Pedagogical innovations in Ukrainian educational institutions: social challenges and realities of war

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ABSTRACT. The article presents the issue and features of the innovative approach to the organization of the educational process in Ukrainian educational institutions in martial law. The following research methods were used: the analytical method, surveys, and qualitative and quantitative analysis of empirical data. The author's understanding of innovative approaches, technology tools of teaching, innovative pedagogical activity, innovative culture, and teachers' competence is characterized. Considerable attention is paid to the technologies of personality-oriented training and pedagogy of partnership. The experience of organizing distance learning for Ukrainian students in wartime, including the creation of special educational projects: online lessons, video lessons on YouTube and national television; International Ukrainian School (for temporarily displaced persons), All-Ukrainian Online School with the support of the Ministry of Education and Science of Ukraine. Emphasis is placed on the innovative potential of digital education to improve teaching/learning methods in various types of educational institutions, as well teachers' different skills and ability to respond to societal challenges of technology, socio-economic and military-political situation in the country. The results of an empirical study covering 146 teachers and lecturers of educational institutions in Ukraine are presented. The effectiveness of digital education has been proved, as well as the necessity to improve organizational and methodological tools, forms of work of teachers and students to develop critical thinking, skills of dialogic learning, project work in a team, inquiry-based learning, etc. The necessity to use the latest digital tools to realize the creative potential of teachers in their professional activities is emphasized.

Keywords: innovative approach, pedagogical innovation, digital education, pedagogy of partnership, educational technologies.

Inovações pedagógicas nas instituições educacionais da Ucrânia: desafios sociais e realidades da guerra

RESUMO. No artigo é representada a essência e as particularidades de aproximação inovadora para organização de processo de ensino nas instituições educacionais da Ucrânia nas condições de estado de guerra. Na investigação são usados tais métodos: método analítico, interrogatório, análise de qualidade e quantidade dos dados empíricos obtidos. É caraterizada a compreensão de autor de aproximações inovadoras, de tecnologização de estudos, de atividades pedagógicas inovadoras, de cultura inovadora e competência de pedagogo. Uma atenção significativa é prestada às tecnologias de ensino pessoal orientado e a pedagogia de colaboração. É argumentada a experiência de organização de ensino à distância dos alunos ucranianos nas condições de guerra, em particular, a criação de projetos educacionais especiais: lições online, lições de vídeo em YouTube e televisão nacional; Escola ucraniana internacional (para as pessoas deslocadas temporariamente fora do país), Escola de toda Ucrânia online com apoio de Ministério da Educação e Ciência da Ucrânia. É assinalado o potencial inovador de educação digital para aperfeiçoamento de metodologias de instrução / ensino nas instituições educacionais de diferentes tipos, assim como de capacidade dos pedagogos à variabilidade e mobilidade no que diz respeito ao desenvolvimento de tecnologias, a situação social política e militar política no país. São apresentados os resultados de investigação empírica acerca de 146 mestres e professores de instituições educacionais da Ucrânia. É provada a efetividade de ensino digital, assim como a necessidade de aperfeiçoamento de ferramentas de organização e metodologia, as formas de trabalho de professores e os alunos para desenvolvimento de pensamento crítico, as habilidades de estudos de diálogo, de trabalho coletivo, *inquiry-based learning*, etc. É acentuada a necessidade de uso de ferramentas digitais mais avançadas para realização de potencial criador nas atividades profissionais.

Palavras-chave: aproximação inovadora, estudos de inovação pedagógica, ensino digital, pedagogia de colaboração, tecnologias de ensino.

Innovaciones pedagógicas en los centros educativos Ucranianos: desafíos sociales y realidades de la guerra

RESUMEN. En este artículo se presentan la esencia y las peculiaridades del enfoque innovador de la organización del proceso educativo en los centros educativos de Ucrania bajo la ley marcial. El estudio aplica los siguientes métodos: método analítico, encuesta, análisis cualitativo y cuantitativo de los datos empíricos obtenidos. Se caracteriza la comprensión del autor de los enfoques innovadores, la tecnologización del aprendizaje, la actividad pedagógica innovadora, la cultura innovadora y la competencia de un profesor. Se presta mucha atención a las tecnologías de aprendizaje centradas en la persona y a la pedagogía de la asociación. Está fundamentada la experiencia de organizar la enseñanza a distancia para los alumnos ucranianos en condiciones de guerra, en particular la creación de proyectos educativos especiales: lecciones en línea, lecciones en vídeo en YouTube y en la televisión nacional; la Escuela Internacional Ucraniana (para personas temporalmente desplazadas fuera del país), la Escuela en línea de toda Ucrania apoyada por el Ministerio de educación y ciencia de Ucrania. Se destaca el potencial innovador de la educación digital para mejorar las metodologías de enseñanza/aprendizaje en los centros educativos de diferentes tipos, así como la capacidad de los educadores para ser flexibles y móviles a la hora de responder a los desafíos sociales del desarrollo tecnológico y a la situación económica, social y político-militar en el país. Se presentan los resultados de un estudio empírico en el que participaron 146 profesores y educadores de los centros educativos de Ucrania. Se demuestra la eficacia de la educación digital, así como la necesidad de mejorar los instrumentos organizativos y metodológicos, las formas de trabajo del profesor y de los alumnos para desarrollar el pensamiento crítico, las habilidades de aprendizaje dialógico, el trabajo en equipo por proyectos, el aprendizaje basado en la indagación, etc. Se hace hincapié en la necesidad de utilizar los últimos instrumentos digitales para que los profesores puedan desarrollar su potencial creativo en la actividad profesional.

Palabras clave: enfoque innovador, innovación pedagógica, educación digital, pedagogía de la asociación, tecnologías educativas.

Introduction

To improve the quality of educational services in educational institutions, and stimulate children and youth's interest in educational and cognitive activities, taking into consideration societal challenges to the development of science and technology, the problem of developing and implementing pedagogical innovations remains relevant (Shavinina, 2003).

In global pedagogy, several frameworks have been created over the years, which describe the skills and competencies of citizens for the future (for example, OECD, 2015; Council of the European Union, 2018). Among such important skills are critical thinking, pedagogy of partnership, communication, cooperation, as well as competencies related to multilingualism, multiculturalism, STEM, digital skills, entrepreneurship, civic values, etc. (Reinsfield, 2020; Budnyk, Matveieva, Fomin, et al., 2021). In this context, it is worth emphasizing the importance of moral and ethical qualities, formation and development of cognitive skills, and competencies to promote and maintain health, including its socio-emotional component (OECD, 2018; Smolinska et al., 2020).

In line with STEM education, the emphasis is on Inquiry-Based Learning, the development of observation, and skills in learning experiments (Akkus, Gunel & Hand, 2007). At the same time, ICT technologies are widely used, in particular virtual remote laboratories for online or offline work (Budnyk & Dziabenko, 2020).

In Ukrainian general secondary education institutions in 2018, a reform was launched, providing the improvement of professional skills in the following five areas:

a)   Pedagogy of partnership.

b)   Readiness for innovation.

c)   New standards and learning outcomes.

d)   The school and teacher autonomy.

e)   Education funding (The New Ukrainian School, 2016).

After all, social challenges require a new teacher, capable of change, and being innovative based on co-creation, cooperation, humanity, and tolerance to every student. Similar requirements apply to students of pedagogical universities. In the modern realities of the war on the territory of Ukraine, distance education is carried out (where educational institutions have not been destroyed). Today, the emphasis on universal priorities has strengthened the values of democracy, freedom, humanity, and responsibility in education, and thus – Ukraine's integration into the European Community. The psychological factor of the educational community is important – a conscious European choice, the establishment of

European identity in Ukrainian society, and the national self-identification of the country's citizens. Therefore, innovation in the realities of war involves a focus on universal and national values in education, and teachers' desire to study the best world (European) experience of teaching or education. These and other aspects of innovation in education in Ukraine at different levels of its understanding and implementation will be covered in this article.

The research task is to analyze innovative approaches to the organization of the educational process in world (European) practice and to determine the possibilities of their implementation in educational institutions of Ukraine in the conditions of Russian military aggression; to prove the expediency of using distance learning technologies in the work of educational institutions in modern conditions; to present the results of an empirical study on the readiness of Ukrainian teachers to implement digital innovations in professional activities, taking into account social challenges and the realities of war.

Research methods

The analytical method was used to study scientific-pedagogical literature and media resources on the problems of using pedagogical innovations, particularly digital educational resources and tools in working with students.

The online questionnaire survey method was used to reveal Ukrainian (high-school teachers) teachers' understanding of the essence of the main concepts of pedagogical innovation, pedagogy of partnership, the technology of education, and digitalization, as well as their general readiness to use educational digital technologies in distance education in the wartime realities.

The method of analysis of the received empirical data was used for quantitative and qualitative analysis of the received survey results.

Instrument and Procedures of Research

As a result of the research, a questionnaire was developed for conducting an online survey for teachers, which contained questions of a theoretical and practical nature. The research at its various stages covered 146 respondents from different regions of Ukraine (48 school teachers and 98 university teachers). The choice of the studied sample was random since the questionnaire was sent to various educational institutions, including those forcibly

displaced to other territories of Ukraine during the wartime period. The survey was conducted online from January-February 2022. The survey was anonymous. The respondents were provided with multiple choice questions. The respondents, secondary school teachers, and university professors helped to collect practical material regarding their understanding of the essence of the main research concepts, the relevance, and the necessity of using educational innovations, in particular digital technologies, in remote education of children in wartime conditions. The statistical analyses were prepared based on data obtained from the surveys. Considerable attention was paid to their experience of using specific e-resources in the educational process. The Google Forms service, used for developing the questionnaire made it possible to perform statistical processing of the results of the respondents' answers.

Results of Research
The essence of pedagogical innovation

For many years, pedagogical innovations played a secondary role. School strategic agendas have become more important, assuming a bigger part of their main policies to achieve excellence and maximize educational development value (Nielsen, et al., 2019, p. 5).

Defining the essence of pedagogical innovation as science is determined by a critical analysis of the preconditions, factors of origin, and development of innovations in education. The object of pedagogical innovation is not limited to the innovation process but also includes innovative approaches and phenomena. Thus, the subject of pedagogical innovation serves not only as a transformation of the practice of educational activities but also synthesizes conditions, means, patterns, forms, methods, and technologies associated with innovation. In an educational institution, pedagogical innovation focuses mainly on the humanistic component, and the personal-cultural approach as the unity of personality, activity, and cultural aspects.

In scientific literature innovative pedagogical approaches with the potential to guide teaching and transform learning can be found. An integrated framework has been developed by authors to select pedagogies for inclusion in this paper, consisting of the following five dimensions: (a) relevance to effective educational theories, (b) research evidence about the effectiveness of the proposed pedagogies, (c) relation to the development of twenty-first-century skills, (d) innovative aspects of pedagogy, and (e) level of adoption in educational practice (Herodotou et al., 2019).

Pedagogical innovation today is based on a humanistic approach to the organization of learning, the formation of students' 21st-century skills, by their styles, pace, ability to be stretched difficulty, and educational trajectories: assignments should range from communicative (finding a common language with friends, teachers, classmates, parents, and strangers) through to creative and innovative ones (The New Ukrainian School, 2016).

Modern scientists (Herodotou, Sharples, Gaved, et al., 2019) identified seven innovative approaches that they believe are the most promising for the education of the future:

- Formative analytics,
- Teach back,
- Place-based learning,
- Learning with robots,
- Learning with drones,
- Citizen inquiry.

Other approaches to the implementation of innovations in educational institutions are also identified. Chart 1 shows the dependence of the choice of innovative pedagogical approaches on the projected goals. After all, each defined pedagogical approach is aimed at certain learning outcomes. Therefore, the choice of the direction of the innovative activity of the teacher should be based on the most effective methods and technologies to achieve the educational goal. At the same time, this is an incomplete list of innovative approaches that are highlighted in pedagogy today. In addition, some methods and techniques are recommended to combine in the educational process to achieve the maximum possible results in the field of innovation or research (Peterson, et al., 2018, p. 10).

Table 1 – Different approaches have different purposes.

	We use this approach so that students can…	…with the intention of promoting…
Mastery-based	build knowledge and skills sequentially with practice	Fluency, Automaticity
Spaced learning	memorise core knowledge, practice recall	Fluency, Automaticity
Problem-based	apply skills or knowledge to a situation	Meaning-making, Skill transfer
Place-based	connect knowledge with their context	Meaning-making, Identity building
Discussion-based	practice articulation, take in other perspectives	Communication, Perspective-taking
Flipped learning	self-pace when meeting new content	Metacognition, self-management
Inquiry	make connections, make their own learning path	Metacognition, self-management
Product-oriented	be motivated, produce high quality work	Engagement, Perseverance

Source: Peterson, et al., 2018.

In teaching, it is extremely important to be able to make important decisions about the implementation of innovations in the educational process (Higgins et al., 2015) to ensure its effectiveness. Thus, it is a question of the corresponding competence of the teacher.

The innovative competence of the teacher is examined by researchers as a component of general professional and pedagogical competence, the content of which is determined by the peculiarities of innovation activity, its social significance, creative character, and the focus on the non-stop creation of a new, the development of the personal and professional potential of the teacher (Budnyk, 2019).

For a deeper study of this problem in professional activity (any theory is based on practice; theoretical conclusions are made based on certain practical actions), we conducted an empirical study among teachers (future teachers) on their implementation of innovative approaches.

In the context of the innovative progress of education, it is about the innovativeness of pedagogical activities as an important condition for the development of an innovative culture of the individual. It can be argued that there is an objective connection between the innovative personality and the innovative culture as a system of values created by pedagogical science. First of all, the bearer of an innovative culture is the teacher as a subject of innovative activity, the creator of educational innovations. Therefore, one of the questions in our questionnaire concerned teachers' understanding of the subject of the innovative educational process.

According to the survey, the subject of innovations are:

- a teacher's innovative activity (37.5%);
- pedagogy of cooperation (8.3%);
- digital learning technologies (12.5%);
- mobile learning (8.3%);
- innovations (16.7%);
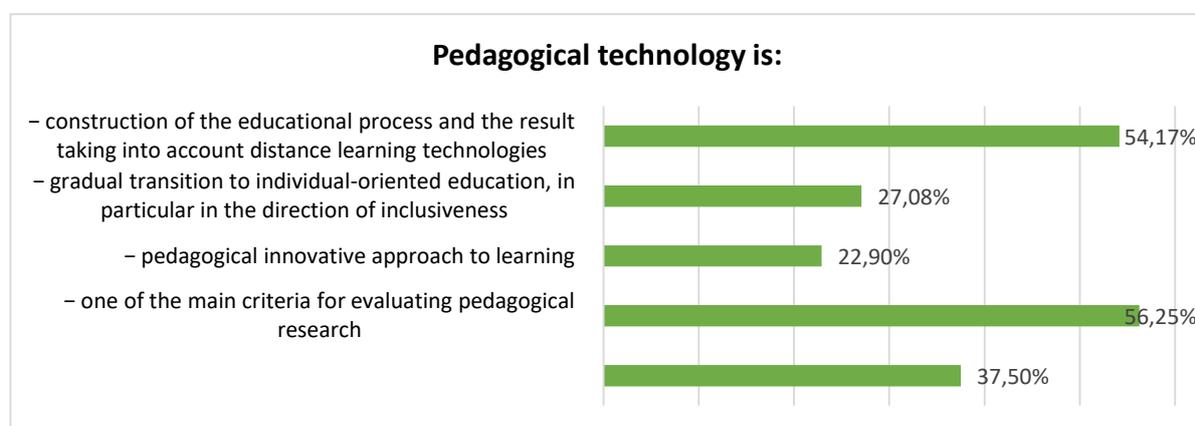- pedagogical approaches to the organization of education (25%).

As we can see, the teacher's innovative activity is an important criterion for the qualitative implementation of innovations in educational practice. According to theoretical analysis, the innovative educational process involves the creation, dissemination, and application of pedagogical innovations in practice. We interpret these innovations as a set of new ideas, and teaching/learning experiences that are scientifically sound and recommended for practical use.

At the same time, not every pedagogical innovation has a positive practical effect. It depends on several factors, but the main criterion of innovation is the novelty of the pedagogical tool, method, content technology, and so on. After all, any innovation is a process of transformation of pedagogical activities taking into account socio-cultural norms and patterns. We found out the practical educators' attitudes on this issue. It was noted that a third of respondents consider pedagogical novelty as "giving initiative to students in cognitive activity" (33.3%), "criterion for evaluating pedagogical innovations" (29.2%), "innovative ideas or methods" (12.5%), "methods of innovative research" (25%).

**The technological approach to education**

In modern science and practice, the technological approach to education is becoming increasingly popular (Reinsfield, 2020). Educational technologies (problem-based learning technologies, research learning technologies, game technologies, distance learning technologies, etc.) are aimed at optimizing pedagogical tools, methods, and forms of organization of education and training, obtaining maximum efficiency, and learning outcomes with minimal spending time, human and technological resources, etc. Technologization, according to the interviewed teachers, involves the final result of pedagogical activities (8.3%), strict adherence to the content and sequence of innovation stages (54.2%), the institution's ability to create and implement certain innovations (16.7%), readiness for pedagogical experiment and corresponding risks (20.8%). Interpretation of the essence of technology by practitioners and their understanding of its importance for innovative pedagogical activities are presented in Figures 1, and 2.

Figure 1 – Definition of pedagogical technology (according to respondents).

Pedagogical technology is:

- – construction of the educational process and the result taking into account distance learning technologies: 54,17%
- – gradual transition to individual-oriented education, in particular in the direction of inclusiveness: 27,08%
- – pedagogical innovative approach to learning: 22,90%
- – one of the main criteria for evaluating pedagogical research: 56,25%
- 37,50%

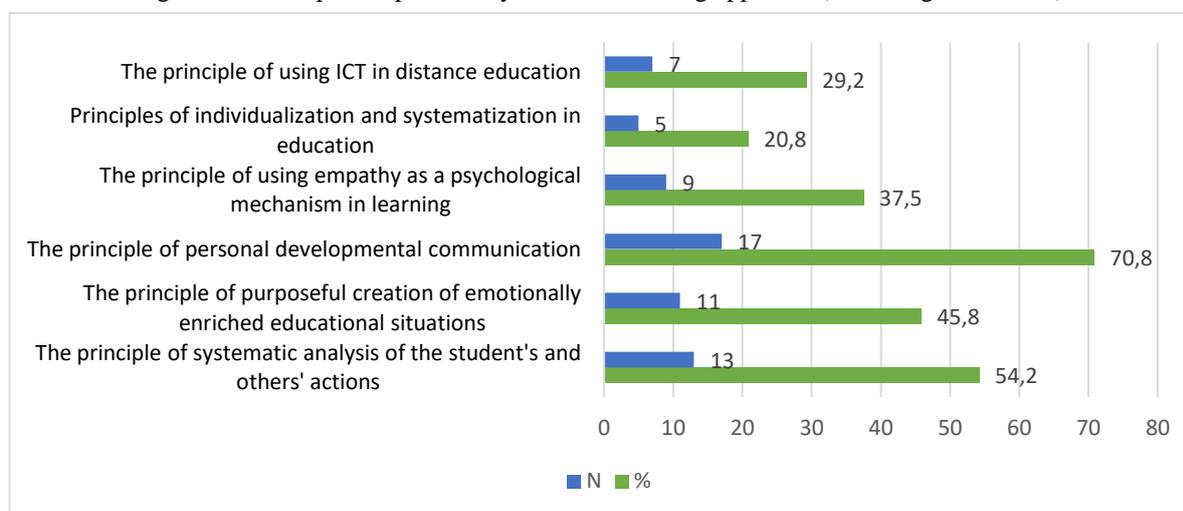Source: The survey was conducted by the authors of the article.

Figure 2 – The importance of pedagogical technology for educational practice (according to the survey).
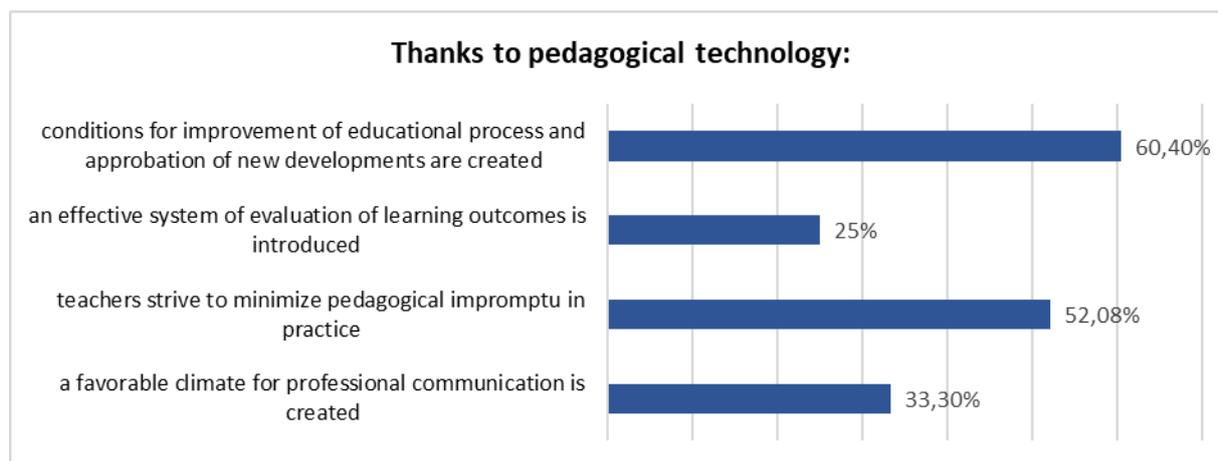
Source: The survey was conducted by the authors of the article.

The results of the survey have proved that a significant part of teachers tolerates and use personality-oriented learning technologies. We received the following answers to the question about the orientation of the technology principles (Fig. 3). More than half of respondents indicate the necessity for systematic analysis of students' and others' actions in line with personality-oriented technology (54.2%), and a significant part (45.8%) consider it appropriate to create emotionally enriched educational situations on purpose, use empathy as a psychological mechanism in education (37.5%), focus on personal interests and features of development using ICT in distance education (29.2%), etc. However, the largest number of respondents (70.8%) consider developmental communication, constructive exchange of information, and skills of dialogic speech to be effective principles in personality-oriented learning technologies.

Figure 3 – Principles of personality-oriented teaching approach (according to teachers).
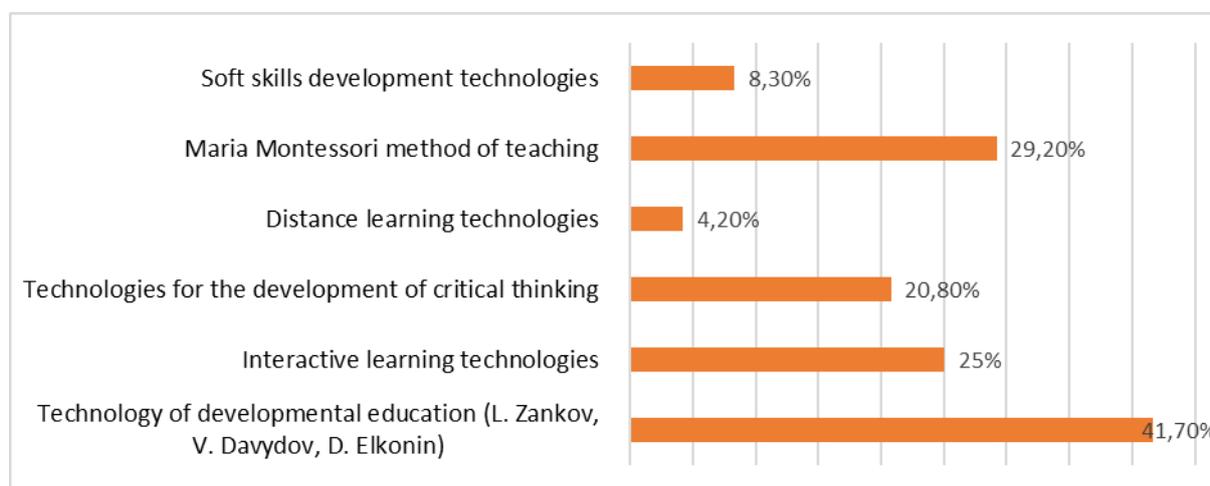

Source: The survey was conducted by the authors of the article.

Today, various models of personality-oriented teaching approaches are being developed, which include:

1) the priority of individuality, self-worth, and identity of the child as an active carrier of subjective experience, formed under the influence of different factors (school, family, media, friends, etc.);

2) education is the unity of two interrelated components: teaching and learning;

3) designing the educational process with a focus on individual activities and socially significant standards of a new cognition experience;

4) designing the educational process to identify the individual progress of each student, opportunities for his/her socialization, pedagogical cooperation, etc.

At the same time, there is a so-called symbiosis of innovations, when certain pedagogical technologies are simultaneously aimed at the person's value (Fig. 4). According to the respondents, the models of personality-oriented learning are interactive learning technologies, development of critical thinking and social skills, etc.

Figure 4 – The most effective models of personality-oriented teaching technology.

Source: The survey was conducted by the authors of the article.

An effective principle of educational innovation is a partnership (Fig. 5). Partnership pedagogy is based on communication, interaction, and collaboration between teachers, pupils, and parents. Pupils, parents, and teachers are united by common goals and aspirations; they are free and involved allies, equal participants in the educational process, and all responsibility for its outcomes (The New Ukrainian School, 2016).

The key principles of pedagogy of partnership:

–Respect for personality;

−Benevolence and a positive attitude;

−Confidence in relationships;

−Dialogue, interaction, mutual respect;

−Distributed leadership (proactive behaviors, the right of choice and taking responsibility for it, the horizontality of connections);

−Principles of social partnership (equality of parties, being keen to accept responsibilities, obligation to fulfill agreements) (The New Ukrainian School, 2016).

Figure 5 – Private and Social Returns of Education.
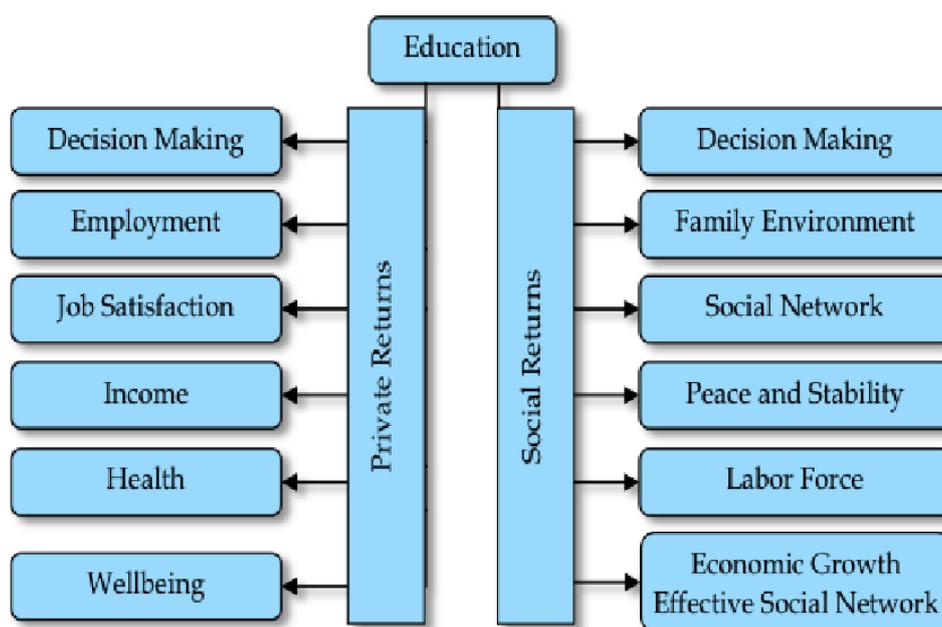
Source: Mathonsi, 2013.

In educational institutions in New Zealand, programs providing a pedagogical partnership between secondary school teachers and university teachers were launched Fig 6. Such practices have been successfully implemented in many progressive countries in the last century (Sirotnik & Goodlad, 1988). "School and university staff members valued working together as professional development for all partners, as a potential avenue for joint research, and as a platform to enhance student teacher's preparedness for their first classroom" (Bernay, Stringer, Milne, et al., 2020).

Figure 6 – School–University partnerships.
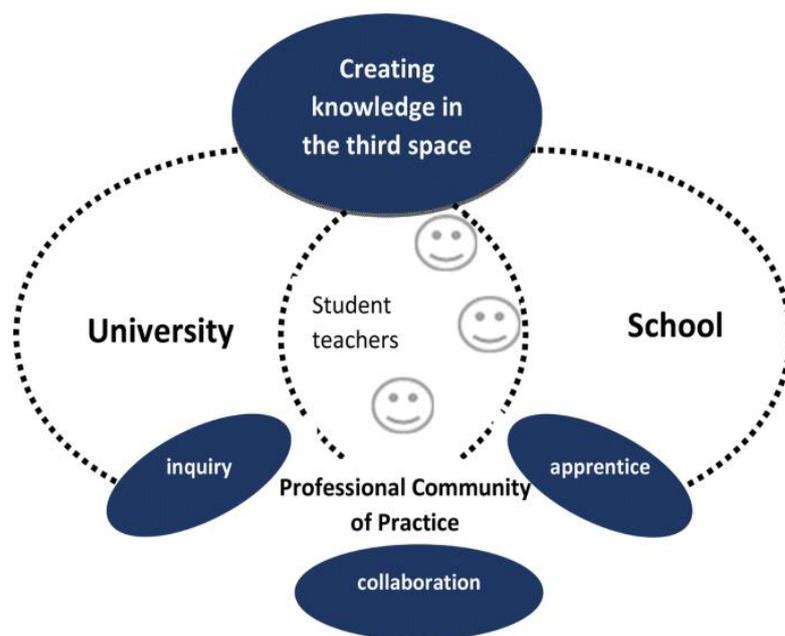
Source: Bernay, Stringer, Milne, *et al.,* 2020.

According to our survey, many teachers consider partnership as a pedagogical innovation: the organization of educational dialogue between teachers and students (25%), cooperation between students, teachers, and parents (54.2%), school-community interaction, school-family cooperation – respectively 8.3%, the implementation of the principle of individualization in distance education – 4.2%.

Thus, more than half of the respondents consider the principle of partnership as cooperative learning through the interaction of students, teachers, and parents. And this is not accidental, as the pedagogy of partnership is a truly democratic way of cooperation between teachers and students, considering differences in their life experiences, competencies, and skills, providing unconditional equality concerning respect, trust, tolerance, and friendliness. Therefore, this approach is innovative for post-Soviet countries that used to practice totalitarianism. The model of partnership in education, for example, in Africa is public-private (Mathonsi, 2013).

In partnership, we emphasize the readiness of all subjects of the educational process (students, teachers, parents) for constructive cooperation and effective interaction in learning.

The innovative potential of digital education

In current conditions, when most countries of the world have already recovered from the coronavirus pandemic and are gradually moving to offline training, all institutions in Ukraine continue to work remotely due to Russia's military invasion. Alternative learning as a challenge of today is digital education, it is important to emphasize digital culture, digital literacy, and competence of all participants in the educational process. After all, digital culture and human thinking affect learning outcomes, requiring the development of pedagogical innovations (Rosen, 2010). The realities of the war led to the creation of special educational projects in Ukraine so that children could continue their education even during martial law. These are online and video lessons on YouTube; for students evacuated to other countries, the programs of the International Ukrainian School, and relevant online resources are offered (for example, the All-Ukrainian Online School website, which contains teaching materials for secondary school students). In addition, Ukrainian TV is involved in the educational process, which systematically broadcasts video lessons for 5-11 grade students within the project "Learning without borders" with the support of the Ministry of Education and Science of Ukraine (Learning without borders, 2022). Thus, the innovative potential of digital education is growing, improving teaching and learning methods, and technologies for working with students.

Since the beginning of the war, the International Ukrainian School of the Ministry of Education and Science of Ukraine (external study on an individual basis) has also started operating in Ukraine. It is also a kind of innovation influenced by social realities (International Ukrainian School, 2022). On the website of this school, you can find programs for independent work with links to electronic textbooks and didactic/multimedia materials for different classes and grades.

Today, the world community also helps Ukrainian teachers who, due to objective reasons, left their schools and cannot work online. 188 teachers from different countries became volunteer teachers: Canada, Italy, Turkey, Iceland, the USA, and Australia. Such world educational stars, as Howard Gardner, Barbara Oakley, Esther Wojcicki, Gordon Newfeld, and many others consider it an honor to hold webinars for Ukrainian educators (One hundred days of war, 2022). Through joint efforts, the experience of "How not to lose the national education system in the war conditions" has been accumulated, and the possibilities of social and psychological support of citizens are used.

The system of postgraduate and higher education in Ukraine also provides distance learning, but admission to undergraduate, bachelor's, and master's degrees is carried out especially, without the traditional use of external independent assessment, a single entrance exam, and a single professional entrance test. The current situation in the Ukrainian education system is a testament to the ability of teachers, students, government, and the community to respond to changes and challenges of real life and to introduce new forms and methods of working with digital technologies and resources in distance work.

However, digital education is not only necessary in emergencies (wars, pandemics, etc.). It determines the quality of education and the implementation of educational innovations.

The effectiveness of digital educational technologies is usually evaluated by the following indicators: "improved and enhanced teaching and learning; digital maturation, including tackling the first and second digital divide; data-driven decision making and evidence-based education; and AI in education" (Gabriel et al., 2022).

> A study presented in the Apple Classrooms of Tomorrow research (ACOT) (Apple, 1991) identified five steps in integrating technologies into teaching practice – representing the entry of digital culture into the teaching-learning process: exposure, adoption, adaptation, ownership, and innovation. This demonstrates that pedagogical innovation is part of a process that demands technological use that may initially be limited, but that creative integration of digital technologies in the learning process can enhance efficient and engaging pedagogical practices (Nielsen, et al., 2019).

The results of our study show that more than a third of teachers are convinced that "digital education is based on the concept of digitalization and involves the replacement of special programs" (37.5%), and the priority and effectiveness of learning depend on a successful combination of online and offline technologies (blended learning) (8%), non-formal education through online learning (12.5%); use of ICT for distance learning (16.7%).

In the context of the European Higher Education Area, various possibilities of information technologies are considered today, and active methods of teaching students are introduced, which motivate them to creative research, and non-standard decision-making, as opposed to traditional lectures or seminars of reproductive nature (Lord, 1997). Therefore, today the problem of acquiring competencies and personal abilities in e-learning technologies as a necessary condition for their continuous professional development, as well as readiness to use digital resources and tools, especially in remote rural schools, is relevant (Budnyk, Matveieva & Fomin, 2022).

To the questionnaire "What digital resources do you use most often in working with students?" we got 98 responses from high school educators. Of course, the coronavirus pandemic has led to the transition to distance learning for a long time, which means that universities have created some digital and logistical support to work with students online (distance learning platforms, e-libraries, e-journals, e-classrooms for virtual laboratory experiments, etc.).

Russia's military invasion of Ukraine (February 24, 2022) forced all educational institutions to return to distance work. And the use of digital resources and tools for communication with students is the creativity and every innovative teacher's autonomy.

The following digital tools are most often used in the educational process of Ukrainian universities: Kahoot, QR-code, Padlet, Mind Map, Wordwall, Mentimeter, and others. (Fig. 7)

Figure 7 – Use of distance digital learning resources.
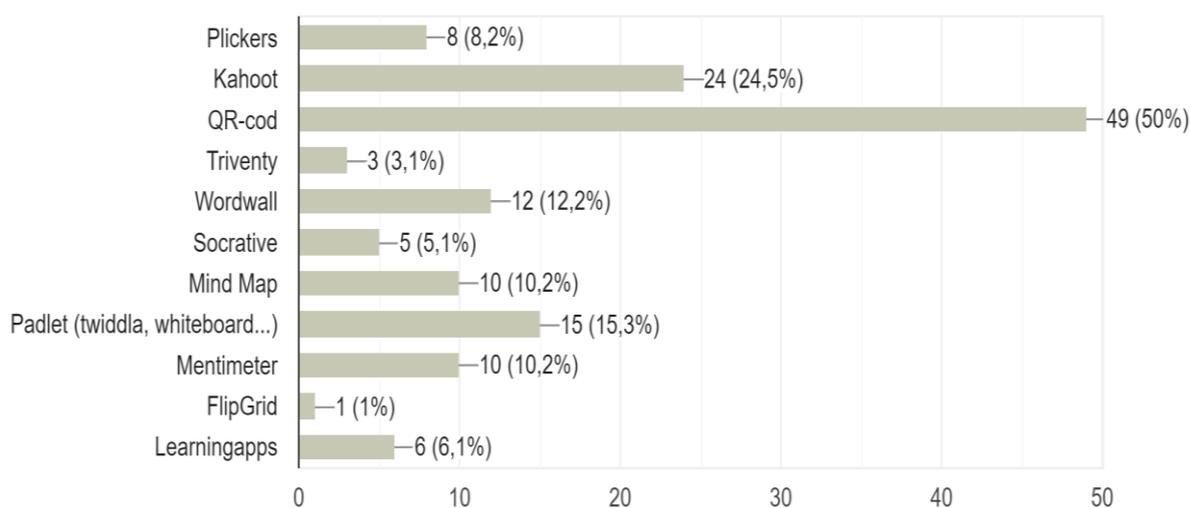
Source: The survey was conducted by the authors of the article.

According to the study, 34.7% of high school teachers fully support distance learning, and 63.3% partially approve of it due to the lack of offline communication, difficulties in objective evaluation of laboratory work and experiments, as well as creative projects, etc.

The important nowadays problem for educational institutions not only in Ukraine but also in many countries around the world is "developing support materials, usually commissioned by teachers, that can enhance the learning process", and "using data science to understand online experiences of students" (Nielsen, et al., 2019). After all, in the line of innovation, first of all, it is necessary to improve organizational and methodological tools,

methods, and forms of pedagogical work for the development of critical thinking, skills of dialogic learning, project teamwork, inquiry-based learning, etc. For this purpose, the latest technologies must be adapted from the content of educational programs, and in addition, we should practice brainstorming sessions to create new teaching tools.

Interactive comics as an educational innovation

Interactive comics as a teaching method is a special means of an educational monologue or dialogue with the help of a series of thematic images with short texts and symbols, interesting for school children.

Comics usually contain 5-6 frames, giving students the opportunity to perceive and reflect on the relevant causal relationships, respectively, and acquire skills to create various stories and educational dialogues. In the educational process, comics contribute to the development of students' creative abilities because they also use specific vocabulary to reflect emotions, contributing to the dramatization of plots as well as allowing students to use perception and experience of the emotions of characters to understand and control them. They also serve as an effective means of developing imagination, and fantasy, the ability to formulate and express thoughts, highlight the main idea, work in a team, and so on.

In the context of digitalization of the educational process, digital tools should be used for the creation of comics of various types and complexity (Domyancich-Lee, Cleeland & McCleary, 2021) and in the study of various subjects, such as social sciences and humanities (Jacobs, (2007). They are widely used in school textbooks in America and Europe because this pedagogical tool is effective for quick memorization of certain information.

To create comics, teachers use the following programs: Toondoo (http://www.toondoo.com/), Pixton (http://www.pixton.com/), Canva (https://www.canva.com/uk_ua/), StoryboardThat (https://www.storyboardthat.com/storyboard-creator) and others. Fig. 8 presents comics created for primary school students for Science lessons by the authors of the article.

Figure 8 – Author's development: Comics for primary school lessons "I explore the world".

Source: The comics was created by the authors.

Working with comics will help to develop students' creative thinking and speech activity during discussions of educational topics on the plot.

The creation of Ukrainian comics and memes on the war themes, often humorous, to relieve anxiety and stress, is especially relevant today. Mostly, these are positive characteristics in order to support, first of all, servicemen and children in occupied or already liberated territories, to claim faith in victory over the enemy.

Similarly, educators use other digital tools and resources online to visualize the educational process, including distance learning, namely: word clouds, short instructional videos, presentations, interactive worksheets, posters, puzzles, etc. They increase students' motivation and interest, cognitive activities, and promote faster learning.

Conclusions

The theoretical analysis of the research problem proved that modern pedagogical science emphasizes the implementation of educational innovations should be aimed at the formation and development of students' specific skills or competencies necessary for social

life and effective learning. They include skills such as critical thinking, teamwork, independent work, cooperation, digital literacy, adaptability, etc. (Herodotou et al., 2019). The quality of the introduction of educational innovations in practice is determined by the level of development of the teacher's creativity, and his/her focus on innovation (Budnyk, Mazur & Matsuk, et al., 2021). It is important to increase the teacher's innovative competence, interpreted as a system of motives, knowledge, skills, abilities, personal qualities, and values that enable the implementation of all stages of innovative professional activity: from modeling and forecasting to innovation in professional practice.

The teacher's innovative activity is carried out by taking into account the challenges of modernizing the education system by the adopted Standards, and the national development strategy based on a civilizational approach or wartime conditions. This means implementation of innovation activities involves the adoption of the idea of the diversity of the world as the formation of individuality in the space of universality to recognize the priority of universal values. At the same time, the world's educational systems should function according to the civilization trends of the development of national educational systems (Budnyk, 2019). Therefore, innovative approaches to the organization of the educational process in world (European) practice are timely and, under the existing conditions, should be introduced into the national education system even in wartime. The results of our research testify to the priority importance of digital technologies in distance education.

It is proved that together with innovations, first of all, it is necessary to improve teachers' organizational and methodological tools, methods, and forms of work for the development of student's critical thinking, skills of dialogic learning, and project work in a team, inquiry-based learning, etc. To do this, the latest technologies must be adapted from the content of educational programs, and practice brainstorming sessions to create new teaching tools.

Thus, we emphasize the teacher's readiness to implement innovations based on an interdisciplinary approach, taking into account the social challenges and realities of the war in Ukraine. Pedagogical innovation is based on a successful combination of achievements in the philosophy of education, the complex creative sciences, psychology, general axiology, pedagogical management, sociology, anthropology, and others, where the individual is the focus of the study.

As a result of the research, it was found that during the few months of the war with Russia, Ukrainian education has indeed undergone significant changes, primarily in the

direction of the implementation of digital innovations in distance learning. The survey, which was conducted using Google Forms, made it possible to carry out a quantitative and qualitative analysis of its results. In particular, the professional experience of teachers gained during the war has been summarized. It is extremely important that teachers across the country are united on the educational front in order to continue to provide students with quality educational services Despite the forced relocation of a significant number of teachers, students, or entire educational institutions to currently safer regions of the country or abroad, the experience of organizing the educational process in the conditions of a full-scale war in the 21st century in Ukraine, which is located geographically in the center of Europe, is quite interesting. After all, the education system in this country has passed the sustainability test, which means that the future young generation will be educated on the principles of freedom, peace, patriotism, independence, and humanism. Therefore, students are motivated to study in order to protect their country in the long run and to acquire quality education for the development and revival of a bright future. The teacher plays a significant role in this process, focusing on the introduction of progressive innovations, national education, and the development of the creative potential of children and youth.

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