educator stated, "I learned a new platform that can be successfully used in working with pre-schoolers to assess their understanding of the topic, as well as to diversify the learning process and encourage them to learn" (respondent P6L1). Furthermore, educators mentioned that they gained experience collaborating with their colleagues. They shared their experiences and helped their colleagues learn to use several new, simple digital solutions (respondent S5L1). They also supported others in using digital solutions by creating an e-course example in collaboration with colleagues to enhance their digital skills (respondent H8L1).

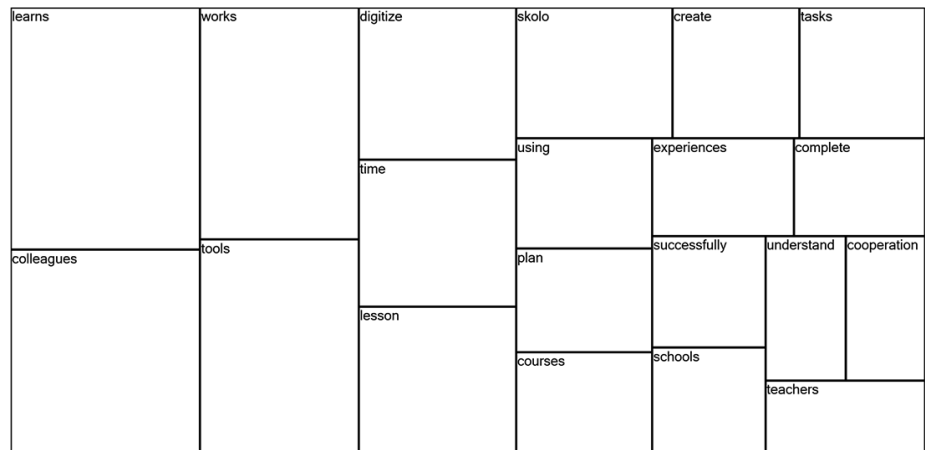


Fig. 3. Tree map for the 20 most frequently used words in response to the open question, “What were the main challenges during the course?” (n = 8,636)

Figure 4 shows that the most frequently mentioned words regarding participants’ challenges during the course were “time” (weighted percentage 7.89%), “find” (3.60%), “work” (2.62%), “learning” (2.24%), and “colleagues” (1.64%). Further exploration of tree map routes reveals that the lack of planning time was one of the main challenges faced by participants: “It was difficult to balance learning with work and complete assigned tasks on time” (respondent E8K2). Many respondents also mentioned issues with collaboration among colleagues and students. An important challenge in further implementing the change in schools was observed in the overall busyness of educators: “It was difficult to convince colleagues to step out of their comfort zone” (respondent E2V1). Finding, learning, and utilising digital solutions were also among the challenges highlighted by participants: “It was difficult to find digital solutions that are easy to comprehend for my colleagues” (respondent H9Z1). Educators mentioned struggling to learn a variety of digital solutions in order to participate in the course activities. These included Moodle and Office365 (respondents E3KV1, H12Z1), as well as digital solutions they learned on their own, such as eKlase and BeeBot (respondents P8PR2, P9V3). Interpreting and completing learning tasks during the course also presented challenges for participants, both in terms of understanding the theoretical materials (respondent H13R3) and in following the tasks: “It was difficult for me to determine which tasks to prioritise and how much effort to put into them” (respondent S6R1).

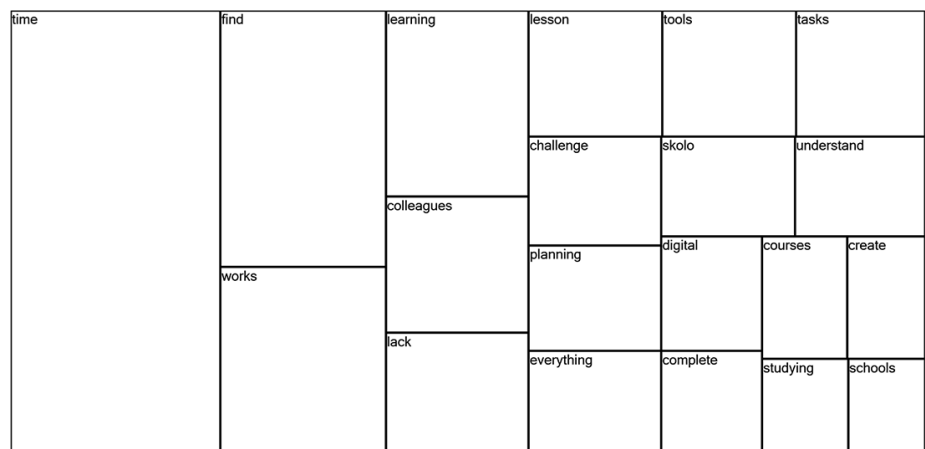


Fig. 4. Tree map for the 20 most frequently used words in response to the open question, “What were the main successes during the course?” (n = 8,636)

A strong positive correlation (Pearson correlation coefficient = 0.66) is observed between the successes and challenges mentioned by participants, suggesting that the keywords are similar in both data sets. In other words, the factors that participants found most challenging were also among those they were most proud of if they managed to accomplish them. Figure 5 shows a comparison between the most frequent keywords in both datasets. As can be seen, learning to utilise new digital solutions (using keywords such as “digitize” and “tools”) and collaborating with colleagues are among the most frequently mentioned factors in both data sets, although they appear more frequently in successful cases. On the other hand, planning time also appears in both data sets, although more frequently among challenges, similar to understanding tasks and planning work.

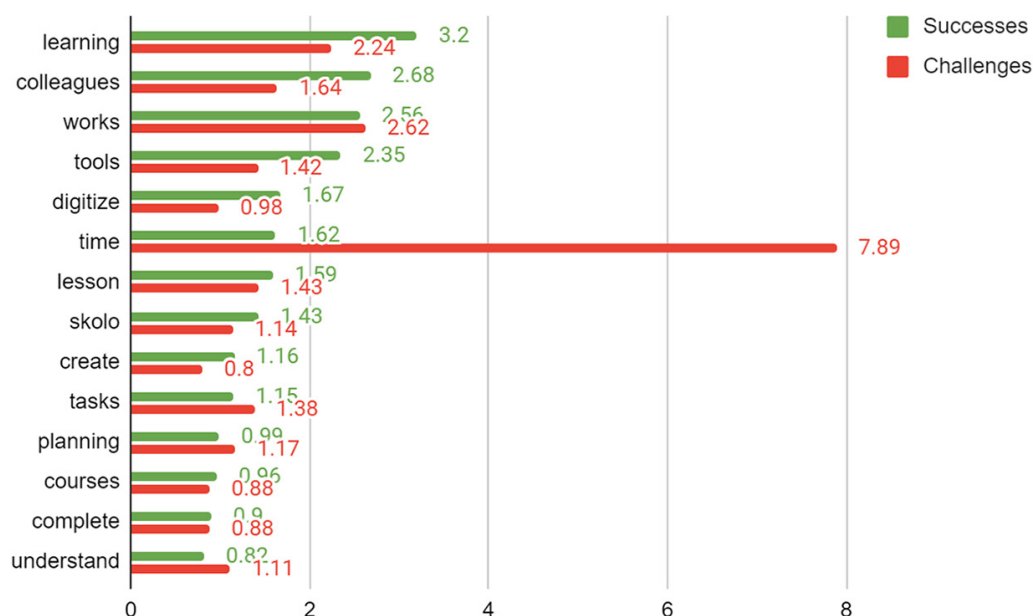


Fig. 5. Comparison between the 15 most mentioned words in participants' main successes and challenges data sets (n = 8,636)

A cross-sectional analysis was conducted on a specific group of 108 participants from eight different learning groups of educators who work with students of varying age ranges. The purpose of this analysis was to examine the results of the keyword analysis. Statements were categorised using the double-blind method and then coded according to predetermined categories. As shown in Table 1, this deductive approach yielded similar categories to the earlier inductive approach, thus providing support for the selected categories.

It is worth noting that the synonym word option was utilised in content analysis using NVivo. As a result, the word count was higher in the analysis conducted with NVivo. In the cross-sectional analysis, more specific categories were selected. This could potentially reduce the word count and influence the categories on the list. For example, participants provided examples of self-directed learning, although they did not always explicitly use those words. Similarly, participants described mentoring activities and received feedback on the success of their learning. Automated content analysis decreases the possibility of researcher bias; however, as observed from the data, it also increases the ambiguity of the results. “Skolo” was one of the most frequently mentioned words in both the challenges and successes data sets. During the course, a new state-funded platform called skolo.lv was introduced.

Course participants had the opportunity to be among the first educators to test the platform and provide feedback to enhance the user experience. This resulted in confusion and dissatisfaction regarding its functionality, as it had not been fully implemented. However, it also led to satisfaction when participants were able to assist their colleagues in implementing this platform in their work. However, this is still a single digital solution that, due to the circumstances, was frequently mentioned by participants. However, it probably should not be overemphasised in comparison to other digital solutions that participants learned during this course. Triangulation, through the use of both data analysis approaches, could help to interpret the data more objectively.

Table 1. Inductive and deductive approach results for open-ended response categorizing (15 most common categories)

No.	Inductive Approach (Double-Blind Categorization)				Deductive Approach (NVivo Word Frequency)			
	Successes		Challenges		Successes		Challenges	
	Word	Count	Word	Count	Word	Count	Word	Count
1.	colleagues*	1,156	time	1,328	learning	1,430	time	2,930
2.	new**	1,071	learning	634	colleagues	1,197	find	1,335
3.	experience exchange	561	colleagues	578	works	1,143	works	971
4.	learn	486	new	506	tools	1,050	learning	833
5.	students	420	tasks	505	digital	746	colleagues	607
6.	collaboration	387	students	257	time	721	lack	545
7.	group	342	materials	217	lesson	711	lesson	529
8.	materials	327	self-directed	159	skolo	640	tools	527
9.	time	309	group	158	create	517	tasks	511
10.	opportunities	255	mentor	145	tasks	511	challenge	457
11.	mentor	253	experience exchange	111	using	467	planning	435
12.	tools	207	collaboration	100	plan	442	everything	432
13.	self-directed	145	digital	80	courses	427	skolo	422
14.	feedback	138	feedback	66	experiences	426	understand	413
15.	skills	132	skills	56	complete	400	digital	362

Notes: *Green – common categories; **Yellow – possibly common categories.

5 DISCUSSION AND CONCLUSIONS

Many of the factors that educators mentioned as successes in their learning experience were also significant challenges. These challenges included learning to use new digital solutions, applying digital solutions in their work, collaborating with colleagues to learn and implement new digital solutions, and managing time effectively to achieve set goals. This suggests that the most challenging aspects of learning were also the most rewarding when accomplished. These findings highlight the importance of providing continuous and personalised support to educators in order to help them overcome the challenges they face and achieve the best possible results in implementing technology-enhanced learning. This support is crucial for driving significant and long-lasting change in education.

Practical approaches, such as gaining experience in implementing new digital solutions in teaching and learning, have been proven to enhance educators' digital competence [4, 6, 19, 27, 41]. Furthermore, both inexperienced and expert implementers of technology-enhanced learning can and should learn from their colleagues' experiences in order to successfully implement technology-enhanced learning, as demonstrated by the results of this research. This research also supports the notion proposed by Damşa and colleagues [30] that collaboration pathways and support encourage educators to explore new digital solutions. Collaboration with colleagues was mentioned as one of the main success factors by educators. Educators gaining and sharing their experiences with technology in support groups could be one of the reasons for participants' perceived success in achieving their learning goals. Nevertheless, personal and interpersonal factors play a significant role in the success of a support group. These factors include common learning goals, shared experiences among participants, active engagement in the support group, and other relevant factors [51, 52]. Therefore, external assistance and coordination would help establish well-organised and effective support groups [53, 54].

The research data clearly highlights that the primary obstacle faced by educators is the scarcity of time when integrating new technologies into their work. There is not enough time allocated for learning to use new digital solutions or teaching colleagues and students to use them. Allocating time for researching and implementing new digital tools is also mentioned as one of the main challenges and opportunities in other studies [37, 49]. Therefore, the additional time educators invest when working with new digital tools should be acknowledged. This process requires educators to not only explore various solutions but also evaluate their effectiveness for their students, strategize the most suitable and pedagogically sound approach for implementation in teaching and learning, and assess the pros and cons of their utilisation afterwards [12, 13].

A lack of availability of digital solutions was not mentioned as one of the main obstacles to implementing technology-enhanced learning by educators in this research. A lack of motivation to learn and implement digital solutions, however, was among the top obstacles to implementing new digital solutions in learning. This suggests that establishing common goals and requirements for technology-enhanced learning could have a greater impact on the success of digitalization efforts in the schools of the research participants. This is consistent with other research that emphasises the significance of having a clear vision for the successful implementation of technology-enhanced learning in the process of digitalization [27, 43]. Furthermore, although some participants mentioned technical issues, they were not among the top problems mentioned by educators. Rather, the lack of enthusiasm to implement digital solutions in learning among colleagues, including the school leadership team and, in some cases, students, caused the problems.

The successful implementation of digitization processes in school environments can be accomplished by combining educational and organisational changes, investing in digital technologies, and providing support for the development of student and educator competencies. Data from this research shows that while educators perceive the availability of digital technologies and infrastructure as mostly sufficient, the lack of a common vision, collaboration, and support for integrating digital solutions into learning is among the main issues for implementing technology-enhanced learning.

It should be taken into account that the research was carried out only in the context of Latvia. All educators enrolled in the further education course were provided with a uniform online learning design, which included lectures, practical sessions, and support group activities. Although the discussion provides interpretation based on the analysis of literature, the study's scope and the data used

did not provide answers as to why educators emphasised specific challenges or successes in their learning during the course. Therefore, more research should be conducted on how various learning designs can support the development of educators' pedagogical-digital competence. Furthermore, conducting more individualised research could offer a deeper understanding of the specific educational needs and experiences of educators.

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