



DOI: <https://doi.org/10.57125/ELIJ.2023.09.25.02>

How to cite: Huda, O. (2023). The role of communication between parents and teachers in the implementation of electronic learning elements in secondary school. *E-Learning Innovations Journal*, 1(2). 21-38. <https://doi.org/10.57125/ELIJ.2023.09.25.02>

The role of communication between parents and teachers in the implementation of electronic learning elements in secondary school

Nataliia Stepanova

*Candidate of Philosophical Sciences, Associate Professor, Department of Preschool and Special Education of the Educational and Scientific Institute of Pedagogical Education, Social Work and Art of Bohdan Khmelnytskyi Cherkasy National University, Cherkasy, Ukraine,
<https://orcid.org/0000-0002-6842-629X>*

Lidiia Pletenytska*

*PhD, Candidate of Pedagogical Sciences, Associate Professor of the Department of primary education, Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk, Ukraine,
<https://orcid.org/0000-0003-1867-8314>*

Tetiana Zakharina

Candidate of Pedagogical Sciences, Associate Professor, Professor, Department of Social Rehabilitation and Social Pedagogy, Faculty of Psychology, Chernihiv National University of Technology, Chernihiv, Ukraine, <https://orcid.org/0000-0003-0357-7457>

***Correspondence email:** lidiapletenicka@gmail.com.

Received: February 9, 2023 | **Accepted:** May 22, 2023 | **Available online:** September 25, 2023

Abstract: The modern school system is undergoing an active digital transformation. The introduction of electronic tools in secondary education opens up a number of opportunities, but in this system, timely communication between parents and teachers and is vital, which affects the



effectiveness of e-learning control. This paper aims to analyze the impact of communication between parents and teachers during the process of introducing e-learning elements. The study selected 7 secondary schools that are actively implementing e-learning or elements of e-learning. The sample consists of two groups of participants: teachers (19) and parents (120). The inclusion criteria for teachers were based on their experience in teaching with the use of electronic technologies and their experience with online platforms. Parents were selected on a random basis. The main tool in the study was a questionnaire based on a Likert scale. The results show that the surveyed teachers actively use modern digital technologies to effectively organize e-learning. There is also a noticeable improvement in students' results when using modern electronic tools and learning support. Communication between parents and teachers contributes to the support of the E-learning system. Besides, current teachers use a variety of communication tools, such as emails, websites, or specific mobile applications, to inform parents about curricula, programs, schedules, and other aspects of learning. The findings note that communication improves both tracking of results and facilitates more effective engagement. The final recommendations are to create effective channels of communication between teachers, students and parents to facilitate information exchange and interaction, and to improve the involvement of parents in the innovative educational development through electronic means.

Keywords: interaction between parents and teachers, secondary education system, digitalization, electronic technologies, surveys.

Introduction

In secondary school, communication between parents and teachers plays an important role in tracking student performance. At the same time, the current education system is increasingly using e-learning, which uses various innovations and digital technologies. All of them are aimed at realizing one theme: improving the learning process. Recent research has shown the importance of digital technologies for making learning accessible and flexible (Alam, 2021; Vahtivuori-Hänninen et al., 2014). Besides, it has also been determined that they contribute to the formation of creativity and digital literacy, which is now particularly in demand in the labor market (Zhang & Aslan, 2021). Some studies have identified the potential of e-learning as contributing to the formation of additional competencies and expanding new horizons for students (Al Rawashdeh et al., 2021; Edelhauser & Lupu-Dima, 2020). However, on the other hand, modern studies have also identified that the introduction of these innovative technologies is accompanied by various challenges, among which communication between parents and teachers can also play an important role (Zarei & Mohammadi, 2021). Some studies have shown that in secondary schools with e-learning, it is significant to communicate with the child's parents or guardians on a regular basis (Alenezi, 2020). Thus, the need of effective interaction can lead to a number of misunderstandings, low technology implementation, and lower learning outcomes.

Research Problem

Hence, given the previous trends in the rampant influence of electronic technologies on the secondary education system, it is important to highlight the role of interaction between parents and teachers and their use of modern electronic learning support tools. Thus, the school pedagogy of cooperation is based on establishing effective interaction between all participants in the educational process. It is especially important to emphasize new opportunities for



organizing parent-teacher interaction, which in fact plays a key role in the implementation of the educational process required in modern conditions. Digitalization tools open up new opportunities for establishing such cooperation. For this reason, e-learning in secondary school is an important mechanism for adapting the educational system to the changing demands of globalization and critical challenges. This study will be useful in the context of developing new recommendations for improving the level of parent-teacher collaboration to achieve better outcomes for today's students

Research Focus

As can be seen from the research problem, communication in secondary schools between parents and teachers is critical to tracking outcomes. Therefore, the focus of this study is to analyze the role of communication between parents and teachers in the implementation of e-learning elements in secondary schools. In particular, the study aims to conduct a preliminary survey among parents and teachers to identify the main barriers and opportunities that arise in the process of such communication. The analysis will also be aimed at studying the interaction on the success of the e-learning system implementation.

Research Aim and Research Questions

Therefore, the purpose of this study is to identify the main aspects of effective communication between parents and teachers that contribute to the successful implementation of e-learning elements in secondary school. Hence, the research questions are:

1. What is the importance of e-learning in the secondary school system?
2. What is the assessment of the impact of communication on the success of e-learning?
3. What recommendations can be developed to improve parent-teacher interaction?

Literature Review

Modern scientific literature presents various aspects of e-learning implementation in education at different levels. The authors provide important information on understanding the nuances of the introduction of electronic technologies in education. Alzahrani (2020) conducted a methodical review of the benefits of implementing augmented and virtual reality technologies in e-learning. This author drew attention to the fact that the augmented reality system has an important potential to improve the knowledge acquisition for students. Alqahtani and Rajkhan (2020) comprehensively characterized the peculiarities of e-learning implementation according to the analysis of various effective strategies and models during the threat of COVID-19. Other authors have drawn attention to the fact that the effective implementation of an e-learning system requires teachers to have an appropriate level of training and highly developed digital literacy (Androshchuk et al., 2020; Malik, 2021). Babic et al. (2020) described the main factors influencing secondary school teachers' intentions to use e-learning technologies. The authors note that during the pandemic, these technologies proved to be effective and therefore, teachers are actively using them in the post-Covid-19 era. A continuation of this idea can be found in other works (Stojanović et al., 2020; Vasilache, 2022). Bai et al. (2021) identified the impact of modern technologies and innovative solutions in secondary education on English language learning through an e-learning approach. The authors explained that the introduction of electronic technologies contributes to the formation of independence for students. A similar trend can be



traced in other works that describe the impact of technology on the formation of the extracurricular environment and the development of 21st century skills (Berg et al., 2021; Engeström & Käyhkö, 2021; Evans & Achiam, 2021). Also, Firmansyah et al. (2020) identified the value of an out-of-school environment based on electronic technologies that complement the traditional learning system. Other studies also emphasize the importance of supporting learning environments based on remote technologies (Díaz-Iso et al., 2019; Feraco et al., 2021). Bolat (2020) emphasized the importance of managing such a model of education and stressed the introduction of knowledge monitoring and scale validation principles to regulate such learning. The theoretical study by Castilho Barilli (2012) is also important, analyzing the problem of using modern technology as an important didactic resource for e-learning. Cheng and Yuen (2020) conducted a systematic and multi-group analysis of the adoption and continued use of e-learning systems among secondary school students from different social backgrounds. The authors also characterized various factors that influence their ability to engage with these technologies. Chen et al. (2020) provided an overview of the impact of artificial intelligence on improving certain aspects of educational services. Cohen (2021) also demonstrated the role of machine learning as an important area for transforming the education system as a whole. This issue was also addressed by Darwish (2022), who discussed the importance and implications of using artificial intelligence systems in modern e-learning. Modern authors have also drawn attention to the issue of the readiness of current teachers to implement e-learning systems, especially in times of crisis (Ebner et al., 2020; Favale et al., 2020).

Opportunities for further development of digitalization, in particular, the use of artificial intelligence to establish communication between parents and teachers, have become a separate topic for research. For example, Joshi et al. (2021) considered the use of artificial intelligence capabilities to be an indispensable companion to education in the future. Besides, other researchers have also emphasized the importance of adapting the educational process to the new digital environment, taking into account the possibilities of using artificial intelligence (Koos, 2018; Panigrahi, 2020). In particular, it has been proposed to introduce automated programs to ensure cooperation between parents and teachers, which would quickly identify some opportunities to improve learning (Lee & Lee, 2021; Miller, 2019). Saleem et al. (2021) conducted a systematic review of the possibilities of using digital technologies in secondary school education: thanks to this, many scientific views on this topic have been processed and systematized. However, they also noted the possible need for additional teacher training (Sork, 2020).

Modern research has also shown that e-learning is an important process of interactive and online learning (Gherheş et al., 2021). E-learning is becoming popular among an increasing number of users primarily because of its practicality and a number of advantages that have been described in detail by modern scholars. First of all, e-learning is available to everyone at any time and in any place (Haleman & Yamat, 2021; Valverde-Berrocso et al., 2020). At the same time, there are many different courses and lessons on various topics, so there is a significant opportunity to choose any field and direction of study and form a convenient flexible schedule of classes (Gruson et al., 2019). Also, according to Kibuku et al. (2020), relevance is a particularly important advantage. At the same time, the value of online materials is that they are constantly updated, and modern innovative solutions do not stand still, and children always want to be aware of the latest inventions and know how to work with them (Korhonen et al., 2021). Therefore, modern authors have formed an important theoretical framework for studying the peculiarities of



e-learning, recognizing its main advantages. However, as can be seen from the review, the problem of communication is not widely raised by the authors. Therefore, the main focus of this study is to analyze the role of communication between learners, including parents and teachers, in the e-learning system. This aspect determines the scientific value of this study.

Materials and Methods

The paper is written systematically and in stages. This study is based on an experiment and the collection of materials based on a survey conducted among teachers and parents. Therefore, the study uses a quantitative approach and conducts a detailed quantitative data analysis.

Sample and Participants

Secondary schools that are actively implementing e-learning or elements of e-learning were selected for the study. Therefore, 7 secondary schools that actively implement e-learning elements were selected for the experiment. The system of selection of schools was based on several important criteria to guarantee the representativeness of the study. In particular, geographical location was an important factor. Schools were selected from different regions (Lviv, Ivano-Frankivsk, Kyiv, and Cherkasy). This was done to take into account some possible differences in the implementation of the e-technology system. Another important criterion was the level of e-learning implementation. The school should have experience in implementing electronic technologies. The authors of the experiment also took into account the diversity of students. Thus, the selection of schools was based on educational institutions with different social statuses of students.

The sample consists of two groups of participants: teachers and parents. The inclusion criteria for teachers were based on their experience in teaching with the use of electronic technologies and experience in using modern online platforms. As a result, 19 teachers were selected. Parents were selected on the basis of random participation in the study. Every participant gave their informed permission to take part in the experiment and to the research processing of their data. A total of 120 parents were included. Table 1 provides a description of the informative statistics from the respondents.

Table 1

Description of the Sample of Teachers and Parents

Parameter	N	%
Teachers		
Gender		
Men	8	45%
Women	10	55%
Age		
25-34	4	22%
35-44	6	33%
45-54	6	33%
55	2	11%



Total work experience (in years)		
Less than 5	3	17%
5-10	5	28%
11-20	6	33%
More than 20	4	22%
Work experience in management positions		
Less than 5 years	10	56%
5-10 years	5	28%
More than 10 years	3	17%
Parents		
Gender		
Men	50	40%
Women	75	60%
Age		
Up to 30	20	16%
31-40	60	48%
41-50	30	24%
Over 50	15	12%
Education		
Secondary education	30	24%
Incomplete higher education	20	16%

Source: Author's development.

Instruments and Procedures

The survey was conducted in stages. First, teachers were interviewed, and then parents. The survey was anonymous and conducted online using Google Forms. The questionnaires were designed separately for teachers and parents and contained one question each. The survey was based on a Likert scale, where 1 - "strongly disagree", 2 - "disagree", 3 - "neither agree nor disagree", 4 - "agree", 5 - "strongly agree".

For teachers:

1. I am completely satisfied with the systematic implementation of E-learning at my school
2. I use various electronic technologies in the teaching process
3. Students actively use electronic learning materials
4. Better results of pupils are visible in the process of using e-learning materials
5. I have sufficient level to implement the effective use of electronic tools in teaching.
6. I regularly use digital technologies to communicate with parents
7. I frequently inform parents about the use of modern electronic tools.



8. Parents are actively interested in the implementation of e-learning.
9. Communication with parents helps me to better understand the needs of students.
10. Active use of electronic tools facilitates the communication system with parents.

For parents:

1. I am fully satisfied with the e-learning system at my child's school.
2. My child's learning is based on various electronic technologies
3. The child actively uses and learns with the help of e-learning materials
4. I can see the child's progress based on the use of electronic learning materials
5. I am satisfied with the teacher's level of use of electronic technologies
6. Teachers support my child in the process of e-learning
7. Teachers often inform about the use of modern electronic tools.
8. I am actively interested in the implementation of e-learning.
9. Communication with teachers helps me to better understand the needs of the child.
10. Active use of electronic tools facilitates communication with the school.

The survey was completely anonymous, and no signs of inequality were found during the survey. Each participant provided their informed permission to take part and have their answers processed for further research and data interpretation.

Data Analysis

The data obtained were processed by entering key responses into Excel spreadsheets. Thematic analysis of the responses was carried through the specification and identification of the main assessments and topics.

Statistical methods were used to characterize the percentage distribution of responses (thus characterizing the response to each question in the questionnaire). Graphical methods were used to create diagrams of the distribution of answers.

The comparative analysis of the findings with the conclusions of other scientists is carried out by means of comparison.

Results

The introduction of e-learning opens up new prospects for the development of secondary education. Digital technologies make it accessible, so students can learn from different locations (Pulkkinen et al., 2019). It is especially chief to implement it in high school when students are preparing to enter higher education. Therefore, the educational institutions selected for the study are actively introducing E-learning systems into the educational space. Teachers generally rate their rank of pleasure with the implementation of E-learning at 4 and 5 points (9 and 7 respondents, respectively). The other 3 respondents rate it between 2 and 3 points. The survey also found that teachers use various electronic technologies to create an effective e-learning model. The statement "I use various electronic technologies in the teaching process" was rated



by teachers at 4 and 5 points (10 and 9 people respectively). Taking into account the performance of their students, teachers indicated that they actively understand modern technologies and skillfully use e-learning materials. The statement Students actively use e-learning materials was mostly rated at 5, 4, and 3 points (8, 6, and 5 people, respectively). At the same time, teachers also notice better student performance when using modern electronic tools and learning support tools (see Table 2).

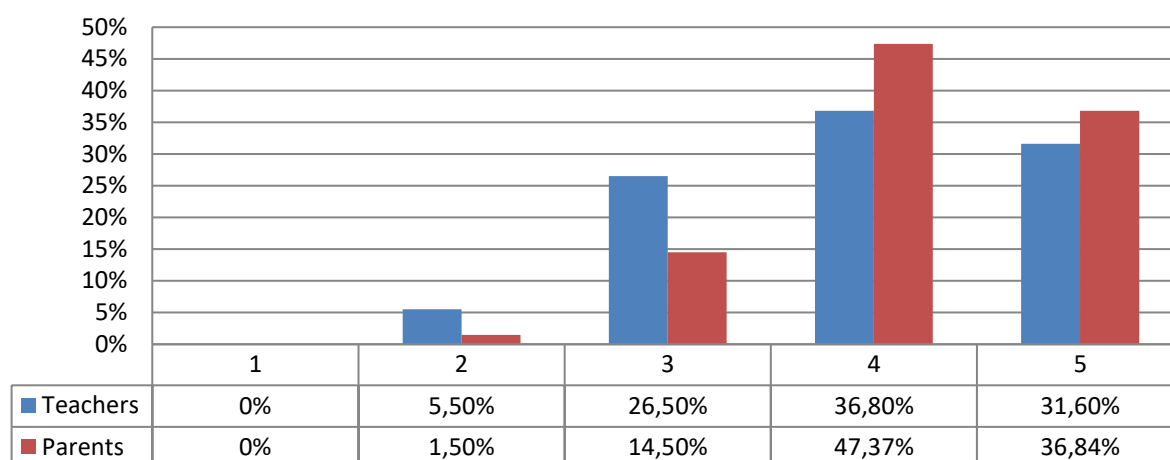
Table 2

Teachers' Assessment of the Use of E-Learning in Secondary Schools

Questions	1	2	3	4	5
I am satisfied with the systematic implementation of E-learning	0 0%	2 10,5%	1 5,25%	9 47,37%	7 36,84%
I use various e-technologies in the learning process	0 0%	0 0%	0 0%	10 52,63%	9 47,37%
Students actively use electronic learning materials	0 0%	0 0%	5 26,32	6 31,58%	8 42,11%
Better results of students are visible in the use of electronic materials	0 0%	2 10,5%	6 31,58%	7 36,84%	4 21,05%

Source: Author's development

However, the fact that not all teachers are satisfied with the system of E-learning implementation available to them indicates that there is potential for improvement of this model of learning in secondary schools. However, the proving point is that students are able to use e-learning materials skillfully, and teachers notice better results. Most teachers rated their level of use of electronic tools at 4 points. This is a high level, which means that most teachers are familiar with electronic learning systems. On the other hand, parents are also satisfied with the level of teachers' use of electronic technologies, as evidenced by their scores (5 points - 36.84%, 4 points - 47.37%, 3 points - 14.5%, and 2 points - 1.5% (See Figure 1).

**Figure 1***Assessment of E-Learning Proficiency*

Source: Author's development.

Thus, as shown in Figure 1, most teachers have sufficient skills to use electronic tools effectively. This factor is especially important for effective interaction between teachers and parents based on digital tools and resources. At the same time, parents are generally satisfied with the e-learning system in their schools (5 points - 32.0%, 4 points - 28.0%, 3 points - 24.0%). Parents rated the statement that their child's education is based on various electronic technologies mostly at 5 - 60.08% and 4 - 24.8%. The majority of parents also said that their children are skillful in learning with the help of modern electronic materials provided by teachers (5 points - 44.8%, 4 points - 28.0%, 3 points - 27.2%). Some parents often gave a score of 3 in their questionnaires. This indicates that it is difficult for them to assess the real state of their children's learning and performance, or they find it difficult to assess their children's progress. However, despite this trend, most parents see their child's progress in the e-learning system (see Table 3).

Table 3*Parents' Assessment of the Use of E-Learning in Secondary School*

Questions	1	2	3	4	5
I am satisfied with the e-learning system at my child's school	0 0%	20 16,0%	30 24,0%	35 28,0%	40 32,0%
The child's learning is based on various electronic technologies	3 2,4%	3 2,4%	12 9,6%	31 24,8%	76 60,08%
The child actively uses and learns with the help of e-learning materials	0 0%	18 14,4%	34 27,2%	35 28,0%	56 44,8%
I can see my child's progress based on the use of e-learning materials	0 0%	8 6,4%	12 9,6%	64 51,2%	41 32,8%

Source: Author's development.



Thus, modern parents determine that their child is making progress based on the use of modern electronic materials. At the same time, communication between parents and teachers is particularly essential in the e-education system, which is ensured through various digital means of communication. It is especially important for tracking the results of students, i.e. for realizing successful learning of children. Modern teachers use a variety of communication tools, such as emails, websites, or individual mobile applications, to inform parents about curricula, programs, schedules, and other aspects of education (Moreno-Guerrero et al., 2020). This is also evidenced by the survey data.

The majority of teachers indicated that they often inform parents through certain electronic means of communication (5 points - 52, 63%) (see Table 4). Parents' responses also reflect this trend, as 64 people, or 51.2%, indicated that teachers do communicate with them actively. This, in turn, improves both the tracking of results and facilitates more effective interaction. Besides, the electronic communication system allows parents to quickly contact teachers through electronic channels in order to receive information about their child's performance, progress, and to discuss any issues or concerns. On the other hand, the majority of teachers agree or strongly agree with the statement that parents are actively interested in the implementation of e-learning (42.11% and 26.32% respectively). The survey also found that active communication with parents helps teachers better understand certain problems with students. Moreover, 52.63% of teachers or 10 respondents fully support the thesis that the active use of electronic tools improves the system of interaction and is effective. Parents also indicated that they are interested in interaction in the e-learning environment and are interested in the implementation of e-learning (76 or 60.08% strongly agree and 31 or 24.8% agree). Parents also recognized that the active use of electronic tools facilitates communication with the school (see Table 4).

Table 4

Communication Aspects of E-Learning Organization

Questions	1	2	3	4	5
Teachers					
I often inform parents about the use of modern electronic tools	0 0%	0 0%	0 0%	9 47,37%	10 52,63%
Parents are actively interested in the implementation of e-learning	0 0%	2 10,53%	3 15,79%	10 52,63%	4 21,05%
Communication with parents helps to better understand the needs of students	0 0%	0 0%	0 0%	8 42,11%	11 57,89%
Active use of electronic tools facilitates the communication system	0 0%	0 0%	0 0%	9 47,37%	10 52,63%
Parents					



Teachers often inform about the use of modern electronic tools	1 1,2%	3 2,4%	10 8,0%	47 36,7%	64 51,2%
I am actively interested in the implementation of e-learning	3 2,4%	3 2,4%	12 9,6%	31 24,8%	76 60,08%
Communication with teachers helps me better understand the needs of my child	0 0%	8 6,4%	12 9,6%	64 51,2%	41 32,8%
The use of electronic tools facilitates communication with the school.	0 0%	0 0%	11 8,8%	35 25%	79 63,2%

Source: Author's development.

Thus, as Table 4 shows, there are noticeable trends in the responses of parents and teachers. In particular, they identify the important role of communication tools for the effective implementation of e-learning. Also, communication e-technologies allow teachers to provide parents with recommendations or specific advice on how to better support children's learning at home through electronic channels (Prasetyo et al., 2020). Besides, the electronic communication system allows teachers and parents to discuss the individual needs of each child and seek individual joint solutions to realize their successful learning.

Discussion

The proposed results demonstrate the interest of teachers and parents in the further use of digital technologies in the organization of the educational process. In particular, the findings indicate that modern teachers are actively engaged in modern technologies and skillfully use electronic learning materials, which has a constructive impact on student outcomes. This confirms the findings of other researchers, according to which the ability of teachers to adapt to modern real-world learning environments has a positive effect on learning (Lapada et al., 2020; Niemi & Kousa, 2020). Similarly, the proposed study confirms the results of Lukas and Yunus (2021), which indicate that students quickly adapt to updated learning environments, in particular those related to the digitalization of education. Besides, the research survey showed that teachers use various electronic technologies to form an effective e-learning model, which somewhat contradicts the results of other researchers (Ouyang & Jiao, 2021; Rostam Abadi et al., 2022). In particular, it was proposed to use proven methods that have gained general recognition (Ouyang & Jiao, 2021). The difference in results can be explained by the use of different educational methodologies, some of which are based on centralized management and others on a certain democratization of school education.

The findings generally confirm the tendency to take into account the importance of parents' opinions when organizing the educational process in secondary schools (Irfan et al., 2020). The proposed results indicate that current educators have a fairly high level of proficiency in using digital tools, which is also highly appreciated by parents. The findings confirm the results of researchers who also indicate that there is potential for improving learning in secondary school (Mailizar et al., 2020; Mohammed & 'Nell' Watson, 2019). In particular, researchers have



repeatedly drawn attention to certain solutions that can improve the joint and coordinated work of parents and teachers in the education and upbringing of students. Given the fact that teachers are undoubtedly more knowledgeable about education and upbringing, an important aspect of such interaction is establishing communication between parents and teachers and the management of the institution. In fact, according to scientists, it is the administration that should help ensure that parents have up-to-date information about the educational process (Shymkova et al., 2021). This will contribute to the overall activation and interest in this process. In order to establish communication between parents and teachers, it is proposed to hold regular open meetings: the presence of parents in the classroom will allow them to observe the organization of the educational process, discuss all issues, make certain comments, and listen to teacher suggestions (Akram et al., 2022; Lavonen, 2020). Importantly, the use of digital elements can simplify this process. The physical presence of parents at school is not so necessary, as the realization of the elements of blended learning involves the use of remote elements. Therefore, "class attendance" can be organized at a convenient time, which generally does not take much time and effort (Lavonen, 2020; Oyediran et al., 2020). The use of such a tool may be important in the next organization of schooling, but will require additional empirical validation.

The findings, for example, demonstrate that teachers are interested in using various means of communication, such as emails, websites or apps, etc. to establish communication with parents. At the same time, parents are also interested in such cooperation and actively seek contact with teachers, monitoring their children's progress and problems in learning, which was also partially emphasized by researchers (Tarteer et al., 2022). As a result, the further evolution of parent-teacher cooperation in secondary school will take into account elements of digitalization and its active use by all participants in the educational process.

The proposed methodology has its limitations. In particular, the Likert scale is generally considered to be a rather subjective survey tool (Lasmanawati et al., 2021), as there are no clear criteria for distinguishing between adjacent scores of 2 and 3, 3 and 4, and each respondent made a distinction between such criteria at their own discretion. In general, this could have made some adjustments to the calculations, shifting the emphasis in the survey by a few tenths of a point. Secondly, the use of the most recent research literature was due to the importance of using digital elements in teaching, which have been actively used at this time. However, the emphasis on English-language literature could potentially result in a certain methodological limitation, as some relevant recent studies written in other languages could have been overlooked.

Conclusions and Implications

Hence, parents and teachers recognize the effectiveness of the e-learning system and identify its advantages, including accessibility and flexibility of students' schedules. Parents also noted the variety of electronic technologies used in teaching their children. For this reason, the selected schools are actively implementing various tools to improve the educational process. It is worth noting that a significant number of respondents noted progress in children's learning due to the use of electronic learning materials. At the same time, the study demonstrated the important role of communication in secondary schools that implement E-learning. Parents and teachers recognize the important role of modern communication tools for the effective implementation of e-learning. Also, communication e-technologies enable teachers to provide parents with advice on how to better support their children's learning at home through electronic channels. Therefore, in light of the results, the following suggestions are given:



1. Modern educational institutions should create effective communication channels between teachers, students and parents to facilitate information exchange and interaction.

2. To improve the involvement of parents in the education through electronic means. The data showed that some parents find it difficult to accurately define the role of electronic technologies. This may be due to a lack of awareness, so the authors of the article recommend improving parental involvement through remote communication technologies.

3. Finally, teachers or school administrators should provide parents with clear instructions on how to use e-learning systems and provide quick support in case of questions.

These recommendations will help to improve communication between all participants in the learning process, as the study has shown that its role is especially important in the E-learning space.

Suggestions for Future Research

This study has opened up several important areas for studying this problem. In particular, the study recommends that schools create effective communication channels between teachers, students, and parents to facilitate information exchange and interaction. Therefore, the next area of research is to describe the role of these communication channels and their impact on communication. The paper also proposes to improve the participation of parents in the current educational process through electronic means. Therefore, an important area for further research is to develop mechanisms to improve parents' willingness to communicate with teachers. Another important direction is to link the role of interaction and communication by interviewing all parties to the educational process, including students. This study will demonstrate the role of communication by interviewing all participants in the learning system. In addition, given the local nature of the experiment, future studies should focus on reaching a larger audience, in particular, it would be worthwhile to include more teachers in the study. This affected the validity of the results. Therefore, further research may affect the validity of these results and, based on their comparison, new recommendations for improving communication interaction in secondary schools can be made. Thus, this problem remains relevant and will require the study of new and new directions of communication in the environment of modern schools.

Acknowledgements

None.

Conflict of Interest

None.

Funding

The Author received no funding for this research.

References

Akram, M., Javed, H. M. A., Niaz, S. F., & Mahmood, W. (2022). The availability, use, and issues of secondary schools teachers towards e-learning. *Journal of Social Sciences Review*, 2(4), 90-96. <https://doi.org/10.54183/jssr.v2i4.60>



- Alam, A. (2021). Possibilities and apprehensions in the landscape of artificial intelligence in education. In *2021 international conference on computational intelligence and computing applications (ICCICA)* (pp. 1-8). IEEE. <https://doi.org/10.1109/iccica52458.2021.9697272>
- Alenezi, A. (2020). The role of e-learning materials in enhancing teaching and learning behaviors. *International Journal of Information and Education Technology*, 10(1), 48-56. <https://doi.org/10.18178/ijiet.2020.10.1.1338>
- Al Rawashdeh, A. Z., Mohammed, E. Y., Al Arab, A. R., Alara, M., Al-Rawashdeh, B., & Al-Rawashdeh, B. (2021). Advantages and disadvantages of using e-learning in university education: Analyzing students' perspectives. *Electronic Journal of e-Learning*, 19(3), 107-117. <https://doi.org/10.34190/ejel.19.3.2168>
- Alzahrani, N. M. (2020). Augmented reality: A systematic review of its benefits and challenges in e-learning contexts. *Applied Sciences*, 10(16), Article 5660. <https://doi.org/10.3390/app10165660>
- Alqahtani, A. Y., & Rajkhan, A. A. (2020). E-learning critical success factors during the COVID-19 pandemic: A comprehensive analysis of e-learning managerial perspectives. *Education Sciences*, 10(9), Article 216. <https://doi.org/10.3390/educsci10090216>
- Androshchuk, I., Androshchuk, I., Kurach, M., Khrenova, V., & Livshun, O. (2020). The system of training future teachers for organizing extracurricular activities of pupils. *Revista Romaneasca pentru Educatie Multidimensionala*, 12(2), 60-85. <https://doi.org/10.18662/rrem/12.2/266>
- Babic, S., Sucic, S. K., & Sinkovic, G. (2020). Understanding the factors that influence secondary school teachers' intention to use e-learning technologies for teaching after the COVID-19 pandemic. In *2020 43rd International Convention on Information, Communication and Electronic Technology (MIPRO)* (pp. 848-853). IEEE. <https://doi.org/10.23919/mipro48935.2020.9245433>
- Bai, B., Wang, J., & Zhou, H. (2021). An intervention study to improve primary school students' self-regulated strategy use in English writing through e-learning in Hong Kong. *Computer Assisted Language Learning*, 35(9), 2265-2290. <https://doi.org/10.1080/09588221.2020.1871030>
- Berg, T. B., Achiam, M., Poulsen, K. M., Sanderhoff, L. B., & Tøttrup, A. P. (2021). The role and value of out-of-school environments in science education for 21st century skills. *Frontiers in Education*, 6, Article 674541. <https://doi.org/10.3389/feduc.2021.674541>
- Bolat, Y. (2020). Out-of-school learning and scale of regulating out-of-school learning: Validity. *International Journal of Education Technology and Scientific Researches*, 5(13), 1630-1663. <https://doi.org/10.35826/ijetsar.258>
- Castilho Barilli, E. C. V. (2012). Virtual reality technology as an didactical and pedagogical resource in distance education for professional training. In P. B. Muyinda (Ed.), *Distance education* (pp. 141-156). InTech. <https://doi.org/10.5772/50625>
- Cheng, M., & Yuen, A. H. K. (2020). Junior secondary students' acceptance and continuance of e-learning system use: A multi-group analysis across social backgrounds. *Behaviour & Information Technology*, 41(2), 324-347. <https://doi.org/10.1080/0144929x.2020.1811378>



- Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, 8, 75264–75278. <https://doi.org/10.1109/access.2020.2988510>
- Cohen, S. (2021). The evolution of machine learning: Past, present, and future. In *Artificial intelligence and deep learning in pathology* (p. 1–12). Elsevier. <https://doi.org/10.1016/b978-0-323-67538-3.00001-4>
- Darwish, A. (2022). Explainable artificial intelligence: A new era of artificial intelligence. *Digital Technologies Research and Applications*, 1(1), 1. <https://doi.org/10.54963/dtra.v1i1.29>
- Díaz-Iso, A., Eizaguirre, A., & García-Olalla, A. (2019). Extracurricular activities in higher education and the promotion of reflective learning for sustainability. *Sustainability*, 11(17), Article 4521. <https://doi.org/10.3390/su11174521>
- Ebner, M., Schön, S., Braun, C., Ebner, M., Grigoriadis, Y., Haas, M., Leitner, P., & Taraghi, B. (2020). COVID-19 epidemic as e-learning boost? Chronological development and effects at an Austrian university against the background of the concept of “E-learning readiness”. *Future Internet*, 12(6), Article 94. <https://doi.org/10.3390/fi12060094>
- Edelhauser, E., & Lupu-Dima, L. (2020). Is Romania prepared for e-learning during the COVID-19 pandemic?. *Sustainability*, 12(13), Article 5438. <https://doi.org/10.3390/su12135438>
- Engeström, R., & Käyhkö, L. (2021). A critical search for the learning object across school and out-of-school contexts: A case of entrepreneurship education. *Journal of the Learning Sciences*, 30(3), 401–432. <https://doi.org/10.1080/10508406.2021.1908296>
- Evans, H. J., & Achiam, M. (2021). Sustainability in out-of-school science education: Identifying the unique potentials. *Environmental Education Research*, 27(8), 1192–1213. <https://doi.org/10.1080/13504622.2021.1893662>
- Feraco, T., Resnati, D., Fregonese, D., Spoto, A., & Meneghetti, C. (2021). Soft skills and extracurricular activities sustain motivation and self-regulated learning at school. *The Journal of Experimental Education*, 90(3), 550–569. <https://doi.org/10.1080/00220973.2021.1873090>
- Favale, T., Soro, F., Trevisan, M., Drago, I., & Mellia, M. (2020). Campus traffic and e-Learning during COVID-19 pandemic. *Computer Networks*, 176, Article 107290. <https://doi.org/10.1016/j.comnet.2020.107290>
- Firmansyah, F., Rahayu, W., & Nurjannah, N. (2020). Evaluation of the entrepreneurship education program through extracurricular activities of Student Company. *Jurnal Penelitian dan Evaluasi Pendidikan*, 24(1). <https://doi.org/10.21831/pep.v24i1.19783>
- Gherheș, V., Stoian, C. E., Fărcașiu, M. A., & Stanici, M. (2021). E-learning vs. face-to-face learning: Analyzing students’ preferences and behaviors. *Sustainability*, 13(8), Article 4381. <https://doi.org/10.3390/su13084381>
- Gruson, D., Helleputte, T., Rousseau, P., & Gruson, D. (2019). Data science, artificial intelligence, and machine learning: Opportunities for laboratory medicine and the value of positive regulation. *Clinical Biochemistry*, 69, 1–7. <https://doi.org/10.1016/j.clinbiochem.2019.04.013>



- Haleman, K. N., & Yamat, H. (2021). The acceptance of e-learning among ESL primary school students during Covid-19. *Journal of English Language Teaching and Applied Linguistics*, 3(1), 8-18. <https://doi.org/10.32996/jeltal.2021.3.1.2>
- Irfan, M., Kusumaningrum, B., Yulia, Y., & Widodo, S. A. (2020). Challenges during the pandemic: Use of e-learning in mathematics learning in higher education. *Infinity Journal*, 9(2), 147-158. <https://doi.org/10.22460/infinity.v9i2.p147-158>
- Joshi, S., Rambola, R. K., & Churi, P. (2021). Evaluating artificial intelligence in education for next generation. *Journal of Physics: Conference Series*, 1714, Article 012039. <https://doi.org/10.1088/1742-6596/1714/1/012039>
- Kibuku, R. N., Ochieng, P. D. O., & Wausi, P. A. N. (2020). E-learning challenges faced by universities in Kenya: A literature review. *Electronic Journal of e-Learning*, 18(2), 150-161. <https://doi.org/10.34190/ejel.20.18.2.004>
- Koos, S. (2018). Artificial intelligence – science fiction and legal reality. *Malaysian Journal of Syariah and Law*, 6(3), 23-29. <https://doi.org/10.33102/mjsl.v6i3.135>
- Korhonen, T., Juurola, L., Salo, L., & Airaksinen, J. (2021). Digitisation or digitalisation: Diverse practices of the distance education period in Finland. *Center for Educational Policy Studies Journal*, 11(Sp.Issue), 165-193. <https://doi.org/10.26529/cepsj.1125>
- Lapada, A. A., Miguel, F. F., Robledo, D. A. R., & Alam, Z. F. (2020). Teachers' covid-19 awareness, distance learning education experiences and perceptions towards institutional readiness and challenges. *International Journal of Learning, Teaching and Educational Research*, 19(6), 127-144. <https://doi.org/10.26803/ijlter.19.6.8>
- Lasmanawati, E., Muktiarni, M., & Maosul, A. (2021). Analysis learning management system in vocational education. *IOP Conference Series: Materials Science and Engineering*, 1098(2), Article 022089. <https://doi.org/10.1088/1757-899x/1098/2/022089>
- Lavonen, J. (2020). Curriculum and teacher education reforms in Finland that support the development of competences for the twenty-first century. In F. M. Reimers (Ed.), *Audacious education purposes* (pp. 65-80). Cham: Springer. https://doi.org/10.1007/978-3-030-41882-3_3
- Lee, H. S., & Lee, J. (2021). Applying artificial intelligence in physical education and future perspectives. *Sustainability*, 13(1), Article 351. <https://doi.org/10.3390/su13010351>
- Lukas, B. A., & Yunus, M. M. (2021). ESL teachers' challenges in implementing e-learning during COVID-19. *International Journal of Learning, Teaching and Educational Research*, 20(2), 330-348. <https://doi.org/10.26803/ijlter.20.2.18>
- Mailizar, M., Almanthari, A., Maulina, S., & Bruce, S. (2020). Secondary school mathematics teachers' views on e-learning implementation barriers during the COVID-19 pandemic: The case of Indonesia. *Eurasia Journal of Mathematics, Science and Technology Education*, 16(7), Article em1860. <https://doi.org/10.29333/ejmste/8240>
- Malik, A. S. (2021). Digital technology, artificial intelligence, and future of medical education. *Journal of University Medical & Dental College*, 12(2), 4-5. <https://doi.org/10.37723/jumdc.v12i2.622>



- Miller, T. (2019). Explanation in artificial intelligence: Insights from the social sciences. *Artificial Intelligence*, 267, 1–38. <https://doi.org/10.1016/j.artint.2018.07.007>
- Mohammed, P. S., & 'Nell' Watson, E. (2019). Towards inclusive education in the age of artificial intelligence: Perspectives, challenges, and opportunities. In J. Knox, Y. Wang, & M. Gallagher (Eds.), *Artificial intelligence and inclusive education* (p. 17–37). Singapore: Springer. https://doi.org/10.1007/978-981-13-8161-4_2
- Moreno-Guerrero, A.-J., Aznar-Díaz, I., Cáceres-Reche, P., & Alonso-García, S. (2020). E-learning in the teaching of mathematics: An educational experience in adult high school. *Mathematics*, 8(5), Article 840. <https://doi.org/10.3390/math8050840>
- Niemi, H. M., & Kousa, P. (2020). A case study of students' and teachers' perceptions in a finnish high school during the COVID pandemic. *International Journal of Technology in Education and Science*, 4(4), 352–369. <https://doi.org/10.46328/ijtes.v4i4.167>
- Ouyang, F., & Jiao, P. (2021). Artificial intelligence in education: The three paradigms. *Computers and Education: Artificial Intelligence*, 2, Article 100020. <https://doi.org/10.1016/j.caeai.2021.100020>
- Oyediran, W. O., Omoare, A. M., Owoyemi, M. A., Adejobi, A. O., & Fasasi, R. B. (2020). Prospects and limitations of e-learning application in private tertiary institutions amidst COVID-19 lockdown in Nigeria. *Heliyon*, 6(11), Article e05457. <https://doi.org/10.1016/j.heliyon.2020.e05457>
- Panigrahi, A. (2020). *Role of artificial intelligence in education*. SSRN. <https://doi.org/10.2139/ssrn.3666702>
- Prasetyo, Y. T., Tumanan, S. A. R., Yarte, L. A. F., Ogoy, M. C. C., & Ong, A. K. S. (2020). Blackboard E-learning system acceptance and satisfaction among Filipino high school students: An extended technology acceptance model (TAM) approach. In *2020 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)* (pp. 1271–1275). IEEE. <https://doi.org/10.1109/ieem45057.2020.9309876>
- Pulkkinen, J., Räikkönen, E., Jahnukainen, M., & Pirttimaa, R. (2019). How do educational reforms change the share of students in special education? Trends in special education in Finland. *European Educational Research Journal*, 19(4), 364–384. <https://doi.org/10.1177/1474904119892734>
- Rostam Abadi, Z., Seydi, M. S., & Golmohammadian, M. (2022). Analyzing teachers' beliefs about the desired classroom: A phenomenological study of the intellectual system of high school teachers. *Journal of Counseling Research*, 21(83), 179–191. <https://doi.org/10.18502/qjcr.v21i83.11089>
- Saleem, A. N., Noori, N. M., & Ozdamli, F. (2021). Gamification applications in e-learning: A literature review. *Technology, Knowledge and Learning*, 27, 139–159. <https://doi.org/10.1007/s10758-020-09487-x>
- Shymkova, I., Tsvilyk, S., Hlukhaniuk, V., Solovei, V., & Harkushevskyi, V. (2021). Use of learning management system ILIAS in teaching technologies for intending teachers of secondary and vocational education. *Society. Integration. Education. Proceedings of the International Scientific Conference*, 5, 470–482. <https://doi.org/10.17770/sie2021vol5.6313>



- Sork, V. L. (2020). Creating inclusive classrooms by engaging STEM faculty in culturally responsive teaching workshops. *International Journal of STEM Education*, 7(1), Article 32. <https://doi.org/10.1186/s40594-020-00230-7>
- Stojanović, D., Bogdanović, Z., Petrović, L., Mitrović, S., & Labus, A. (2020). Empowering learning process in secondary education using pervasive technologies. *Interactive Learning Environments*, 31(2), 779-792. <https://doi.org/10.1080/10494820.2020.1806886>
- Tarteer, S., Much, Y. A., Ghanem, M., Odeh, A., Elian, S., Hashaykeh, S., Salha, S., Affouneh, S., & Khlaif, Z. N. (2022). Challenges facing online learning during COVID-19. In D. Burgos & S. Affouneh (Eds.), *Radical solutions in Palestinian higher education* (p. 119-133). Singapore: Springer. https://doi.org/10.1007/978-981-19-0101-0_10
- Valverde-Berrocoso, J., Garrido-Arroyo, M. d. C., Burgos-Videla, C., & Morales-Cevallos, M. B. (2020). Trends in educational research about e-learning: A systematic literature review (2009-2018). *Sustainability*, 12(12), Article 5153. <https://doi.org/10.3390/su12125153>
- Vasilache, S. (2022). Suddenly online: Active learning implementation strategies during remote teaching of a software engineering course. In M. E. Auer, H. Hortsch, O. Michler, & T. Köhler (Eds.), *Mobility for smart cities and regional development - challenges for higher education* (pp. 395-402). Cham: Springer. https://doi.org/10.1007/978-3-030-93904-5_40
- Vahtivuori-Hänninen, S., Halinen, I., Niemi, H., Lavonen, J., & Lipponen, L. (2014). A new Finnish national core curriculum for basic education (2014) and technology as an integrated tool for learning. In H. Niemi, J. Multisilta, L. Lipponen, & M. Vivitsou (Eds.), *Finnish innovations and technologies in schools* (pp. 21-32). Rotterdam: SensePublishers. https://doi.org/10.1007/978-94-6209-749-0_2
- Zarei, S., & Mohammadi, S. (2021). Challenges of higher education related to e-learning in developing countries during COVID-19 spread: A review of the perspectives of students, instructors, policymakers, and ICT experts. *Environmental Science and Pollution Research*, 29, 85562-85568. <https://doi.org/10.1007/s11356-021-14647-2>
- Zhang, K., & Aslan, A. B. (2021). AI technologies for education: Recent research & future directions. *Computers and Education: Artificial Intelligence*, 2, Article 100025. <https://doi.org/10.1016/j.caeai.2021.100025>