Education Mind

EDUCATION MIND
2024, VOL 3, NO 3, 423-437
DOI: 10.58583/EM.3.3.10

Research Article

Open Access

Elementary school teachers' views on digital content development processes

İbrahim Topkara [1], Süleyman Erkam Sulak [1]

[1] Primary Education, Ordu University, Ordu, Turkey

ARTICLE HISTORY

Received: 19.08.2024
Accepted: 17.09.2024

KEYWORDS

Digital content development
Elementary school teachers
Digital literacy

CORRESPONDENCE

İbrahim Topkara,
ibrahimtopkara785@gmail.com

ABSTRACT

The aim of this study is to examine the views of elementary school teachers (ESTs) on digital content development (DCD) processes. In this regard, the difficulties faced by the ESTs in the process of DCD, their suggestions to tackle these difficulties and their resources and opportunities in the process of qualified DCD were investigated. In addition, the suggestions of the ESTs in facilitating and enabling the DCD process were addressed. The present study is qualitative research and designed in a case study design. Ten elementary school teachers working in the state schools in eight different provinces of Turkey participated in the study. The interviews were conducted online. The research data was collected through a semi-structured interview form. The interview form consists of 10 questions. The data of the study were analyzed via content analysis method. As a result of the data analysis, a total of 221 coding was conducted in line with the two sub-problems. The research findings have shown that, regarding the first sub-problem, elementary school teachers faced the most difficulties in developing digital content such as cloud usage and lack of digital skills, fell behind receiving sufficient support, and preferred video platforms such as YouTube to solve these difficulties. The results concerning the second sub-problem reveal that elementary school teachers experience difficulties such as insufficient technological infrastructure, hardware and training deficiencies. In this regard, It is recommended that Turkish digital content development platforms should be developed, necessary software and expert support should be provided for digital content development, and free access to hardware should be provided.

Introduction

The digital revolution in recent years has led to profound changes in numerous aspects of human life, including the way people communicate, work, play and learn (Borzenko et al., 2024). The transition to the digital age has affected many fields of science, but mostly education. Therefore, digital skills have been emerging in educational processes as a prerequisite to comply with the increasing digital economies and the society (van der Vlies, 2020). In order for this transformation to be effective in education, teachers are required to be equipped with digital skills.

One of the digital skills can be expressed as developing digital content (Kadarisman et al., 2022; Sulianta et al., 2019; Vuorikari et al., 2022). In this regard, the ability to develop digital content has become one of the fundamental skills for which individuals- notably educators- should qualify today. Moreover, far beyond the transmission of knowledge, it also involves developing students' 21st century skills such as critical thinking, creativity and digital literacy (Riyanto & Saluky, 2023). In this context, the promotion of digital content development skills is also likely to steer the future of education.

The competence framework for the development and measurement of digital competence has been established within DigComp, which is recognised by the European Union (EU). In this respect, one of the five competence areas required for digital competence is the ability to develop digital content (Vuorikari et al., 2022). Digital content generally refers to any content published in a computer-readable format (Redecker & Punie, 2017). According to Tuta and Luić (2020), digital contents are electronic contents either displayed electronically or on the internet for use in education and independent learning. The role of these contents in education should be supported by pedagogical approaches. Otherwise, there may be a risk of creating content that adversely affects the developmental areas of students away from pedagogical knowledge.

The skills of developing digital content can make learning more engaging and interactive for students by enabling teachers to create learning materials that may be adapted to various subject areas (Korkmaz & Akçay, 2024; Riyanto & Saluky, 2023; Saputra et al., 2024). Besides, digital contents are able to allow students not only to acquire knowledge, but also to think about how they use and learn this knowledge, thus enabling them to have a deeper learning experience (Nieto-Márquez et al., 2020). Therefore, digital teaching/learning content can be regarded as an effective tool in the teaching/learning process (Lamanauskas, 2017).

Digital content makes the learning process more efficient by providing ubiquitious and easy-to-use features that students can access anywhere and anytime (Kadarisman et al., 2022). Good content should be educationally useful and contain elements which can draw the attention of users (Kim, 2019). Making rich content and innovative curricula available online may ultimately help reduce inequality in the acquisition of essential knowledge (Alenezi et al., 2023).

The digital content development is a complicated process that includes the design, development, implementation and evaluation of educational materials and enables the production of content in accordance with learning objectives and target audience with a systematic approach (Çevik et al., 2024). Mete and Demir (2021) note that the digital content development process addresses the steps of 'creating the scenario to determine the content, identifying the graphic / visual design, determining the sound and music design, and revealing the material through software development'. According to Schwalbe (2009), this process, however, involves the steps of analysis and planning, design, development, implementation and evaluation. Both approaches show that the digital content development process has a wide framework from technical details to all steps.

'Examples of digital content are web pages and websites, social media, data and databases, digital audio such as mp3s and e-books, digital images, digital video, video games, computer programmes and software (Redecker & Punie, 2017). On the other hand, Mete and Demir (2021) classify digital content as interactive books, augmented reality applications, video games and multimedia tools. Digital content has become increasingly adaptable and diverse, ranging from digital textbooks to educational games, immersive Virtual Reality and Artificial Intelligence-generated content (Day et al., 2023). Despite this diversity, most teachers lack the necessary professional development to select and integrate digital resources into their classrooms (Xie et al., 2017).

Based on the related body of literature, it has been revealed that a large number of studies have been conducted on teachers' digital content development. The focal point of these studies are generally on the difficulties encountered in content development (Akram et al., 2022; Çevik et al., 2024; Kopcha, 2012; Martin et al., 2022), course contents (Clarke & Bowe, 2007; Yoldaş et al., 2023); digital competences (Hervás-Torres et al, 2024; Marnita et al., 2023; Polat & Göktaş, 2023); the principles of design (Rahmi & Azrul, 2021;) and digital content development platforms (Arkan & Kaya, 2018; González-Mingot et al., 2024; Kurtdede- Fidan et al., 2016). However, there is a limited number of studies on the difficulties faced by elementary school teachers (ESTs) in digital content development processes and solutions to overcome these difficulties (Akın et al., 2024; Ertem, 2016; Marnita et al., 2023).

In the light of abovementioned information, considering in a holistic approach, it is of great importance to understand the views of ESTs, who encounter difficulties in content development, on digital content development processes in order to enhance student learning in a more efficient way. In this context, the aim of this study is to investigate the views of elementary school teachers (ESTs) on digital content development (DCD) processes. To this end, answers to the following two sub-problems have been sought:

1. What difficulties do elementary school teachers face in the process of digital content development and what kind of solutions do they come up with to overcome these difficulties?
2. What are the opportunities, resources and needs of elementary school teachers in the process of developing qualified digital content and what can be done to facilitate and enable the processes?

Method

Research model

This study was conducted with the holistic single case study design among the qualitative research designs. Case studies mean to describe and examine a limited system in a detailed way (Merriam, 2018: 40). In addition, case studies encourage researchers to preserve and comprehend the integrity and coherence of a research topic (Punch, 2016: 144). In this study, elementary school teachers' opinions towards the digital content development process, their implementations and the difficulties they encounter during this process were investigated in the context of solutions and available resources. This study designed utilizing the case study approach aims at gaining an in-depth understanding of the experiences of elementary school teachers in digital content development processes.

Study group

The study group of this study consists of 10 elementary school teachers. The information regarding the participants is presented in Table 1 below.

Frequency and percentage values including information about the demographic information of the students are presented in Table 1.

Table 1 Participants' Information

Participant	Gender/ Age	City	Professional Experience	Education	Meeting Duration	Number of Coding
P1	Male/ 43	Ordu/ district	20th year	B.A.	24 mins.	28
P2	Male/ 42	Trabzon/village	20th year	M.A.	23 mins.	26
P3	Male/ 49	Elâzığ/ centre	23rd year	M.A	30 mins.	19

Participant	Gender/ Age	City	Professional Experience	Education	Meeting Duration	Number of Coding
P4	Female/ 52	Gaziantep/ centre	29th year	B.A.	29 mins.	20
P5	Female/ 52	Ordu/ district	23rd year	B.A.	30 mins.	26
P6	Female/ 40	Antalya/ district	19th year	B.A.	29 mins.	22
P7	Male/ 28	Gaziantep/ centre	3rd year	B.A.	22 mins.	17
P8	Male/ 43	Kocaeli/ district	20th year	B.A.	24 mins.	25
P9	Female/ 44	Nevşehir/ centre	23rd year	B.A.	23 mins.	18
P10	Female/ 41	Adıyaman/ district	18th year	B.A.	30 mins.	20
					Total Meeting Duration: 264 minutes, Total number of coding: 221	

*P=Participant

Table 1 shows the information regarding the participants in this study. 10 elementary school teachers who were working actively in eight different cities of Turkey participated in the interviews. The participants were selected considering the representation of different cities in Turkey and various working places (city centres, districts and villages). The professional experiences of the participants range between 3 and 29 years. 8 of 10 participant teachers hold a B.A. while the rest two hold an M.A. One of the participants has a double major in Computer Education and Instructional Technology (CEIT) and Elementary School Teaching in the Faculty of Education.

Data collection process

The interviews were held online on Zoom platform. Before the interviews, the participants were informed about the research and appointments were made with them accordingly. All participants participated in the interviews on the designated time and date. Necessary data could not be obtained from only one of the participants since the participant was not competent in digital content development at all. Therefore, the research data were collected via interviews conducted with 10 participants in total.

The data of this study was collected in March 2024. Firstly, a semi-structured interview form was developed by the researchers. In the first phase, an interview form with 21 questions was designed to contain questions regarding elementary school teachers' experiences in developing digital content, the difficulties they encounter and their needs in the process. Later, the form was sent to an academician who works on digital literacy and a language expert via email to be checked in terms of grammar, clarity and comprehensibility of the questions. The questions were designed to measure a single structure. Three questions that repeat and overlap among the other questions were removed from the form. The questions were rearranged to focus on difficulty detection and competency measurement. Based on the feedback received from the experts, the form was finalized to contain 10 questions.

Data analysis

First, the interviews that were recorded as audios based on the participants' permission were converted into texts via Microsoft Word program. The interviews transcribed were analysed in-dept with the content analysis among the qualitative data analysis methods. The content analysis is a systematic and objective research analysis method that aims to make reliable and valid interpretations on the oral, visual or written data to describe, make sense of and measure specific phenomenon (Downe-Wamboldt, 1992). MAXQDA software was used in this analysis process to manage and analyse the data in a more effective way.

In the first phase of the data analysis, the transcribed texts were read comprehensively and key statements and concepts related to the research questions were determined. These statements

were coded via the open coding method and themes were created by grouping the similar codes. The open coding method is the first and most basic step used in analysing qualitative data and is the process of examining the data by dividing it into meaningful pieces and assigning labels to these pieces (Punch, 2016). Each opinion was coded with vivo codes based on the participants' statements during the open coding process. During this coding process, a steady-state comparison technique was used to preserve the context of the data and obtain valid results. This technique contains the continuous evaluation of the relationship between the new codes and themes with the previous ones (Glesne, 2015).

After determining the main themes, the relationship among these themes was examined and it was evaluated how these themes contributed to the general purposes of the study. The themes and sub-themes were grouped under categories. In order to foster the validity of the findings obtained, an expert on digital literacy was consulted on this grouping operation. In line with the expert's opinions, some themes were reviewed and revised when necessary, during the analysis

Ethical issues

This study was conducted considering the principles covered in "Ethical Guide for Educational Research" published by British Educational Research Association (BERA) in 2018. This guide presents a comprehensive framework about the ethical issues in educational research. In line with this, the participants were informed about all aspects of the study (aim, methods, possible risks and advantages) and they freely decided to participate in it. They were clearly told that the interviews would be recorded as audio files and examined only by the researchers. Finally, the interview recordings and the transcriptions were stored securely.

All personal data of the participants was kept confidential during the transcription, analysis and reporting processes. In order not to call the participants with their names, the participants were coded as P1, P2, P3 … P10. In this way, the participants' identities were kept confidential, and their privacy was protected. The study did not harm the participants either physically or psychologically. During the interviews, the participants were treated kindly and with dignity and they were allowed to state their opinions without being interrupted or judged during the interviews.

Findings

This section presents firstly the findings regarding the first research question and then the findings regarding the second research question under the headings below.

Difficulties elementary school teachers encounter in digital content development process / their opinions regarding the solutions

Two themes were created for the difficulties the elementary school teachers encounter in the digital content development process and the solutions they implement to overcome these difficulties. These themes, according to their frequencies, are "*difficulties encountered (f=84)*" and "*solutions (f=34)*". As a result of the data analysis, the codes belonging to the themes created were presented according to their frequencies in Table 2 below.

Table 2 Difficulties encountered and solutions

Difficulties (f= 82)	Solutions (f= 34)
Cloud difficulties (f= 12)	YouTube support (f= 6)
Digital competence (f=12)	Trial/error (f= 5)
Technical problems (f=8)	Colleague/peer support (f= 5)
Free access (f= 7)	Expert support (f= 5)

Content development duration (f=6)	Research (f= 2)
Cognitive obstacles (f=5)	Differentiations (f= 2)
Planning/ organization (f=5)	Various memberships (f= 2)
Technological infrastructure (f=4)	Alternative tools (f= 1)
Foreign language (f= 4)	Similar studies (f= 1)
Students' interests/needs (f= 3)	Blogs (f= 1)
Storing (f= 2)	Trainings (f= 1)
Resistance to develop (f=2)	Book (f= 1)
Following updates (f= 2)	Educational program (f= 1)
Difficulty in use (f=2)	Artificial Intelligence (f= 1)
Expert support (f=2)	-
Information pollution (f=2)	-
Crowded classrooms (f=1)	-
Educational program (f=1)	-
Social pressure (f=1)	-
Being busy (f=1)	-
No difficulty (f=1)	-

According to Table 2, it is seen that a total of 116 coding operations were performed regarding the elementary school teachers' opinions towards the difficulties they encounter in developing digital content and their solutions for them. Within this context, the codes emerged were explained in the frame of the themes they are affiliated to by justifying them with participants' direct statements.

Difficulties encountered

Difficulties related to cloud system *(f= 12)* and digital competence *(f= 12)* are at the top of the list of the difficulties encountered by the elementary school teachers. In addition to this, technical problems *(f=8),* free access to platforms *(f= 7)* and long content development duration *(f=6)* are other difficulties experienced by the teachers.

The participants' experiences about the cloud related problems were classified under six categories as "*transfer problems, storage capacity, access problem, data loss risk, security concern, Inadequate free access opportunities*". The participant who stated no problems encountered is the one who is at the same time a graduate of Computer Education and Instructional Technology.

The participants' statements are as follows:

"*I can have problems in reaching the data in cloud. For instance, I can delete them by mistake, or sometimes I cannot find where I save them (P5)".*

"*There is also insecurity because the cloud system has not been completely settled yet. I guess there are not many cloud users in society. Finally, there is insecurity. We do not know what will happen to the information stored there (P3)".*

"If the size is big, there may be problems about transferring it (P2)".

"*Not everyone can use technology in this way. This is also a disadvantage. In other words, there are not many teachers who are competent about technology right now (P1).*

"I had no information regarding digital content development at first. To put it simply, I could not even make collages (P4)".

"I have never experienced any difficulties in this process (P7)".

"I had difficulties such as some of the content we prepared not being suitable for the smart board. (P8)".

"Also, you start enthusiastically at the beginning, they provide you with the program. Once you use it two or three times, it then becomes paid. Once I say, 'I have learned this content perfectly and I can use it', that moment it says, 'this is the paid version, you cannot use it' (P4)".

"Additionally, when we want to develop content for all objectives and specific topics and want it to be unique, that really requires a serious amount of time (P3)".

It is clear that the participants who are not graduates of CEIT have experienced more difficulties in digital content development process, which neatly shows the importance of CEIT education in order to improve elementary school teachers' digital content development skills. It is seen that the difficulties encountered by the elementary school teachers mostly rely on the difficulties in cloud usage and lack of digital competence. In addition to these, technical problems and long duration for content development also affect classroom teachers' digital content development process negatively.

Solutions

According to Table 2, it is observed that classroom teachers benefit most from YouTube *(f= 6)* to find a solution for the problems they encounter in digital content development process. Apart from YouTube, the methods most frequently used by classroom teachers are trial/error *(f= 5),* colleague/friend support *(f= 5)* and expert support *(f= 5)*. Other strategies are also used by teachers with varying frequencies.

The participants' statements are as follows:

"I took advantage of YouTube. When I sometimes had troubles or asked myself what to do next with that tool, I looked for an answer on YouTube (P7)".

"I benefit from video platforms such as YouTube. I also followed the channels that explain how to develop a specific content (P2)".

"I tried a lot before I discovered the videos on YouTube. I tried to find everything by trying myself and that took a lot of time (P9)".

"We are elementary school teachers. There are not many computer teachers or teacher trainers in our schools. However, I tried to get support from them when I had problems. Although there were not any computer teachers in my school, I could find support from them using my friendship network (P6)".

"I asked my friends who knew how to use these programs (P9)".

"Also, I got help from artificial intelligence. For example, I got support from artificial intelligence to create a song about a topic. My students and I thought about how to create the song together. AI generated really nice ideas for us. It led us. While it was providing us with ideas, we were able to generate more by moving from the ones given. It facilitated our work (P10)".

Elementary school teachers benefit from various solutions in digital content development process. The one mostly used among these solutions is the video platforms such as YouTube, which can be explained with its containing rich resources in terms of training videos and trainers and being user-friendly. Also, it is seen that some teachers have problems reaching a computer teacher or a teacher trainer. This shows that teachers are not supported adequately and that they need more guidance on developing digital content.

Elementary school teachers' needs in the digital content development process and their opinions about facilitating the process

Three themes were created regarding elementary school teachers' opinions about the opportunities and resources/needs in their schools in digital content development process and

facilitation of this process. These themes, according to their frequencies, are "*needs (f=42), facilitation/activation (f=42)* and *opportunities and resources (f=21)*. The codes under the themes created as a result of the analysis are presented according to their frequencies in Table 3 below.

Table 3 Elementary school teachers' opportunities/ needs/ what they need to do in digital content development process

Needs (f= 42)	Facilitation/ activation (f= 42)
Technological infrastructure (f= 7)	EBA (f= 9)
Training (f= 6)	Trainings (f= 9)
Purpose (f= 3)	Technological infrastructure (f= 7)
Motivation (f= 3)	Free access (f= 5)
Free access (f= 3)	Turkish platforms (f= 4)
Perception (f= 2)	Research (f= 1)
Accessibility (f= 2)	Ministry units (f= 1)
Content management (f= 2)	Collaboration (f= 1)
Variety of material/program (f= 2)	Material share (f= 1)
Student interests/needs (f= 2)	School website (f= 1)
Suitable program (f= 2)	Educational program (f= 1)
Time (f= 2)	Expert support (f= 1)
Inspection (f= 1)	Artificial intelligence (f= 1)
Topic selection (f= 1)	Opportunities and resources (f= 21)
Institutional support (f= 1)	Equipment/tools (f= 13)
Student readiness (f= 1)	Internet connection (f= 4)
Program literacy (f= 1)	Expert support (f= 3)
Specialization (f= 1)	In-service courses (f= 1)

Opportunities and resources

Table 3 shows that elementary school teachers have access to various opportunities and resources to develop digital content in their schools. The most available opportunities and resources are equipment and tools *(f=13)* and internet connection *(f=4)*. Equipment and tools include interactive whiteboards, computers, cameras, phones and smartboards. In-service courses *(f=1)* are also considered as an important resource for some teachers to improve their digital content development skills.

The participants' statements are as follows:

"We, my school, have met the interactive board this year, which became a surprise for all of us. This one was different from the ones in previous schools. PARDUS system was installed on it (P3)".

"There are also computers in the classrooms (P8)".

"In fact, every type of equipment is available. There are cameras, phones, smart boards. We have almost all opportunities (P2)".

"We have smart boards via which we can develop digital content in our school. Smart boards are productive but unfortunately the PARDUS system that we use is not a system that we can use very actively. It freezes from time to time. For this reason, we try to develop digital content with our own opportunities, our own computers and operating systems (P1)".

"Let me say this on behalf of our school, we have teacher trainers here. Our teacher trainers rush to help the teachers in need of help regarding digital content (P6)".

"There are courses offered by Ministry of National Education (MoNE) in our school (P5)".

"We have smart boards and internet in our school. However, since we are in a district away from the city centre, the internet speed is not very good (P8)".

It can be said that elementary school teachers generally have partial access to technological infrastructure in digital content development process. However, some teachers experience difficulties with internet infrastructure, which may lead to inequality in terms of developing digital content. For this reason, it is important to take action for all teachers to access necessary opportunities and resources.

Needs

When Table 3 is examined, it is seen that elementary school teachers have many needs in digital content development process. The most important needs include a strong technological infrastructure *(f=7),* trainings about digital content development *(f=6),* a purpose *(f=3),* motivation *(f=3)* and free access *(f=3)*.

The participants' statements are as follows:

"I think firstly elementary school teachers' perceptions should change. It seems to me like this because there are teachers among the ones I know that are still prejudiced about using smart boards. Therefore, the most important thing is that their perceptions should change (P7)".

"As all children today can access the internet, some contents/traditional technologies do not appeal to them anymore. For example, simulations and augmented reality applications should be used more in terms of providing variety (P8)".

"You should also have technological equipment, a nice computer. I could not prepare any content on my previous computer. When I downloaded a few programs and started working, it used to shut down (P9)".

"All teachers can be offered trainings on this. Based on the levels, such as separate trainings for elementary schools and separate trainings for high schools. The infrastructure of the school should be suitable for this. Coordinators can be assigned to offer simple trainings based on teachers' needs. The most critical thing is to save teachers from free-riding and to enable them to produce and present digital content themselves through trainings, I think (P3)".

"A motivation like 'I can do', 'everybody can do'. Or the school management should support teachers in digital content development process. They should guide teachers about trainings and courses, encourage them to improve themselves. They need to must pave the way for teachers without hindering them (P4)". "Well, an application may not solve everything, but I think there should be applications that will meet our problems or needs to a large extent, without turning it into too much of a commercialism. Fees affect us negatively. The ministry has a unit named YEĞİTEK. They should try to solve this problem with this unit (P3)".

Teachers complain about inadequate technological infrastructure, traditional methods not attracting the students' attention, lack of equipment, lack of training and lack of motivation. They also emphasize the need for free or low-cost tools and resources. It is especially important to change teachers' perceptions and increase their motivation. They should believe in the need for developing digital content and be eager for this topic. In addition, teacher trainings regarding digital content development are also critical. These trainings may enable teachers to develop more effective digital contents by providing them with necessary information and skills.

Facilitation and activation

When Table 3 is examined, it is seen that elementary school teachers' opinions about facilitation/activation of the digital content development process include EBA *(f=9)*, trainings *(f=9)*, technological infrastructure *(f=7)*, free access to platforms *(f=5)* and Turkish-based platforms *(f=4)*.

The participants' statements are as follows:

"EBA worked well during pandemic but now it is not sufficient. I have also witnessed that most of the ones who develop content in EBA get those from somewhere else and upload them on EBA. Our problem is that we do not consider it as a need since there are ready ones. We leave it there when we could perhaps produce much higher quality content. EBA needs to be updated based on needs. The responsible parties can ask teachers' opinions about their expectations from EBA, where they have problems most and which ones EBA can solve by getting feedback and conducting needs analysis (P3)".

"EBA is insufficient. I used it actively in the first phase of distance education. The logic behind it is also nice but it has not been improved enough. All assignments used to be performed there. There were also presentations and games in it. But they are insufficient. I find them unattractive to get children's attention. The infrastructure of EBA needs to be further strengthened and it needs to be better introduced to teachers because teachers do not know how to use it (P6)".

"There needs to be a technological room that is constantly renewed. Secondly, paid programs on the market should be offered to teachers free of charge. When you look at it, Canva seems like a free program for teachers, but it needs to be in the MoNE's own infrastructure, and teachers need to be given training on it. Because no matter how well you know it, you cannot keep up with the new updates (P1)".

"In fact, if we have entered a teaching process through children's discovery, I wish the tablets distributed in high schools had been given to the students in elementary schools as well. More beautiful digital contents would have been developed when the kids with their tablets go through the process together with us (P10)".

"It would be easier if there was a Turkish software. All are foreign based, and we are not very familiar with them (P1)".

"Teachers should be able to access paid, qualified programs with their MEBBIS (MoNE data processing systems) password. Teachers can be supported this way (P2)".

It is stated that the content in EBA is not up-to-date and not suitable for teachers' needs, its infrastructure is insufficient and that some teachers do not know how to use EBA. Teachers are of the opinion that organizing training on digital content development tools and their usages for teachers will facilitate the digital content development process.

In addition to this, there are not enough computers and tablets and sufficient internet connection at schools and teachers are not equipped with portable gadgets like laptops or tablets. Furthermore, teachers state that free access to the software and hardware required for developing digital content at schools should be provided and Turkish-based platforms should be developed by the MoNE. Providing teachers with this support in various ways will help them produce more effective digital content and create a richer learning environment for their students.

Discussion and conclusion

As the first result of this study, the cloud usage, technical problems, lack of digital competence and long content development durations encountered by elementary school teachers in the digital content development processes limit their participation in the digital transformation. The finding that teachers use cloud services such as Google Drive the most in schools in the study conducted by Mingot and Marín (2024) does not coincide with the results of the current study. On the contrary, the findings of this study are in harmony with the studies of Görmez and Şen (2023) who pointed out the deficiencies in technological infrastructure, of Akram and others (2022) who drew attention to internet speed and infrastructure deficiencies and of Hyndman (2018) who emphasized the deficiencies in technical support and time. While Demirel-Kaya and others (2024)

emphasized that teachers experience reluctance in developing digital content due to lack of time, Akın and others (2024) stated that internet connection problems and inadequacy of technological gadgets are highlighted difficulties in this process. These findings clearly show that technological infrastructure should be strengthened, and teachers should be supported in terms of time management in order for them to be successful in digital transformation. In addition, Lamanauskas (2017) stated that teachers face many challenges such as selecting the right teaching content, improving their technological skills and schools being equipped with the latest ICT tools. In this context, it is understood that both technical and pedagogical supports are required to be increased for the digital transformation to take place in an effective way.

In the second result of this study, it is found that elementary school teachers try out various strategies and look for support from various resources in order to adapt to the digital transformation. They often resort to methods like trial-error and colleague and expert support while generating their own solutions. Especially YouTube is widely used by teachers both as a teaching tool and to learn new and various teaching methods, to develop in certain subjects and to increase their professional competence (Adu-Marfo et al., 2024). According to the study conducted by Krauskopf et al. (2012), although YouTube is an entertainment-oriented platform, pre-service teachers consider it also as a source of information to stay up to date on various topics and actively participate in content and social interactions at the same time. The fact that teachers widely use these platforms is a sign that teachers need systematic training on this. Görmez and Şen (2023) revealed that teachers frequently received consultancy from information technologies teachers in this process. Hlasna et al. (2017) stated that the most important factor supporting ICT use is firstly the training provided by the employer which is followed by peer support. Ertmer et al. (2006) emphasized that intrinsic motivation is more decisive than extrinsic factors in effective technology use. The study by Kopcha (2012) also showed that professional development techniques such as mentoring support teachers in overcoming barriers to technology use. These findings reveal that teachers need systematic training and a strong network for support during the digital transformation process, and also the importance of intrinsic motivation in this process.

The third result of this study points out that the factors that teachers need most in digital content development processes are a strong technological infrastructure, various trainings on the topic, free access to platforms and Turkish-based platforms. Furthermore, high motivation of teachers stands out as an important element supporting these processes. These findings emphasize how critical these factors are for teachers to be successful in the digital transformation. When the literature is examined, it is seen that the most commonly used ICT tools include interactive boards, internet and educational programs (Hlasna vd., 2017). Similarly, in the study of Akın et al. (2024), four basic needs were identified among the supports that teachers need in developing digital content: expert support, educational materials, technological infrastructure support and pedagogical support. These results reveal the importance of a comprehensive support system to be provided to teachers for the effective implementation of the digital transformation.

The fourth result of this study reveals that EBA, various trainings, strong technological infrastructure, free access to platforms and Turkish-based platforms facilitate teachers' digital content development processes the most. Özalp and Reisoğlu (2022) stated that teachers need support particularly in digital resources, assessment and evaluation processes and supporting students. Kara and Örer (2024) emphasized that digital learning programs and resources should be easily accessible. Also, it is stated that infrastructure, connectivity and digital equipment, high-quality content, user-friendly tools and secure platforms are critical to support a high-performance digital education ecosystem (European Commission, 2020).

According to the last result of this study, the elements that most facilitate teachers' digital content development processes include EBA, various trainings, a strong technological infrastructure, free access to platforms and Turkish-based platforms. These results reveal how critical these elements are for teachers to be successful in the digital transformation. Ertmer et al. (2006) pointed out that teachers want to learn new ideas and tools that are directly relevant to their current situation and that are offered at flexible times the most. When the literature is examined, Kurtdede-Fidan et all. (2016) stated that elementary school teachers prefer to use the contents in EBA, however, they are reluctant to develop content for it. Supporting this, Akın and others (2024) pointed out that EBA should be improved. It was stated that teachers are in need of sufficient trainings to implement and teach digital technologies (Spiteri & Chang Rundgren, 2020; van der Vlies, 2020). These findings clearly demonstrate the importance of training and support provided to teachers in order to successfully implement digital transformation.

The results of this study reveal the difficulties encountered by elementary school teachers in digital content development processes, the elements that support and facilitate these processes, and the strategies for adapting to the digital transformation in a comprehensive manner. It is understood that a strong technological infrastructure, support in time management and systematic training are of critical importance for teachers to be successful in digital transformation. In addition, high motivation of teachers stands out as an important element supporting success in digital content development processes. The results show that in order for the digital transformation to be conducted effectively, a comprehensive support system should be provided to teachers and the trainings offered to them should be increased.

Recommendations

1. Considering the technical problems that teachers encounter in the digital content development process, and their deficiencies in digital competence, it is important to provide a stronger technological infrastructure in schools. In this context, comprehensive improvements should be made by the state or local governments in terms of internet connection and technical support.
2. Continuous training programs should be organized to ensure that teachers gain the skills they need in the digital content development process. These trainings should be designed to enable teachers to use digital resources effectively and should focus on practical implementations.
3. Considering the importance of intrinsic motivation in teachers' participation in digital transformation, educational models that include motivation-enhancing strategies should be developed and implemented. Especially, educational programs that are offered at flexible times and include content that addresses teachers' current needs can make teachers more eager to participate in this process.
4. An integrated support system that provides both technical and pedagogical support can be created to solve the problems that teachers encounter in the digital content development process. This system can help teachers manage their digital transformation processes more effectively by providing consultancy services, mentoring programs and expert support.

Acknowledgements

Extended summary of this article was presented as an oral presentation at the International Congress of Integrated Social Research and Interdisciplinary Studies (ISRIS), held from May 30 to June 1, 2024, in Batumi, Georgia.

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

Adu-Marfo, A. O., Kwapong, O. A. T. F., Oheneba-Sakyi, Y., & Miller-Young, J. (2024). Understanding teachers' usage of YouTube as a pedagogical tool: A qualitative case study of basic school teachers in Ghana. *E-Learning and Digital Media*. https://doi.org/10.1177/20427530241239393

Akın, M., Berk, G., Erol, E., & Erol, M. E. (2024). Öğretmenlerin öğretim teknolojilerini kullanımı ve öğretim teknolojilerine adaptasyonu [Teachers' use of and adaptation to instructional technologies]. *Ulusal Eğitim Dergisi [National Education Journal]*, *4*(1), 58-77. https://doi.org/10.5281/zenodo.10542817

Akram, H., Abdelrady, A. H., Al-Adwan, A. S., & Ramzan, M. (2022). Teachers' perceptions of technology integration in teaching-learning practices: A systematic review. *Frontiers in Psychology, 13*, 920317. https://doi.org/10.3389/fpsyg.2022.920317

Alenezi, M., Wardat, S., & Akour, M. (2023). The need of integrating digital education in higher education: Challenges and opportunities. *Sustainability*, *15*(6), 4782. https://doi.org/10.3390/ su15064782

Arkan, A. ve Kaya, E. (2018). Eğitim bilişim ağı (EBA) ve 2023 eğitim vizyonu [Education information network (EBA) and 2023 education vision]. *SETA Perspektif*, 221.

Borzenko, O., Tamozhska, I., Varhata, O., Hetmanenko, L., & Shevchuk, V. (2024). The Influence of Information Technologies on Modern Teaching Methods. *International Journal of Religion*, *5*(10), 403-411. https://doi.org/10.61707/f45ryd78

British Educational Research Association. (2018). *Ethical guidelines for educational research*. London: BERA.

Clarke, O., & Bowe, L. (2007). Interactive digital content for teaching and learning English as a second language. *TESOL in Context*, *17*(1), 15-22.

Çevik, M., Uysal, A., Kellerlioğlu, H. A., Uğraş, N. H., & Ertürk, A. (2024). Eğitimde dijital içerik geliştirme stratejileri [Digital content development strategies in education]. *International QMX Journal*, *3*(2), 922-929. https://doi.org/10.5281/zenodo.10729215

Day, L., Colonnese, F., Gasparotti, A., Batura, O., Melstveit, M., Olausson, N., ... & Looney, J. (2023). *Digital education content in the EU: State of play and policy options*.

Demirel Kaya, E., Güler, Z., Aras, C., Çimen, Y., Özdoğan, M. A., Yazıcı, M. F., & Taşıyaran, M. (2024). *Cumhuriyetin 100. yılında öğretmenlerin gözüyle teknoloji ve eğitim bölgesel çalıştayları raporu [Report of regional workshops on technology and education through the eyes of teachers on the 100th anniversary of the Republic*]. Talim Terbiye Kurulu Başkanlığı [Presidency of the Board of Education]. Ankara.

Downe-Wamboldt, B. (1992) Content analysis: Method, applications, and issues. *Health Care for Women International 13*(3): 313–321. http://dx.doi.org/10.1080/07399339209516006

Ertem, İ. (2016). Oyun temelli dijital ortamlar ve Türkçe öğretiminde kullanımına ilişkin sınıf öğretmenlerinin görüşleri [Opinions of elementary school teachers on game-based digital environments and their use in teaching Turkish]. *Akdeniz Eğitim Araştırmaları Dergisi [Mediterranean Journal of Educational Research]*, (20), 1-10

Ertmer, P. A., Ottenbreit-Leftwich, A., & York, C. S. (2006). Exemplary technology-using teachers: Perceptions of factors influencing success. *Journal of computing in teacher education*, *23*(2), 55-61.

European Commission. (2020). Digital education action plan (2021-2027) Resetting education and training for the digital age. Available at: https://ec.europa.eu/education/education-in-the-eu /digital-education-action-plan_en

Glesne, C. (2015). *Nitel araştırmaya giriş [Introduction to qualitative research]* (A. Ersoy & P. Yalçınoğlu, Eds.). Ankara: Anı Yayıncılık.

González-Mingot, S., & Marín, V. I. (2024). Digital educational platforms in primary education: the case of Catalonia. *Technology, Pedagogy and Education*. https://doi.org/10.1080/1475939X.2024.2337346

Görmez, E., & Şen, A. (2023). Okulların teknolojik alt yapılarının öğretmenlerin dijital okuryazarlık becerisine yansıması üzerine bir çalışma [A study on the reflection of schools' technological infrastructure on teachers' digital literacy skills]. *Uluslararası Karamanoğlu Mehmetbey Eğitim Araştırmaları Dergisi [International Karamanoğlu Mehmetbey Educational Research Journal]*, *5*(2), 110-127. https://doi.org/10.47770/ukmead.1359655

Hervás-Torres, M., Bellido-González, M., & Soto-Solier, P. M. (2024). Digital competences of university students after face-to-face and remote teaching: Video-animations digital create content. *Heliyon 10* (11). https://doi.org/10.1016/j.heliyon.2024.e32589

Hlasna, P., Klímová, B., & Poulova, P. (2017). Use of information and communication technologies in primary education–A case study of the Czech Republic. *International Electronic Journal of Elementary Education*, *9*(3), 681-692.

Hyndman, B., (2018). Ten reasons why teachers can struggle to use technology in the classroom, *Science Education News*. 67, 4, 41-42.

Kadarisman, Marisa, Asnah M.N. Limbung, & Suryo Prabowo. (2022). Training on the Development of Utilization of Digital Teaching Materials for Teachers to Improve Student Learning Outcomes. *JTP - Jurnal Teknologi Pendidikan, 24*(3), 400–411. https://doi.org/10.21009/jtp.v24i3.31799

Kara, A., & Örer, B. (2024). Öğrenci ve öğretmen görüşleriyle dijital okuryazarlık ile dil öğreniminde etik. *Dijital Okuryazarlık Araştırmaları [Digital Literacy Research]* (F. Kana & Y. M. Elkıran, Eds.), 37-51. Holistence Publications.

Kim, J. (2019). A study on the change of education system with the development of digital content industry. *International journal of advanced smart convergence*, *8*(3), 145-150. http://dx.doi.org/10.7236/IJASC.2019.8.3.145

Korkmaz, M., & Akçay, A. O. (2024). Determining digital literacy levels of primary school teachers. *Journal of Learning and Teaching in Digital Age*, *9*(1), 1-16. https://doi.org/10.53850/joltida.1175453

Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers & Education*, *59*(4), 1109-1121. https://doi.org/10.1016/j.compedu.2012.05.014

Krauskopf, K., Zahn, C., & Hesse, F. W. (2012). Leveraging the affordances of Youtube: The role of pedagogical knowledge and mental models of technology functions for lesson planning with technology. *Computers & Education*, *58*(4), 1194-1206. https://doi.org/10.1016/j.compedu.2011.12.010

Kurtdede- Fidan, N., Erbasan, Ö. & Kolsuz, S. (2016). Sınıf öğretmenlerinin eğitim bilişim ağı'ndan (EBA) yararlanmaya ilişkin görüşleri [Elementary school teachers' views on using the education information network (EBA)]. *Uluslararası Sosyal Araştırmalar Dergisi [International Journal of Social Research], 9*(45), 626-637. https://doi.org/10.17719/jisr.20164520642

Lamanauskas, V. (2017). *Reflections on education*. Siauliai: Scienta Socialis.

Marnita, M., Nurdin, D., & Prihatin, E. (2023). The effectiveness of elementary teacher digital literacy competence on teacher learning management. *Journal of Innovation in Educational and Cultural Research*, *4*(1), 35-43. https://doi.org/10.46843/jiecr.v4i1.444

Martin, F., Gezer, T., Wang, W. C., Petty, T., & Wang, C. (2022). Examining K-12 educator experiences from digital citizenship professional development. *Journal of Research on Technology in Education*, *54*(1), 143-160. https://doi.org/10.1080/15391523.2020.1815611

Merriam, S. B. (2018). Nitel Araştırma, Desen ve Uygulama İçin Bir Rehber [A Guide to Qualitative Research, Design, and Implementation], (*S. Turan, Ed.). Nobel Yayıncılık*, Ankara.

Mete, G., Demir, T. (2021). Alan uzmanlarının Türkçe dersi dijital içerik geliştirme sürecine yönelik görüşleri [The opinions of field experts on the process of developing digital content for Turkish lessons]. *Akademik Sosyal Araştırmalar Dergisi [Academic Social Research Journal],* 9/116, 202-224. http://dx.doi.org/10.29228/ASOS.51084

Mingot, S. G., & Marín, V. I. (2024). Digital educational platforms in primary education: The case of Catalonia. *Technology, Pedagogy and Education*, 1-19. https://doi.org/10.1080/1475939X.2024.2337346

Nieto-Márquez, N. L., Baldominos, A., & Pérez-Nieto, M. Á. (2020). Digital teaching materials and their relationship with the metacognitive skills of students in primary education. *Education Sciences, 10*(4), 113. https://doi.org/10.3390/educsci10040113

Özalp, E., & Reisoğlu, İ. (2022). Examining the digital competencies of teachers working in primary education institutions in terms of various variables. In *International Social Sciences Congress in the Age of Digital Transformation*, İstanbul, Turkey.

Polat, E., & Göktaş, Y. (2023). Türkiye'deki devlet okulu öğretmenlerinin pedagojik dijital beceri yeterlilik düzeyi [Pedagogical digital skills proficiency level of public school teachers in Turkey]. *HUMANITAS-Uluslararası Sosyal Bilimler Dergisi [HUMANITAS-International Journal of Social Sciences], 11* (INCSOS VIII Special Issue), 298-318. https://doi.org/10.20304/humanitas.1248731

Punch, K. F. (2016). *Sosyal Araştırmalara Giriş* [*Introduction to Social Research*], (D. Bayrak, H. B. Arslan & Z. Akyüz, Eds.), Siyasal Kitabevi, Ankara.

Rahmi, U., & Azrul, A. (2021). Message design of printed and digital material to meaningful learning. *Al-Ta Lim Journal*, *28*(1), 26-34. http://dx.doi.org/10.15548/jt.v28i1.634

Redecker, C. (2017). *European framework for the digital competence of educators: DigCompEdu* (Y. Punie, Ed.). Publications Office of the European Union. https://doi.org/10.2760/159770

Riyanto, O. R., & Saluky, S. (2023). Differences in teachers digital content production skills for learning. *Indonesian Journal of Cyber Education*, *1*(2), 95-104.

Saputra, D. S., Yonanda, D. A., Yuliati, Y., & Haryanti, Y. D. (2024). The effectiveness of digital teaching materials to improve literary literacy skills in primary schools. *Jurnal Cakrawala Pendas*, *10*(3), 671-679. http://dx.doi.org/10.31949/jcp.v10i3.10384

Schwalbe, C. B. (2009). Leveraging the digital media habits of the millennials: Strategies for teaching journalism courses. *Southwestern Mass Communication Journal, 25*(1), 40-88

Sulianta, F., & Supriatna, N. (2019). Digital content model framework based on social studies education. *International Journal of Higher Education*, *8*(5), 214-220. https://doi.org/10.5430/ijhe.v8n5p214

Tuta, J., & Luić, L. (2020). Information-communication significance of digital teaching materials in e-education, *Proceedings of ICERI2020 Conference*, 6291–6297, https://doi.org/10.21125/iceri.2020.1354

van der Vlies, R. (2020). Digital strategies in education across OECD countries: Exploring education policies on digital technologies. *OECD Education Working Papers*, 226. https://doi.org/10.1787/ 33dd4c26-en

Vuorikari, R., Kluzer, S. and Punie, Y., DigComp 2.2: The Digital competence framework for citizens - With new examples of knowledge, skills and attitudes, EUR 31006 EN, *Publications Office of the European Union*, Luxembourg, 2022, ISBN 978–92–76–48883–5. https://doi.org/10.2760/490274, JRC128415

Xie, K., Kim, M. K., Cheng, S. L., & Luthy, N. C. (2017). Teacher professional development through digital content evaluation. *Educational Technology Research and Development*, *65*, 1067-1103. https://doi.org/10.1007/s11423-017-9519-0

Yoldaş, D., Halil, Ç., Özkul, S., Taş, M., Ayçiçek, H., Yalçın, H., ... & Ölmez, G. (2023). Web 2.0 uygulamaları ve araçları ile hazırlanan dijital ders içeriklerinin eğitim öğretime etkisi [The impact of digital course contents prepared with Web 2.0 applications and tools on education]. *International Journal of Social Humanities Sciences Research*, *10*(92), 313- 325. http://dx.doi.org/10.26450/jshsr.3507