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INNOVATIVE, INFORMATION AND DIGITAL TECHNOLOGIES IN THE ELEMENTARY SCHOOL EDUCATIONAL PROCESS IN THE REALITIES OF LARGE-SCALE MILITARY AGGRESSION: UKRAINIAN EXPERIENCE

TECNOLOGIAS INOVADORAS, DE INFORMAÇÃO E DIGITAIS NO PROCESSO EDUCATIVO DO ENSINO BÁSICO NAS REALIDADES DE AGRESSÃO MILITAR EM GRANDE ESCALA: EXPERIÊNCIA UCRANIANA

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ABSTRACT

The aim of the study is to analyze the Ukrainian experience of the introduction of innovative, information digital technologies in the educational process of elementary school in the conditions of Russia's large-scale military invasion. The study was conducted based on an experiment in which it was possible to prove the effectiveness of the use of innovative, information, digital technologies in the use in the elementary school. The results substantiated the benefits of using these technologies under martial law. It was proved that the productivity of learning in the experimental group increased by 15%, that is, thanks to the measurements of assessments it was possible to confirm the effectiveness of the appeal to innovative teaching methods. The conclusions note that the formation of these skills as the Russian invasion continues will be a relevant problem for future research.

Keywords: Primary Education, Ukraine, Experiment, Innovative Teaching Methods.

RESUMO

O objetivo do estudo é analisar a experiência ucraniana da introdução de tecnologias inovadoras, de informação e digitais no processo educativo do ensino básico nas condições da invasão militar em grande escala da Rússia. O estudo foi realizado com base numa experiência em que foi possível comprovar a eficácia da utilização de tecnologias inovadoras, informáticas e digitais no ensino básico. Os resultados comprovaram os benefícios da utilização destas tecnologias no âmbito da lei marcial. Foi provado que a produtividade da aprendizagem no grupo experimental aumentou em 15%, ou seja, graças às medições das avaliações foi possível confirmar a eficácia do recurso a métodos de ensino inovadores. As conclusões indicam que a formação destas competências, à medida que a invasão russa continua, será um problema relevante para a investigação futura.

Palavras-chave: Ensino Primário, Ucrânia, Experiência, Métodos De Ensino Inovadores.

Introduction

Russian aggression in Ukraine, which began in 2014 with the annexation of Crimea and the fomenting of separatist sentiment and hostilities, moved into the open phase in February 2022. The war was an important challenge for the educational system, as many schools were destroyed, and the educational process shifted first completely to distance learning and then to blended learning. Thanks to the decisions made during the long wartime, the educational process was not disrupted or halted, although it underwent certain transformations.

The COVID-19 pandemic and related quarantine restrictions led to the widespread introduction of innovative, information and digital technologies in educational activities. This area of activity in Ukraine has increased significantly due to the Russian invasion, the use of digital tools in education has continued its evolution and use. For this reason, the products, and tools of digitalization of the

educational sector in Ukraine are gradually adapted and modified in accordance with the new challenges and the objective reality of martial law at all levels (local, national, interstate). Ukraine under martial law continues to fight for its own independence in both real and digital terms. Modern changes in the field of educational services will require taking into account a large number of challenges in economic, demographic, psychological, and cultural planes.

The Ukrainian experience of implementing information and innovative technologies is a relevant problem to study because other European countries have not been in a war situation for a long time (probably since the collapse of Yugoslavia in the 1990s). Certain elements could be implemented in other states, given the demonstrated effectiveness. Therefore, the purpose of the study is to analyze the Ukrainian experience of implementing innovative, information digital technologies in the educational process of an elementary school in a large-scale military invasion.

Methodology

Design

Experimental study of the peculiarities of the use of information and communication and digital technology was implemented during several stages – theoretical search, experimental and generalized. Each of these stages included the implementation of appropriate areas of pedagogical support. In particular, the first stage (theoretical search) covered the study of the state of use of digital and information technology in the contemporary pedagogical literature, identifying the main available educational information platforms, resources, tools for effective digital learning of students. The second stage experimental provided for the organization and conduct of the experiment and test the effectiveness of the use of information and communication technologies in the education of elementary school students. First, we investigated teachers' attitudes toward the use of ICT, and then experimentally tested the effectiveness of the use of modern technology in primary education. In order to process the results obtained, such software as Statistica was used.

The third stage – generalized – consisted in clarifying the use of ICT in the preparation of schoolchildren, the summary of the results and formative results, and key recommendations.

Participants

The sample included 205 elementary school students and 120 teachers. All teachers ranged in age from 24 to 67 and possessed varying amounts of teaching experience from 1 to 35 years. The main selection criteria were educational attainment and realization of employment in an educational institution in Ukraine as of 2022. All respondents and participants in the experiment agreed to be eligible to participate in the study. In addition, participation is free and of their own free will.

Instruments

Testing was conducted in the experimental and control groups to determine the effectiveness of the use of ICT in the teaching of younger students. The teachers' survey was conducted through Google forms, which ensured anonymity. The list of closed-ended questions was uploaded to the system on the eve of the survey implementation. The results were processed using Excel. Cronbach's alpha was used to determine the validity of the developed questionnaire (0,8).

Data collection

The material for the study was collected during 10.09.2022-01.01.2023. Accordingly, the survey was continued during the first semester of the academic year 2022/2023. To study the effectiveness of the use of ICT in the organization of the educational process, the questionnaires developed by the authors were used, which offered open-ended questions for teachers. The questionnaire to determine the specifics of the use of information and digital technologies in the conduct of learning in elementary school included an assessment (five-point scale) on the following factors: effectiveness, convenience and accessibility, interactivity, role and importance in the process of education and learning, impact on the motivation level and interest of students, organizational importance, etc.

Analysis of data

The study is formed based on the use of systems analysis, through the prism of which the role of innovative information and digital technologies in the system of learning junior high school students is defined. With the help of system analysis, the decomposition of the ICT system into separate parts was implemented and the analysis of how they interact in order to implement the main goal – the effective implementation of learning in a war environment – was made. In addition, with the help of comparative analysis, it was possible to compare the results of the experimental and control group of schoolchildren. With the help of the predictive method of research identified opportunities for further development of digital and information technology in the educational process of elementary school.

Ethical criteria

The experimental part of the study was carried out in an atmosphere of trust, respect for students and teachers, expressing their own thoughts on the problem of using digital and information technology in education. All these stages of the work in general comply with generally accepted principles of academic-scientific ethics of research work. Note that the participants of the study gave informed written consent to the data processing beforehand.

Results

Modern researchers point out that “information technology” is a type of technology that performs information processes in certain ways: collecting, accumulating, storing, transmitting, processing, and presenting (displaying) information (MARTINEZ-NUÑEZ; BORRAS-GENE; FIDALGO-BLANCO, 2016, p. 18-36; LUND; AAGAARD, 2020; (KHARYTONOV *et al.*, 2021, p. 157-169). This set of methods, analytical processes, and software and hardware integrated into a single technological system performs information functions to improve their reliability, responsiveness, decrease labor intensity, and use of information resources (BLUMENTHAL, 2020; GREGORY *et al.*, 2020; MCGREW, 2021, p. 103512).

Accordingly, the use of the concept of "information and communication technologies" in learning notes the growing importance of computer networks in the performance of information processes in the educational industry over the past decades (GÜTL *et al.*, 2014, p. 37-48). Information and communication technologies of learning can be considered as a set of ways and technological means in the application of information technology based on computer networks and ways of communication that ensure the effectiveness of educational processes.

As part of the task to find out the main aspects of the use of information and digital technologies in elementary schools, a pilot survey of elementary school teachers was organized based on Google forms. Note that the reasoning of elementary school teachers on the problem of using digital and information technology in the context of ICT warfare in professional activities. It can be noted that the views of primary school teachers depended on both age and pedagogical experience. The survey found that all elementary school teachers use digital and information technology in their teaching activities. At the same time, 57.45% systematically apply innovative methods of work in pedagogical activity, however, implement group work of schoolchildren using a variety of ICT tools in the main subjects of the elementary school. 41.07% of teachers use digital and information technology as auxiliary tools, for example, to visually locate objects of learning when organizing lessons. At the same time, 35% of teachers noted that they also use digital platforms situationally: when, depending on the situation, it is impossible to teach using standard face-to-face classes.

At the same time, the results of the questionnaire showed that the majority of teachers believe that innovative technologies contribute to deeper learning of educational material through the use of E-resources. In addition, 87% of teachers said that technology improves the learning process in the war. Given the factor of accessibility, teachers can organize training with children who are in other regions of Ukraine, other countries. This promotes equal access to information for all participants in the educational process, as well as self-education because an important advantage of modern education is an interest in independent search. At the same time, most teachers also believe that innovative educational technologies

allow the implementation of an individual approach, effectively organize independent work of students.

Despite this, 54% of the respondents noted that it is important in the preparation of modern teachers to increase the level of digital qualification in professional activity. Therefore, Ukrainian teachers are aware that the process of forming an information society and the long war brings new demands on the readiness of teachers to effectively organize lessons in a total digitalization of the educational space. This, in turn, requires teachers to master modern ICT tools, awareness of innovative teaching methods and practices, a high level of media literacy, etc.

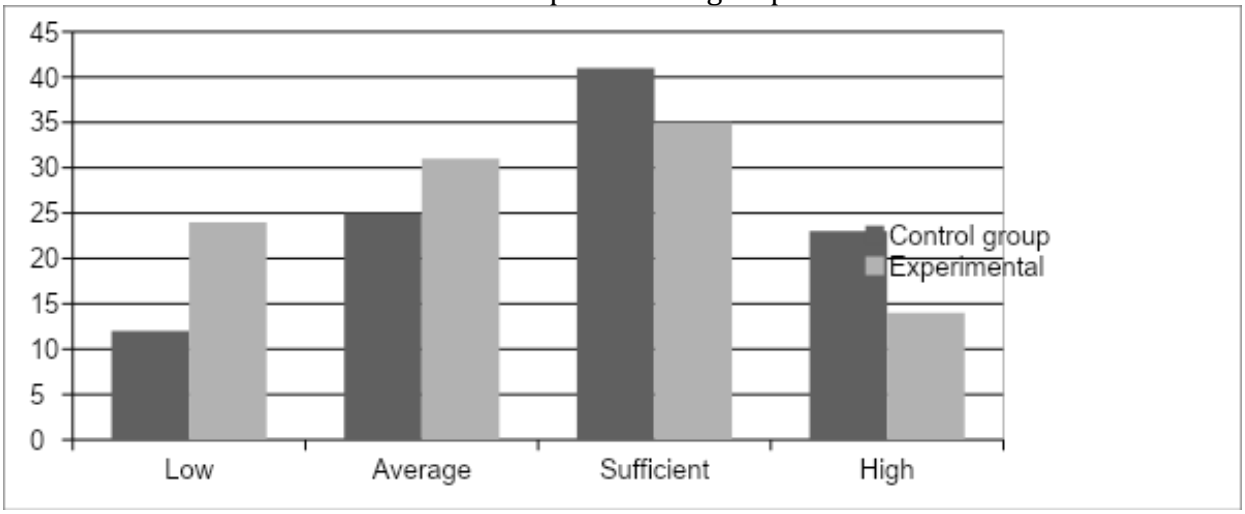
Researchers believe that many students already from elementary school are oriented more towards acquiring knowledge through experiential, hands-on learning activities rather than passive listening. An important aid in this way should be research-based technology and hands-on work, in which appropriate solutions are sought and their own vision of events is offered, free exchange of opinions, etc. (ANGGRAINI; HANDAYANI, 2022, p. 1-12). These technologies should be implemented with science tasks adapted for elementary school children: observations, measurements, experiments, experiments, surveys, etc.

Thus, the use of ICT along with the formation of appropriate learning hyper environments can lead to a situation in which former students who had problems with learning can quickly master this knowledge, moving toward it in an independent direction (GOMES *et al.*, 2019). Addressing the formation and application of innovative hypermedia aims to create a range of intermediaries and additional intermediate stages for the gradual transition from the use of symbolic to the application of imaginative thinking in students (NOROUZI LARSARI, 2022).

The key stages of the study were the initial and final monitoring of the study of the effectiveness of the introduction of innovative technologies in the educational system against the background of the spread of military events. Two groups 4A100 and 4B102, which were taught in elementary schools in Ukraine according to the mixed model, were chosen for the purpose of implementation of the experiment.

In order to determine which of these groups will be the experimental and which of the control, a survey was organized, with the help of which the level of achievement of students in these groups was determined. After the survey, it was determined that in the group of 4A100 students with high and sufficient level was 62%, in the group 4B102 - 49%. Consequently, based on these results, group 4A was selected as the control group and 4B as the experimental group (See Figure 1).

Figure 1 – Diagnostic data (high and sufficient level of student achievement) of the control and experimental group



Source: Authors' development.

Note that the average score at the beginning of the study was 6.9 for the experimental group and 8 for the control group (the maximum score was 12). (See Table 1).

Table 1 – The average score of the experimental and control groups

Average grade score		
Group name	Scores	Total number of schoolchildren
Experimental group	6,9	102
Control group	8	100

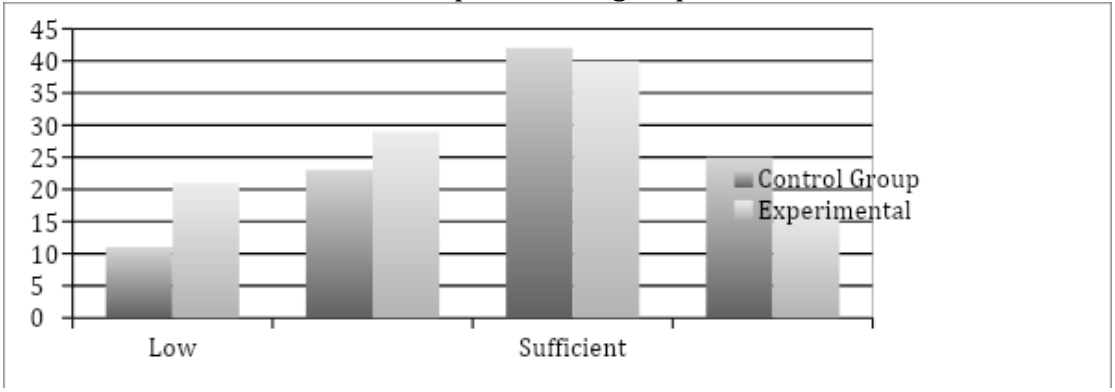
Source: Authors' development.

In group 4A100 in the study of the main subjects, classes were organized according to the traditional methodology through the prism of mixed learning (a combination of offline and online learning with the use of strictly traditional methods).

At the same time in the group, 4B102 classes were also of mixed type, but with the use of modern innovative digital and information technology: digital interactive whiteboards, the use of multimedia resources and presentations, virtual reality platforms, the use of computer games, etc. When studying mathematics students used modern multimedia resources, special games. By means of modern multimedia programs and graphic resources, the lessons of the fine arts were organized. The study of the Ukrainian language also took place through the demonstration of special videos and games. At the same time, with the help of other digital platforms children read a variety of texts, learning reading and literacy.

The results of the control review demonstrated that the experimental group learned the material better than the control group by 15% (considering the criterion of the number of students of sufficient and high levels)) (See Figure 2).

Figure 2 – Baseline data (high and sufficient level of student achievement) of the control and experimental group



Source: Authors' development.

Accordingly, the average score of the experimental group is - 7.9%, while the control group has 8.2. Consequently, the effectiveness of the use of innovative teaching methods and digital technology has received experimental confirmation (See **Table 2**).

Table 2 – The average score of the experimental and control groups

Average grade score		
Group name	Score	Total number of students
Experimental Group	7,9	102
Control group	8,2	100

Source: Authors' development.

In the experimental group, students were able to watch a variety of instructional videos while studying the main academic subjects, learning new concepts in science and native language through a game-like prism. The use of computer-based digital techniques was especially effective in foreign language and mathematics (NOROUZI LARSARI, 2022). In addition, through the use of modern multimedia technologies, learning became more interesting, which influenced the increase in the motivational level of students (REYNIS; BECHINI, 2014). Important in the process of teaching elementary school students the use of a digital interactive whiteboard (HIRATSUKA, 2019) Consequently, the experimental testing

demonstrated that the use of modern innovative digital and information technology in the war environment contributes to the effective assimilation of new material in the digitalization of society.

The effective use of ICT will require the formation of a new educational paradigm. Modern examples of teaching in elementary schools show that students must be active participants in the educational process (PAI; VELLA, 2022). The means of functioning of information and communication technologies can be accommodated in the proposed principle of school didactics, recognizing it as the main one among all other educational provisions (LUND; AAGAARD, 2020). Consequently, mutual relations at the levels of students-teachers, students-students, students and the environment, students, and information sources should be transformed (LAPADA *et al.*, 2020, p. 127-144). The important tasks of modern elementary school education have become not so much to impart to students a certain approved amount of knowledge, but first to provide them with appropriate skills to obtain and process new data independently, to create specific skills for more developed thinking – at the level of analysis, synthesis, evaluation.

Discussion

According to Tytova and Mereniuk (2022), military operations in Ukraine have caused the primary education system to undergo a fundamental rethinking of core values. Educators have had to focus on how best to apply digital innovation, benefit students most effectively, and use or disprove the effectiveness of online learning and addressing new digital technologies (CHYKUROVA *et al.*, 2022, p. 224–242; RAK-MŁYNARSKA, 2022). Given the concept of Ridei (2021), the main modern direction of educational institutions should be optimization in learning and teaching with the maximum possible combination of distance and traditional forms of learning, with an emphasis on the formation of skills necessary practical skills. At the same time, according to statistical measurements, about 75% of classes in elementary schools according to the old models were conducted by simple schemes: the teacher conducted the lesson and the students listened attentively. Because of

this, traditional teaching did not show the best results - only one in five students (at best) assimilated the content received from teachers and, accordingly, could reproduce it to a high grade (SLUKHENSKA *et al.*, 2019, p. 167-171). Such scores cannot be considered very high. Other students find it extremely difficult to absorb information in this way, so they may acquire the charter of individuals with low academic achievement (CHYKUROVA *et al.*, 2022, p. 224–242). Consequently, learning with the use of innovative digital technologies is not just a way out of a difficult situation, but as a result of numerous digitalization reforms in Ukraine also contributes to the formation of a new type of specialist – a person who knows how to understand digital technologies, who knows how to improve and implement them (SKAKUN, 2021; KOCAMAN, 2022). Primary education, which forms the prerequisites of digital thinking, is weighty in this process.

Appeal to digital competencies is also relevant because the use of innovative technical digital solutions in learning requires skills and relevant skills, which should be familiarized already at an early age (given the further integration of technology into public life).

According to the results, teachers' digital and information competence is important for the effective use of modern innovative technologies. Many researchers agree (HASANOV; CHERIF, 2021; ANGGRAINI; HANDAYANI, 2022, p. 1-12; JENA; GUPTA; MISHRA, 2021, p. 21-43; BABYCH *et al.*, 2022; TYTOVA; MERENIUK, 2022; PASSEY, 2021).

Tytova and Mereniuk (2022) highlight the importance of digital literacy for both teachers and students in the face of widespread military aggression. At the same time, Skakun (2021) also identified the importance of developing digital competence in modern teachers and described the main conditions for its formation. Tsankov and Damyanov (2019) identified the main aspects of the formation of information competence of modern teachers. We should agree with the researchers who drew attention to the additional negative impact of military invasion (CHYKUROVA *et al.*, 2022, p. 224–242; RAJAB, 2018; TYTOVA and MERENIUK, 2022). The emergence of physical distancing forced self-isolation, and a ban on school attendance resulted in a weakening of the psycho-educational support many

students needed (CHYKUROVA *et al.*, 2022, p. 224–242). It is not easy to build a sense of community in a digital environment, but the issue is extremely relevant given the current situation. Affordable solutions have also become a challenge during combat (KUCIRKOVA; LITTLETON, 2015, p. 324-330). We are talking about the existence and availability of cheap and relatively powerful digital tools (computers) and software, which has become a tangible problem in Ukrainian reality. This problem has become completely private, that is, government agencies were not able to solve them.

At the same time, despite some difficulties with the implementation of the digitalization of education under martial law, this process has demonstrated its effectiveness. Rajab (2018) used the example of educational institutions in the Kingdom of Saudi Arabia to propose and prove the hypothesis that the success of higher education applicants does not depend on the learning environment - real or virtual. In addition, the researcher summarized based on statistical calculations that the introduction of digital innovations in teaching and the transition to a distance form of education can meet the main needs of learning in the same way as in traditional forms of learning (RAJAB, 2018). The researcher chose statistical data from Nejran University in southern Saudi Arabia as the material for his review. Traditional teaching stopped here not so much because of the COVID-19 pandemic, but because of conflicts between the Arab coalition and individual leaders of Saudi and Yemeni rebel groups (SABELLA; HASAN, 2022, p. 431; SCHUMACHER; IFENTHALER, 2021, p. 100791). Similar concepts are also reflected in the study (NURHAKIM; SUNHAJI, 2022, p. 1173-1181). Although our study refers to primary education, these findings reflect an important trend - the use of digital information technology can replace familiar forms of learning in a war setting.

Conclusions

The use of innovative, information and digital technologies in the educational process of an elementary school in the conditions of large-scale Russian aggression has demonstrated its effectiveness. Based on the experiment, we were able to demonstrate the positive dynamics of the use of digital technology in the learning of elementary school students using distance and blended learning. The results of the control review demonstrated that the experimental group learned the material better than the control group by 15% (considering the criterion of the number of students of sufficient and high levels). At the same time, the use of innovative teaching methods and ICTs requires certain conditions to be met. First and foremost, an important aspect of the appropriate use of ICTs is a sufficient level of digital and informational competence on the part of the teachers. This also requires teachers to master modern digital tools, awareness of innovative teaching methods and practices, and a high level of media literacy. In general, the effective use of ICT in Ukrainian realities has begun to create a new educational paradigm. Modern examples of teaching in elementary schools demonstrate that students should be active participants in the educational process, acquire appropriate competencies for conducting independent research and exploratory work. Their formation under martial law and Russian aggression will be a relevant topic for future research.

REFERENCES

ANGGRAINI, Ria; HANDAYANI, Yosi. Digitalization in education. **Journal of digital education, communication, and arts (DECA)**, vol. 5, no. 01, p. 1-12, 27 Mar. 2022. Available from: https://doi.org/10.30871/deca.v5i01.2942. Accessed: 25 Sept. 2023.

BABYCH, Viacheslav, *et al.* Improvement of teaching methods of theoretical component of physical education (with the application of author teaching techniques) in the context of improving the level of social health of students of the special medicalgroup, **Journal for Educators, Teachers and Trainers**, vol. 13(5),

p. 1-9, 22 sep 2022. Available from: https://doi.org/10.47750/jett.2022.13.05.001 Accessed: 25 Sept. 2023.

BLUMENTHAL, Stefan. Tablet or Paper and Pen? Examining Mode Effects on German Elementary School Students' Computation Skills with Curriculum-Based Measurements. **International Journal of Educational Methodology**, vol. 6, no. 4, p. 669-680, 15 Nov. 2020. Available from: https://doi.org/10.12973/ijem.6.4.669. Accessed: 25 Sept. 2023.

CHYKUROVA, Olha *et al.* Aplicación de las tecnologías de la información en el proceso educativo bajo la ley marcial. **Apuntes Universitarios**, vol. 13, no. 1, 2 Dec. 2022. Available from: https://doi.org/10.17162/au.v13i1.1325. Accessed: 25 Sept. 2023.

GOMES, Cristina Azevedo *et al.* Smart City Kids Lab: Creative Computing in Primary School. *In*: 2019 INTERNATIONAL SYMPOSIUM ON COMPUTERS IN EDUCATION (SIIE), 2019, Tomar, Portugal. **2019 International Symposium on Computers in Education (SIIE)**. [*S. l.*]: IEEE, 2019. ISBN 9781728131825. Available from: https://doi.org/10.1109/siie48397.2019.8970130. Accessed: 25 Sept. 2023.

GREGORY, Robert Wayne *et al.* The Role of Artificial Intelligence and Data Network Effects for Creating User Value. **Academy of Management Review**, 3 Mar. 2020. Available from: https://doi.org/10.5465/amr.2019.0178. Accessed: 25 Sept. 2023.

GÜTL, Christian *et al.* Attrition in MOOC: Lessons Learned from Drop-Out Students. *In*: GÜTL, Christian *et al.* **Communications in Computer and Information Science**. Cham: Springer International Publishing, 2014. p. 37-48. ISBN 9783319106700. Available from: https://doi.org/10.1007/978-3-319-10671-7_4. Accessed: 25 Sept. 2023.

HASANOV, Fuad; CHERIF, Reda. Competition, Innovation, and Inclusive Growth. **IMF Working Papers**, vol. 2021, no. 080, p. 1, Mar. 2021. Available from: https://doi.org/10.5089/9781513574172.001. Accessed: 25 Sept. 2023.

HIRATSUKA, Takaaki. LTE in Primary and Secondary Schools. *In*: HIRATSUKA, Takaaki. **Qualitative Research Topics in Language Teacher Education**. [*S. l.*]: Routledge, 2019. p. 192-197. ISBN 9780429461347. Available from: https://doi.org/10.4324/9780429461347-32. Accessed: 25 Sept. 2023.

JENA, Biswa Mohana; GUPTA, S. L.; MISHRA, Niraj. Effectiveness of Online Learning and Face-to-Face Teaching Pedagogy. *In*: JENA, Biswa Mohana; GUPTA, S. L.; MISHRA, Niraj. **Transforming Higher Education Through Digitalization**. Boca Raton: CRC Press, 2021. p. 21-43. Available from: https://doi.org/10.1201/9781003132097-2. Accessed: 25 Sept. 2023.

KHARYTONOV, Evgen *et al.* Distance learning in the conditions of Covid-19:

problems and prospects of their solution. **Revista Amazonia Investiga**, vol. 10, no. 48, p. 157-169, 30 Dec. 2021. Available from: https://doi.org/10.34069/ai/2021.48.12.17. Accessed: 25 Sept. 2023.

KOCAMAN, Berrak. Investigación de los efectos de las actividades STEM en la actitud STEM en estudiantes superdotados. **Apuntes Universitarios**, vol. 13, no. 1, 2 Dec. 2022. Available from: https://doi.org/10.17162/au.v13i1.1309. Accessed: 25 Sept. 2023.

KUCIRKOVA, Natalia; LITTLETON, Karen. Digital learning hubs: theoretical and practical ideas for innovating massive open online courses. **Learning, Media and Technology**, vol. 42, no. 3, p. 324-330, 24 June 2015. Available from: https://doi.org/10.1080/17439884.2015.1054835. Accessed: 25 Sept. 2023.

LAPADA, Aris Alea *et al.* Teachers' Covid-19 Awareness, Distance Learning Education Experiences and Perceptions towards Institutional Readiness and Challenges. **International Journal of Learning, Teaching and Educational Research**, vol. 19, no. 6, p. 127-144, 30 June 2020. Available from: https://doi.org/10.26803/ijlter.19.6.8. Accessed: 25 Sept. 2023.

LUND, Andreas; AAGAARD, Toril. Digitalization of teacher education. **Nordic Journal of Comparative and International Education (NJCIE)**, vol. 4, no. 3-4, p. 56-71, 29 Dec. 2020. Available from: https://doi.org/10.7577/njcie.3751. Accessed: 25 Sept. 2023.

MARTINEZ-NUÑEZ, Margarita; BORRAS-GENE, Oriol; FIDALGO-BLANCO, Ángel. Virtual Learning Communities in Google Plus, Implications, and Sustainability in MOOCs. **Journal of Information Technology Research**, vol. 9, no. 3, p. 18-36, July 2016. Available from: https://doi.org/10.4018/jitr.2016070102. Accessed: 25 Sept. 2023.

MCGREW, Sarah. Challenging approaches: Sharing and responding to weak digital heuristics in class discussions. **Teaching and Teacher Education**, vol. 108, p. 103512, Dec. 2021. Available from: https://doi.org/10.1016/j.tate.2021.103512. Accessed: 25 Sept. 2023.

NOROUZI LARSARI, Vahid. Trends of innovation of primary education in Europe: Goals, curriculum, teaching methods, assessment, organization, structure in the educational system, cooperation with municipality, with parents. **International Journal of Research Studies in Education**, vol. 11, no. 6, 25 Feb. 2022. Available from: https://doi.org/10.5861/ijrse.2022.162. Accessed: 25 Sept. 2023.

NURHAKIM, Nurhakim; SUNHAJI, Sunhaji. The Influence of the Use of Online Learning Media (Whatshap, Google Form and Google Meet) on Online Islamic Religious Education Learning during the Covid-19 Pandemic. **FONDATIA**, vol. 6, no. 4, p. 1173-1181, 1 Dec. 2022. Available from:

https://doi.org/10.36088/fondatia.v6i4.2386. Accessed: 25 Sept. 2023.

PAI, Nagesh; VELLA, Shae-Leigh. The physical and mental health consequences of social isolation and loneliness in the context of COVID-19. **Current Opinion in Psychiatry**, Publish Ahead of Print, 6 July 2022. Available from: https://doi.org/10.1097/yco.0000000000000806. Accessed: 25 Sept. 2023.

PASSEY, Don. Digital Technologies—And Teacher Wellbeing? **Education Sciences**, vol. 11, no. 3, p. 117, 11 Mar. 2021. Available from: https://doi.org/10.3390/educsci11030117. Accessed: 25 Sept. 2023.

RAJAB, Khairan D. The Effectiveness and Potential of E-Learning in War Zones: An Empirical Comparison of Face-to-Face and Online Education in Saudi Arabia. IEEE Access, vol. 6, p. 6783-6794, 2018. Available from: https://doi.org/10.1109/access.2018.2800164. Accessed: 25 Sept. 2023.

RAK-MŁYNARSKA, E. Analysis of trends in the development of the educational environment: education of the future. **Futurity Education**, *[S. l.]*, v. 2, n. 2, p. 4–13, 2022. DOI: 10.57125/FED/2022.10.11.24. Disponível em: https://futurity-education.com/index.php/fed/article/view/51. Acesso em: 25 sep. 2023.

REYNIS, Bernard; BECHINI, Ugo. European Civil Law Notaries ready to launch international digital deeds. **Digital Evidence and Electronic Signature Law Review**, vol. 4, 21 Jan. 2014. Available from: https://doi.org/10.14296/deeslr.v4i0.1793. Accessed: 25 Sept. 2023.

RIDEI, N. Analysis of professional competencies in the characteristics of the teacher of the future: global challenges of our time. **Futurity Education**, *[S. l.]*, v. 1, n. 1, p. 22–32, 2021. DOI: 10.57125/FED.2022.10.11.3. Disponível em: https://futurity-education.com/index.php/fed/article/view/26. Acesso em: 25 sep. 2023.

SABELLA, Nabella; HASAN, Hasan. Arabic Teacher Creativity Towards The Use Of Information Technology In Distance Learning. **Al Qalam**: Jurnal Ilmiah Keagamaan dan Kemasyarakatan, vol. 16, no. 2, p. 431, 8 Feb. 2022. Available from: https://doi.org/10.35931/aq.v16i2.875. Accessed: 25 Sept. 2023.

SCHUMACHER, Clara; IFENTHALER, Dirk. Investigating prompts for supporting students' self-regulation – A remaining challenge for learning analytics approaches? **The Internet and Higher Education**, vol. 49, p. 100791, Apr. 2021. Available from: https://doi.org/10.1016/j.iheduc.2020.100791. Accessed: 25 Sept. 2023.

SKAKUN, I. Digital competencies of the teacher of the future. **Futurity Education**, *[S. l.]*, v. 1, n. 2, p. 39–48, 2021. DOI: 10.57125/FED/2022.10.11.18. Disponível em: https://futurity-education.com/index.php/fed/article/view/42. Acesso em: 25

sep. 2023.

SLUKHENSKA, R. *et al.* DEVELOPMENT OF ELECTRONIC EDUCATION AT HIGHER EDUCATIONAL INSTITUTIONS. **Pedagogy of the formation of a creative person in higher and secondary schools**, vol. 67, no. 2, p. 167-171, 2019. Available from: https://doi.org/10.32840/1992-5786.2019.67-2.32. Accessed: 25 Sept. 2023.

TSANKOV, Nikolay; DAMYANOV, Ivo. The Digital Competence of Future Teachers: Self-Assessment in the Context of Their Development. International Journal of Interactive Mobile Technologies (iJIM), vol. 13, no. 12, p. 4, 18 Dec. 2019. Available from: https://doi.org/10.3991/ijim.v13i12.11068. Accessed: 25 Sept. 2023.

TYTOVA, N.; MERENIUK, K. Digital literacy of future teachers in the realities of large-scale military aggression (Ukrainian experience). **Futurity Education**, *[S. l.]*, v. 2, n. 3, p. 43–54, 2022. DOI: 10.57125/FED/2022.10.11.33. Disponível em: https://futurity-education.com/index.php/fed/article/view/50. Acesso em: 25 sep. 2023.