Moodle-Based Development of Primary Education under Martial Law

Marianna Ostrovska[a,*], Olha Tretiak[b], Halyna Smolnykova[c], Olena Studenets[d], Maria Ivanchuk[e]

[a] **Corresponding Author:** Marianna Ostrovska, Department of Pedagogy and Psychology, Ferenc Rákóczi II Transcarpathian Hungarian College of Higher Education, Beregovo, Ukraine.
E-mail: pedagog.m23@gmail.com
ORCID: https://orcid.org/0000-0001-8810-3810

[b] Olha Tretiak, Department of Science and Mathematics Education and Technologies, Institute of In-Service Education, Borys Hrinchenko Kyiv University, Kyiv, Ukraine.
E-mail: ottretiak@gmail.com
ORCID: https://orcid.org/0000-0002-1160-055X

[c] Halyna Smolnykova, Department of Science and Mathematics Education and Technologies, Institute of In-Service Education, Borys Hrinchenko Kyiv University, Kyiv, Ukraine.
E-mail: galasmolnikova@gmail.com
ORCID: https://orcid.org/0000-0001-5853-146X

[d] Olena Studenets, Department of Theory and Methods of Preschool and Primary Education, Khmelnytskyi Institute of Post-Graduate Pedagogical Education, Khmelnytskyi, Ukraine.
E-mail: olenastud@gmail.com
ORCID: https://orcid.org/0000-0003-2871-0621

[e] Maria Ivanchuk, Department of Pedagogic and Methodics of Primary School Teaching, Faculty of Pedagogy, Psychology and Social Work, Yuriy Fedkovych Chernivtsi National University, Chernivtsi, Ukraine.
E-mail: mariaivanchuuuk@gmail.com
ORCID: https://orcid.org/0000-0002-8104-9724

Abstract

A specific feature of the organization of education during wartime is the creation of a modern educational environment for the harmonious development of students in conditions of war. The substantiation of ways of developing qualities, values and competences of primary school students is important for solving a number of contradictions between the quality training of students to be competitive in the process of building labour relations at age stages, and the insufficient level of their real preparation for productive activities. There is also a contradiction between a significant volume of promising information in the conditions of rapidly changing technologies and unadjusted educational environment to innovative changes in terms of its analysis and use. The aim of the study was to determine the impact of the Moodle platform on the academic performance of primary schoolers under martial law. The aim was achieved through the use of the following methods: questionnaire survey, testing, methods of statistical analysis. It was found that the introduction of the modernized curriculum in the Moodle platform had a positive effect on the academic performance of the students of the experimental group (EG) compared to the students who used the traditional platform. The crosswords, interactive assignments, as well as animated videos in case of correct completion of tests were also added to encourage students to complete additional assignments after the lesson. This also affected the positive result of the final stage of testing. A promising direction for further research may be the development of interactive tasks for primary schoolers to better assimilate the material they have learned.

Keywords:

Learning Management System, Moodle, Primary School, Distance Education, Martial Law

Introduction

February 2022 divided the life of every Ukrainian into the periods before and after the war. All spheres of everyday life of society, including the educational sector, underwent global changes during the martial law. But, despite the dangerous situation in the country, educational institutions continue to provide educational services to students using online learning. The ability to obtain permanent access to education played an important role in the lives of students, parents and teachers. The necessary transition to an unusual format for obtaining educational services has contributed

to the development of the latest platforms and tools for online education, as well as online courses. This demonstrated that certain face-to-face educational elements can be transferred to an online environment, and some courses can be completely transferred to an online format. This effectively promotes the modernization of online learning, which has already been introduced and described as a form of flexible learning for part-time students or students who are unable to attend offline classes because of geographical distance (Adedoyin & Soykan, 2020). However, distance education takes away the desired experience of collaborative learning, socialization, and live communication (Putri et al., 2020; Tang & Braver 2020).

The COVID-19 pandemic gave an impetus to the understanding of the need to turn to a distance learning. In recent years, there has been a tendency to increasing transition of educational institutions to online learning. It is influenced by many economic, social and political factors, and their interaction on an international scale (Yazgan, 2022). However, researchers identified a low level of performance of most distance online environments in motivating students to learn, which is later reflected in their results during annual assessments, while there is almost no consistent strategy for e-learning (Abernathy, 2019).

It was determined that most studies on the impact of COVID-19 on education are focused on higher education only and, in most cases, depend on the academic subject. For example, there have been studies on the impact of limitations in education caused by the COVID-19 pandemic on the performance of medical students (Owusu-Fordjour et al., 2020), management students (Brammer & Clark, 2020), and economics students (Roman & Plopeanu, 2021). Therefore, it was decided to study the effectiveness of the introduction of the Moodle educational platform into the educational system of primary school students in order to enhance their motivation to study and effectively consolidate the acquired knowledge during distance education.

So, the aim of the study was to determine the impact of the Moodle platform on the development of primary education under martial law.

The aim was achieved by fulfilling the following research objectives:

1. Determining the effectiveness of traditional teaching and learning tools;

2. Determining the level of understanding of the material learnt by primary schoolers using the Moodle platform;

3. Conducting a survey of teachers, students and parents regarding the usability of the implemented Moodle platform.

Research hypothesis: If both teachers and parents perceive the use of the Moodle platform as a positive aspect of supplementing learning, an increased students' ability to develop more effective learning skills can be expected.

Literature Review

The most common topic of scientific discussions is the adaptation of educational services to distance learning. During the invasion of the Russian Federation on the territory of Ukraine, the education system faced unprecedented anthropological and social dynamics in combination with technological development. The problem of such dynamics (Laurent et al., 2020) has led to significant transformations in teaching and learning.

Many prospects have emerged during the wartime period and after the COVID-19 pandemic, and an analysis of recent research and publications reveals the current vectors of the digital transformation of education (Wang, 2021; Jones & McNulty, 2022). Digital transformation of education during martial law is a measure aimed at distance learning for the possibility of continuous training of learners. The effectiveness of the distance platform chosen by the teacher will have a significant impact on the quality of education from kindergarten to higher educational institution. Considering the issue in this context, the teacher needs to solve a number of organizational issues, taking into account the students' abilities and the conditions of martial law: find the key elements of the distance course, choose the right strategy for learning, create a high-quality video for asynchronous learning, develop distance learning assessments, set up remote group work, properly select synchronous virtual class tools and asynchronous platforms.

At the beginning of the military invasion, distance learning in Ukraine underwent changes that could have developed for years at other times in a usual environment. Burde et al. (2017) analysed the deployment of pedagogical engineering in distance education in emergency settings. Wang (2021) analysed the transformation of distance learning over the past five years. The study is about "emergency" distance learning using the example of 2020. As a result of the pandemic, all educational institutions were closed, offline classes were cancelled, and in a few days the whole world was forced to switch to distance education.

Engzell et al. (2021) determined whether school closures caused by the pandemic affected primary schoolers' performance, and identified a learning loss equivalent to one-fifth of the school year. The loss was higher than for students from less educated families. In the study of Pozo-Rico et al. (2020) analysed whether a teacher training programme is effective during the

COVID-19 period. It was found during the experiment that teachers who completed the programme coped with stress and information and communication technologies better. However, it does not examine the direct impact of distance learning on the aspects of primary education.

Moorhouse and Beaumont (2020a) studied teachers' use of a video conferencing system (VCS) to deliver synchronous online lessons to primary schoolers in Hong Kong. Teachers were given several suggestions for synchronous learning, such as giving students time to familiarize themselves with the technology using different VCS features (gallery view and screen sharing), and incorporating synchronous lessons into learning. It was suggested to include a pre-task to prepare students and a post-task to extend learning beyond the classroom.

The analysis gives grounds to state that most of the conducted studies were focused on the integration or mixing of digital technologies in offline learning. For example, Tay et al. (2017) analysed the implementation of digital technologies in primary schools in Singapore. It was determined that successful integration depends on the teaching approaches adopted by teachers. Bond (2020) conducted a systematic review of 110 academic publications on the effectiveness of flipped classrooms in primary and secondary school. The author found a positive relationship between flipped classrooms, student engagement and learning, with teacher-made videos, and the use of shared digital technologies (for example, LMS). However, the author also reported the need for further research to identify teachers' perceptions. Pulham and Graham (2018) conducted a review of educational documents to identify the competencies of primary and secondary school teachers required to deliver blended learning, along with technological knowledge such as the use of LMS, the ability to be flexible and personalize teaching content. Agreeing with Bond (2020), Pulham and Graham (2018) identified the lack of published research on blended learning in primary and secondary school.

However, it is important to note the difference between distance education during COVID-19 and wartime. During the pandemic, the main problem in the education system was the transition to a distance learning, because it was almost never used before. After the adaptation period, the students were able to obtain the necessary knowledge without hindrance and attend classes at the time specially allocated for this purpose. However, the war in Ukraine made adjustments to the educational environment, which led to the destabilization of the educational process at all levels. Under martial law, children switched to blended learning or to distance learning. But because of the lack of electricity, schools lost the opportunity to carry out the educational process systematically, which led to an imbalance in the equal acquisition of knowledge by all learners. Some of the schoolchildren were forced to leave the country in search of safety, and did not have the opportunity to attend distance classes, or they moved to safer cities in Ukraine without access to the Internet.

Therefore, it is very important that the educational process be organized so that all educators have the opportunity to solve the key problems of education that arose during the war and to guarantee maximum safety for the participants of the educational process with the simultaneous assimilation of the necessary high-quality knowledge.

Summarizing the above, we can conclude that recent global changes have been constantly affecting all forms of social life, and most of all, the educational system. Therefore, it gives impetus to the development of digital technologies.

Therefore, it can be concluded that global changes have influenced the development of digital technologies. At the beginning, the impact of digital technologies on education was almost invisible because the general technologies had limited utility in the classroom or the work of teachers (Cuban, 2001). In recent years, digital technologies specifically designed for learning, such as presentation software, Learning Management System (LMS), Student Response System (SRS), and game-based learning platforms (GBLP) have begun to play a significant role in education (Moorhouse & Beaumont, 2020b; Voogt et al., 2018). These changes have coincided with the development of Internet-ready portable devices such as tablets and Wi-Fi connectivity, meaning that teachers no longer need to use desktop computers and also take students to computer labs (Hockly & Dudeney, 2018).

Learning Management System is software that enables applying educational content and administer the learning and teaching process. An LMS uses human and technological resources that appropriately enhance learning into an environment for developing learning content designed for teachers as course leaders. Given that our aim in the research was to determine whether the use of e-learning systems can improve the educational process in primary school, the Moodle system was chosen as the learning environment. Moodle is a learning management system, but it is also perceived as a virtual learning environment.

The acronym Moodle is a modular object-oriented dynamic learning environment. Modularity means that the system accommodates smaller modules, activities that together form a whole, as in any e-learning system. The Moodle learning environment is dynamic

and the student takes an active part in the learning process. It is an open source system that allows users of the system to make changes to the programs and adapt them to their own needs. The Moodle toolset includes the following features: creation of a large number of courses using one system, course planning, activity schedule, calendar, user management, management of user roles and user groups in the course, working with existing files and educational content, testing and evaluating users, monitoring user activities, numerous tools for communication and user interaction, system management — backups, statistics, logs, advanced reference system.

The interaction of technology and education shapes e-learning, and their connection is strongly supported by those who develop educational content in e-learning systems. Well-developed and applied educational content in the e-learning system enables implementing various learning, teaching and knowledge testing scenarios.

Materials and Methods

Design

The research methodology was based on a combination of qualitative and quantitative empirical methods and provided for an interpretive approach to the analysis of the obtained data. The experimental part of the study lasted from September 2022 to the end of December 2022 (Table 1).

Participants

For the reliability of the conducted experiment, the research was conducted at 4 secondary schools (2 urban and 2 rural schools) in the city of Uzhhorod. The experimental part of the study was designed for 4th grade students. This is justified by the fact that students will be able to independently answer questions in

Google Forms and propose what they lacked on the Moodle platform.

The total of 816 students aged 9-11 years agreed to participate in the experiment. Of them, 210 people lived in another city or abroad.

Through random selection, students were divided into control (CG) and experimental (EG) groups — 408 students in each group.

A total of 42 teachers (14 supervising teachers and 28 English language teachers) aged 25 to 50 took part in the study. Teaching experience ranged from 5 to 35 years.

Instruments

Author questionnaires were developed to conduct the survey (data collection was organized using Google Forms), the questionnaires used the Likert scale principle (1-5 points, where 1 is absolutely no, 2 — disagree / do not support, 3 — neutral, 4 — rather agree/support, 5 — absolutely agree/support). Cronbach's Alpha coefficient was used to check reliability, which was 0.792, indicating acceptable reliability. The Pearson correlation coefficient was used to validate the questionnaire. The obtained values were in the range of 0.7-0.8 and considered acceptable for research. Statistical data processing was carried out using the Microsoft Office.

Data Collection

The following methods were used to conduct the experimental part of the study:

1. The method of systematic monitoring students' progress by teachers in order to identify the effectiveness of the Moodle platform in the educational process. Methods of testing, surveys and analysis of academic performance were also used.

Table 1

Stages of the study to determine the impact of the Moodle platform on the development of primary schools under martial law

Research stage	Timing	Description of the research stage
Preparatory	May - August 2022	1) Selection of educational institutions for the experiment 2) Obtaining permission to conduct an experiment 3) Conducting a survey of teachers, students and parents to determine the advantages and disadvantages of traditional educational platforms 4) Adaptation of the curriculum to the Moodle platform
Initial	September-November 2022	1) Conducting input testing to determine student performance. 2) Division of students into control (CG) and experimental groups (EG). 3) Implementation of the Moodle platform in the educational process. 4) Conducting final testing to determine the success of students after the implementation of the Moodle platform. 5) Comparison of the obtained results for CG and EG.
Final	December 2022	1) Conducting a survey of teachers, students and parents regarding the convenience of the used platform. 2) Interpretation of the obtained results.

Source: own author's development.

2. The study also involved a classification model of measurement scales: nominal, ordinal, interval, and relationship scale. For the study, the number of correctly completed assignments during training using Moodle as an educational platform was taken as a characteristic of students' performance.

3. The method of expert evaluations was used to analyse the results of the educational activities of students and teachers. A group of experts studied the state of cognitive independence of EG and CG students.

Analysis of Data

The Cronbach's alpha coefficient, which indicates the internal consistency of the test assignments, was used to check and interpret the data obtained at the end of the experimental part of the study. A comparison of the results of the CG and EG test assignments was also carried out.

Ethical Criteria

The chosen methods are verified for conducting research. The conducted experiment corresponds to the academic principles of professionalism, integrity, and respect for general human rights. All participants of the experiment (teachers, parents and students) consented to personal data processing. It was agreed to preserve the names of participants and names of educational institutions confidential. The instruments and techniques were tested for reliability and validity.

Results

The Moodle platform included the following educational elements: a lesson, a test, as well as means of communication and collaboration. The educational activity was designed as a set of pages on which educational content is presented in written or graphic form. Links, animations, multimedia and images were added to the learning content. The pages are united not only by content, but also by questions, with the help of which students personally checked their achievements. As this is electronic learning, students continue their studies after answering the questions correctly. If they make a mistake, they are returned to a page where the content must be repeated.

This way of learning obliges students to answer questions correctly, as one of the problems of e-learning is the loss of motivation, which can lead to skipping classes.

Testing in the Moodle system includes settings and a set of questions. The set of questions in the system is supplemented by selecting individual types of questions, forming a base from which questions are combined into a test. The test includes three types of questions: recall, completion, and calculation. When completing the test, students receive feedback on the correctness of the answer after each relevant question.

Students complete the assignment within the allocated time, and the task can be completed in three ways: submitting answers in writing when the grade is entered into the system; by recording the answers in the system itself and submitting the answers in the form of a created document that is transferred to the system.

The obtained average scores of students in each subject were analysed in order to select educational subjects (Table 2).

Table 2
Percentage of scores obtained after control testing (%)

Percentage of correct answers	Elementary level	Medium level	Sufficient level	High
English language	21	39	30	10
Ukrainian language	19	30	40	11
Mathematics	42	32	19	7
Musical Art	6	10	29	55
I Explore the World	0	6	24	70
Literary Reading	10	44	20	26

Source: author's own development

Taking into account the obtained data, it was decided to implement an experimental programme in subjects with different levels of student performance, namely: with a low level of Mathematics, with a medium level for English Language, and with the highest indicator for I Explore the World.

During remote classes, EG students used the Moodle platform, while CG continued their studies using the usual platforms.

A special feature of the Moodle platform when teaching Mathematics was that EG students were offered to pass a test after each lesson to better memorize the material they had learned. Training assignments were also offered for those willing to try. The difficulty of assignments gradually increased with each level, provided that the previous level was correctly completed. The main advantage was that the content of the assignments was close to the students' interests and also complemented the content of the textbooks without duplicating them.

When learning a foreign language, students expanded their vocabulary with the help of a built-in glossary. After each lesson, students could improve their listening, reading, speaking and writing skills by

completing test assignments. After passing the test, the student got access to an interesting short video with dialogues of the main characters of modern children's films.

In a similar way, the content of I Explore the World was updated.

At the end of the academic semester, CG and EG students were tested to determine the effectiveness of the chosen platform (Table 3).

Table 3

Percentage ratio of obtained CG and EG scores at the end of the experiment

At the end of the experiment								
Subject	CG	EG	CG	EG	CG	EG	CG	EG
English Language	10	8	39	39	38	38	13	15
Mathematics	39	39	31	30	18	19	12	12
I Explore the World	0	0	10	10	22	20	68	70

Source: author's own development

The input and output tests demonstrate the results of measuring the level of academic performance. If we compare the calculated empirical values of the Emp criterion with the critical value of 0.05=1.96 at the significance level of 0.05, we can see a tendency to $T_{emp} \geq T_{cr}$ for comparing the experimental and control groups at the significance level of 0.05. The sample mean and sample variance were used when finding E_{mp} (Table 4).

Table 4

Values of sample means, sample variances at the beginning and at the end of the experiment

The number of completed assignments	CG		EG	
	Before	After	Before	After
Sample mean	5.881	5.760	5.790	6.803
Sample variance	1.110	2.452	1.289	1.558

Source: author's own development

Therefore, it can be concluded that the reliability of the differences in the indicators of the compared samples is 95%.

A qualitative assessment of the level of involvement of EG students in using the Moodle platform was provided by independent works, which were evaluated by experts in terms of content, effectiveness, and indepedence. The level of students' independence in additional activities was determined by the completed assignments: fully completed, partially completed, and no reaction (Figure 1).

Figure 1.

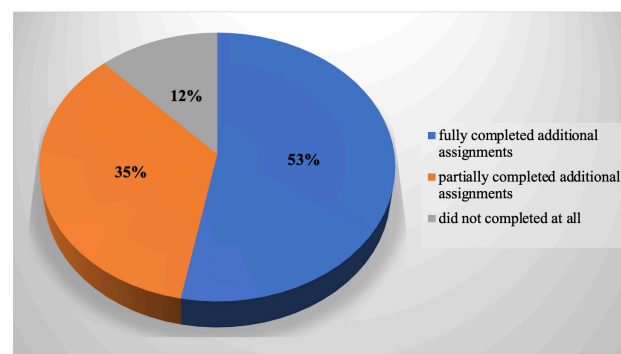*Obtained results of completing additional assignments in the CG (%)*

Figure 1 shows that 53% of students decided to complete all the proposed additional assignments. This is explained by the fact that the assignments were developed with elements of interactivity and in a game format (interesting crosswords, tests with a pleasant bonus in the form of a cartoon, etc.)

Teachers also paid attention to the ease of use of the studied Moodle platform. They drew attention to the fact that the platform plays presentation videos without delays, convenience in controlling the log, adding and controlling the material for classes.

Discussion

The conducted research confirmed the importance of distance learning under martial law, especially for primary schoolers. The Learning Management System gives students the opportunity to continue their studies, communicate with classmates, and complete homework. The conducted study confirmed the initial hypothesis that if both teachers and parents perceive the use of the Moodle platform as a positive aspect of supplementing learning, one can expect an increased ability of students to develop more effective learning skills. Indeed, the obtained results were higher than the results in EG after the control testing of CG.

As not much time has passed since the beginning of the full-scale invasion of Ukraine, researchers have not yet had time to consider the issue of introducing the Moodle platform into distance education in primary education in context of military operations. Therefore, it was decided to compare the obtained results with researchers who considered the implementation of the Moodle platform among secondary school and higher school students during the COVID-19 pandemic. It was also planned to analyse the results obtained after the implementation of the Learning Management System. For example, Bulić and Blažević (2020) considered the field of biology. The test was designed for fifth, sixth, seventh and eighth grade students, and tested the knowledge of students learning on Moodle and students studying in a traditional classroom. The obtained results showed the absence of a statistically

significant difference in the arithmetic mean of the final test results between the two groups. On the contrary, the conducted research found positive results for the final testing. This is explained by the fact that CG students were interested in completing additional interactive assignments, which contributed to an increased level at the end of the experiment. In our opinion, students were able to distract themselves from the psychological stress caused by the state of war in the country through the use of interesting interactive assignments.

In their studies, Astriani et al. (2021), Marikar and Jayarathne (2016) determined the impact of using the Moodle platform to improve the learning of Mathematics for fifth grade students. It was found that implementing the curriculum using Moodle was effective for students' mathematical communication and self-efficacy. In general, students who used Moodle in e-learning performed better than those who received traditional education. In the current study, the results of students who studied using Moodle are also better than those who continued to study using conventional platforms.

Many studies are related to the use of Moodle in higher education. For example, Guillén-Gámez et al. (2022), Desnelita et al. (2021) found that Moodle has a significant impact on the development of virtual learning assignments. Garcia-Murillo et al. (2022) found a high degree of technological satisfaction with Moodle by students of higher educational institutions.

Holiver et al. (2020), Soub and Amarin (2021) determined the positive attitude of teachers and students towards the use of the platform in their practice. Our study confirms the results obtained by the researchers. The teachers, parents and students noted that the Moodle platform helps to use difficult content without delays in playback, facilitates monitoring of planned and completed assignments. In the event of an airstrike, teachers can stop the lesson and post the rest of materials on Moodle so that children and parents can work on them at any time after the danger is over.

We agree with the results of Bayramova and Aliyev (2019), Florjancic and Wiechetek (2022) that the development and implementation of modern technologies, namely Moodle, in education have brought many new opportunities and innovations supported by various educational platforms in the educational environment.

The findings of the study contribute to the understanding of the importance of modern LMS use and learning behaviours for the performance and satisfaction of primary schoolers during martial law.

Conclusions

Digitalization of the educational system is a current topic of the research. At the time of the invasion of the Russian Federation on the territory of Ukraine the educational system faced social and anthropological dynamics in combination with the rapid technological acceleration. The dynamics led to significant educational changes.

The conducted research emphasized and confirmed the importance of modernization and adaptation of educational platforms for better understanding of educational material by primary schoolers. Crosswords, interactive assignments, as well as watching animated videos in case of correct completion of test assignments were added to encourage students to complete additional assignments after the lesson. The main advantage of the Moodle platform was that the children were able to distract themselves from the war and concentrate on completing educational interactive assignments.

In the event of an airstrike, teachers can stop the lesson and post raw materials to Moodle so that children, with the help of their parents or independently, can continue learning at any time after the danger is over. This facilitates continuing systematic learning and unhindered learning of educational material.

A promising direction for further research may be the development of interactive assignments for primary schoolers to better memorize the material they have learned.

References

Abernathy, D. (2019). ADDIE in Action: A transformational course redesign process. *Journal for the Advancement of Educational Research*, *13*(1), 8.

Adedoyin, O. B., & Soykan, E. (2023). Covid-19 pandemic and online learning: The challenges and opportunities. *Interactive Learning Environments, 31(2), 863-875*. https://doi.org/10.1080/10494820.2020.1813180

Astriani, L., Setiyaningsih, D., Misriandi, M., & Yuliani, A. (2021). An implementation of e-learning based Moodle to develop mathematical communication skill and self-efficacy. *Kalamatika: Jurnal Pendidikan Matematika, 6*(2), 207-218. https://doi.org/10.22236/KALAMATIKA.vol6no2.2021pp207-218

Bayramova, U., & Aliyev, A. (2019). Innovations in Higher Education: MOODLE in Azerbaijan Universities. *1st International Informatics and Software Engineering Conference: Innovative Technologies for Digital Transformation, IISEC 2019 - Proceedings*. Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/UBMYK48245.2019.8965535

Bond, M. (2020). Facilitating student engagement through the flipped learning approach in K-12: A systematic review. *Computers & Education, 151*, 103819. https://doi.org/10.1016/j.compedu.2020.103819

Brammer, S., & Clark, T. (2020). COVID-19 and management education: Reflections on challenges, opportunities, and potential futures. *British Journal of Management, 31*, 453-456. https://doi.org/10.1111/1467-8551.12425

Bulić, M., & Blažević, I. (2020). The impact of online learning on student motivation in science and biology classes. *Journal of Elementary Education, 13*(1), 73-87. https://doi.org/10.18690/rei.13.1.73-87.2020

Burde, D., Kapit, A., Wahl, R. L., Guven, O., & Skarpeteig, M. I. (2017). Education in emergencies: A review of theory and research. *Review of Educational Research, 87*(3), 619-58.

Cuban, L. (2001). *Oversold and underused*. Harvard University Press.

Desnelita, Y., Susanti, W., Noratama Putri, R., Rizal, F., & Novaliendry, D. (2021). Application of a collaborative project-based learning model using Moodle in higher education. *RIGEO, 11*(9), 2141-2149.

Engzell, P., Frey, A., & Verhagen, M. (2021). Learning inequality during the Covid-19 pandemic. *Proceedings of the National Academy of Sciences, 118*(17).

Florjancic, V., & Wiechetek, L. (2022). Using Moodle and MS Teams in higher education - a comparative study. *International Journal of Innovation and Learning, 31*(2), 264–286. https://doi.org/10.1504/IJIL.2022.120649

Garcia-Murillo, G., Novoa-Hernandez, P., & Rodriguez, R. S. (2020). Technological satisfaction about Moodle in higher education - a meta-analysis. *Revista Iberoamericana de Tecnologias Del Aprendizaje, 15*(4), 281–290. https://doi.org/10.1109/RITA.2020.3033201

Guillén-Gámez, F. D., Linde-Valenzuela, T., Ramos, M., & Mayorga-Fernandez, M. J. (2022). Identifying predictors of digital competence of educators and their impact on online guidance. *Research and Practice in Technology Enhanced Learning, 17*(1). https://doi.org/10.1186/s41039-022-00197-9

Hockly, N., & Dudeney, G. (2018). Current and future digital trends in ELT. *RELC Journal, 49*(2), 164–178.

Holiver, N., Kurbatova, T., & Bondar, I. (2020). Blended learning for sustainable education: Moodle-based English for Specific Purposes teaching at Kryvyi Rih National University. *E3S Web of Conferences* (Vol. 166). EDP Sciences. https://doi.org/10.1051/e3sconf/202016610006

Jones, M., & McNulty, C. (2022). 'Everybody is sick and there won't be a cure': The Power of Privileging Student Voices Through COVID-19 Drawings. *International Electronic Journal of Elementary Education, 15*(2), 75-85. https://doi.org/10.26822/iejee.2023.280

Laurent, R., Dessus, P., & Vaufreydaz, D. (2020). Design spatial sociotechnique. *Distances et Médiations des Savoirs, 30*. https://doi.org/10.4000/dms.5228

Marikar, F., & Jayarathne, N. (2016). Effectiveness of MOODLE in education system in Sri Lankan University. *International Journal of Modern Education and Computer Science, 8*(2), 54–58. https://doi.org/10.5815/ijmecs.2016.02.07

Moorhouse, B. L., & Beaumont, A. M. (2020a). Involving parents in their children's school-based English language writing using digital learning. *RELC Journal, 51*(2), 259–267. https://doi.org/10.1177/0033688219859937

Moorhouse, B. L., & Beaumont, A. M. (2020b). Utilizing video conferencing software to teach young language learners in Hong Kong during the COVID-19 class suspensions. *TESOL Journal, 11*(3). https://doi.org/10.1002/tesj.545

Owusu-Fordjour, C., Koomson, C. K., & Hanson, D. (2020). The impact of Covid-19 on learning - the perspective of the Ghanaian student. *European Journal of Education Studies, 0*(0). https://doi.org/10.46827/ejes.v0i0.3000

Pozo-Rico, T., Gilar-Corbí, R., Izquierdo, A., & Castejón, J. L. (2020). Teacher training can make a difference: tools to overcome the impact of COVID-19 on primary schools. An experimental study. *International Journal of Environmental Research and Public Health, 17*(22), 1-23. https://doi.org/10.3390/ijerph17228633

Pulham, E., & Graham, C. R. (2018). Comparing K-12 online and blended teaching competencies: A literature review. *Distance Education, 39*(3), 411–432. https://doi.org/10.1080/01587919.2018.1476840

Putri, R. S., Purwanto, A., Pramono, R., Asbari, M., Wijayanti, L. M., & Hyun, C. C. (2020). Impact of the COVID-19 pandemic on online home learning: An explorative study of primary schools in Indonesia. *International Journal of Advanced Science and Technology, 29*, 4809–4818. https://doi.org/10.1371/journal.pone.0259546

Roman M., & Plopeanu A.P. (2021). The effectiveness of the emergency e-learning during COVID-19 pandemic. The case of higher education in economics in Romania. *International Review of Economics Education, 37*, Article 100218. https://doi.org/10.1016/j.iree.2021.100218

Soub, T. F. A., & Amarin, N. Z. (2021). The reality of using Moodle in a distance education program. *Cypriot Journal of Educational Sciences, 16*(5), 2173–2192. https://doi.org/10.18844/cjes.v16i5.6237

Tang, R., & Braver, T. S. (2020). Towards an individual differences perspective in mindfulness training research: Theoretical and empirical considerations. *Frontiers in Psychology, 11,* Article 818. https://doi.org/10.3389/fpsyg.2020.00818

Tay, L. Y., Melwani, M., Ong, J. L., & Ng, K. R. (2017). A case study of designing technology-enhanced learning in an elementary school in Singapore. *Learning: Research and Practice, 3*(2), 98–113. https://doi.org/10.1080/23735082.2017.1350737

Voogt, J., Knezek, G., Christensen, R., & Lai, K. W. (Eds.). (2018). *Second handbook of information technology in primary and secondary education*. New York: Springer.

Wang, C. X. (2021). CAFE: An instructional design model to assist K-12 teachers to teach remotely during and beyond the COVID-19 pandemic. *TechTrends, 65*, 8–16. https://doi.org/10.1007/s11528-020-00555-8

Yazgan, Ç. Ü. (2022). Attitudes and interaction practices towards distance education during the pandemic. *Education and Information Technologies, 27*(4), 5349–5364. https://doi.org/10.1007/s10639-021-10843-2