

Digitalization and Diversification of Modern Educational Space (Ukrainian case)

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Summary

Linking Ukraine's education system with the trends of global digitalization is mandatory to ensure the sustainable, long-term development of the country, as well as to increase the sustainability of the education system and the economy as a whole during the crisis period. Now the main problems of the education system in Ukraine are manifested in a complex context caused by Russian armed aggression. In the context of war, problems include differences in adaptation to online learning among educational institutions, limited access to education for vulnerable groups in the zone of active hostilities, the lack of digital educational resources suitable for online learning, and the lack of basic digital skills and competencies among students and teachers necessary to properly conduct online classes. Some of the problems of online learning were solved in the pandemic, but in the context of war Ukrainian society needs a new vision of education and continuous efforts of all social structures in the public and private environment. In the context of war, concerted action is needed to keep education on track and restore it in active zones, adapting to the needs of a dynamic society and an increasingly digitized economy. Among the urgent needs of the education system are a change in the teaching-learning paradigm, which is based on content presentation, memorization, and reproduction, and the adoption of a new, hybrid educational model that will encourage the development of necessary skills and abilities for students and learners in a digitized society and enable citizens close to war zones to learn.

Keywords:

new learning paradigm, access to education, digital educational resources, war zone, infrastructure.

1. Introduction

The crisis caused by Russian military aggression profoundly affected the entire civilized world. In Ukraine,

the introduction of online learning in response to the COVID-19 pandemic and then the war was the only possible option to end the school year. For a certain category of students, the war partially or completely limited access to education. However, with the start of the new school year in many schools in Ukraine, education continued despite the difficult situation in the country. It takes place either offline or online, depending on the war zone.

Some of the challenges facing students, teachers, and parents in the online learning process include lack of access to the infrastructure necessary to conduct online classes, lack of appropriate digital learning resources, lack of basic digital skills for teachers and students, respectively lack of adequate teacher training to manage online learning. In the case of students with access to online learning, the challenges they face relate to adapting learning methods and educational content to the digital format. Challenges for global education related to the COVID-19 pandemic outlined critical skills to be mastered before 2025 - self-management problem solving, diversifying technology, developing analytical and innovative thinking, active learning and developing learning strategies, solving complex problems, critical thinking and analysis, creativity, originality and proactive technology, use, monitoring, and control or flexibility [1].

The COVID-19 pandemic crisis has affected education systems across the European Union, at school and university levels. In this complex context, the allocations available to the Member States through the Recovery and Resilience Mechanism can be an important source of funding for the reforms needed to make education systems in Europe more sustainable, flexible, and adaptive [2].

For Ukraine, it is especially important to use all available funds to finance education reforms. All economic subsidies from global educational organizations should be used effectively and aimed at investments that support not only the modernization and development of educational infrastructure but also the change of the teaching-learning paradigm and the development of modern educational resources to improve the effectiveness of the education system [3].

We believe that in the process of digitalization of education Ukraine should follow two European strategic priorities for digital education - the diversification of high-performance digital educational technology and teaching methods; the improvement of digital skills and competencies for digital transformation. The purpose of this paper is to describe the diversification of educational methods in the context of digitalization. Assignment: to describe the general problems of education in the context of the war in Ukraine, in the context of the analysis of the diversification of educational methods, to propose a hybrid model of learning, to describe its components, recommendations for the implementation of hybrid education and possible problems of implementation of hybrid education.

2. Literature review

At the level of the European Union, the right to quality, inclusive education, vocational training, and lifelong learning is the first principle of the European pillar of social rights [4]. The European Union's targeted economic recovery efforts give education a central role in strategic development plans. The European Education Area offers cooperation at the European Union level to harmonize the educational systems of member states and allies and support their development. In this context, [5] name the main dimensions of cooperation proposed in the European Education Area to improve the efficiency of the education system by solving permanent systemic problems: quality of education, equity and gender equality, green transition and digital transition, teachers and trainers, the higher and geopolitical dimension of education.

National efforts to improve and modernize education should be synchronized with European priorities [6]. According to [7], global digitalization should be performed and implemented quickly to ensure the implementation of structural changes in education in the shortest possible time. Postponing the implementation of education modernization strategy continues to generate negative consequences associated with the low efficiency of the education system, with high social and economic costs for any country. The vision of education of the future [8] is such that must be synchronized with the European goals for education, to ensure consistency between the national structure of

educational development and the priorities of the European Union. The European and national strategies of education must be harmonized, to support the recovery of social and economic gaps between the member states and EU applicants. We agree with the author because the ratio of these goals can increase the mobility of Ukrainian students and pupils at the level of the European Union and equally increase the attractiveness of the Ukrainian education system for students and pupils from other member states [9]. According to [10], investment in a highly effective education system is the key to the sustainable structural transformation of the country and placing society and the economy on a trajectory of irreversible development. The national educational system must prepare, in the context of the relocation of global value chains, graduates capable of using all social and economic opportunities, and make an active contribution through innovation, entrepreneurial spirit, and understanding of regional and global contexts in positioning the native country in the chain of producers with high added value[11]. European scholars believe that to achieve such goals it is necessary to adopt an educational model that encourages and stimulates active learning and self-management of learning strategies, continuous professional development, lifelong learning, access to quality educational resources for all learners and students, as well as innovation and independent, critical and analytical thinking that contributes to overcoming persistent systemic educational problems. Educators need support in the learning process by providing technological tools to facilitate planning and collaboration and communication with students/students, parents, and other teachers, and school/university administrative staff. They also need ongoing professional development to ensure the effective use of technology [11].

There is a need for training through courses, including online courses, for teachers who want to learn the methodology and didactic design in distance learning technologies and environments. Courses and resources should be available in Ukrainian and support Ukrainian educators to acquire skills in using technology to make learning more effective both offline and online [12]. It is also necessary to certify teachers in this sense and provide transferable professional credits to teachers who receive the appropriate certificate [13].

A number of persistent systemic problems in Ukrainian education affect the performance of the educational system and the competitiveness of graduates. Of course, among the main problems, the main war, which has a negative impact on society and the economy as a whole. At the individual level, many young people this year have not been able to enter higher education [14]. This negatively affects professional and economic opportunities and increases the risk of poverty and social exclusion and dependence on state support and social support mechanisms.

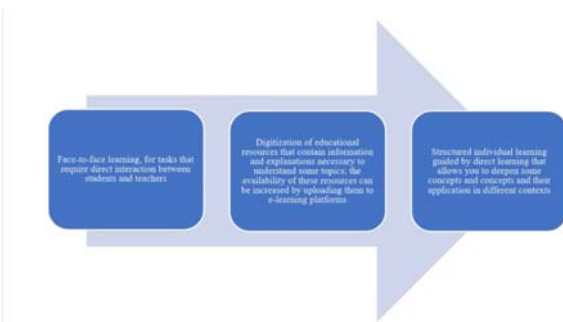
3. Materials and methods

In the context of a military crisis, we suggest revising the instructional model offered by the Ukrainian educational system and adapting it to the learning needs of categories of students from different combat zones. We believe that this diversification of didactic activities should epicenter the student and focus on the development of skills and abilities that students will need after completing their educational cycles, such as the ability to understand and critically evaluate some texts, digital skills, understanding some concepts and scientific concepts (including those from the social sciences), as well as developing practical skills like soft skills, like teamwork, communication, and argumentation of ideas and thoughts, critical evaluation of ideas and opinions, etc.

A learning model that is relevant to the 21st century and linked to the European Union's educational priorities should allow the student to experiment, encourage individualized learning, integrate technology and digital resources into the learning process, and focus on learning content at a pace appropriate for each student.

In the context of the digitalization and diversification of education in Ukraine, we draw attention to the fact that the approach to digitization should not be limited to the creation of hardware and software infrastructure but should offer a new vision of the teaching and learning process that would stimulate creativity, critical thinking, individualized learning and allow students to develop the necessary skills and abilities to adapt to a dynamic and digital economy.

The vision of the teaching model should include incentives and support for educators to move from the role of delivering educational content to creating and adapting learning content and facilitating the learning process (Fig. 1):



[Figure 1] Key components of the hybrid education model

Thus, to improve the effectiveness of the education system in Ukraine in wartime and post-wartime, the paper offers as an example the case of a hybrid model of education (blended learning).

This model of learning not only meets the immediate needs of developing modern educational content or

democratizing education by increasing access to quality education for students and pupils but is part of the strategic priorities for education agreed upon at the European Union level and can accelerate the development of the right skills for the society and economy of the future (Tab. 1):

[Table 1] Recommendations and Problems of the Hybrid Education Model

Recommendations for the implementation of hybrid education	Challenges of implementing hybrid education
In order to improve the strategy of digitalization of education in Ukraine, we propose to conduct an audit and define clear goals for improving digital skills among educators.	Large numbers of students and teachers who lack digital skills and the necessary technology. Lack of access to infrastructures.
Setting clear, measurable goals for increasing the use of digital learning resources in the educational process and a calendar for implementing these goals	Deficient digital infrastructure, especially in active war zones, insufficient financial allocations, and physical capacity to develop this infrastructure
Updated curriculum to develop digital skills from the basics to advanced artificial intelligence	Lack of goals for reforming the curriculum and changing the approach to skills formed by the educational system of Ukraine
Hybrid education involves the active participation of students and teachers in the teaching/learning process	Reduced cooperation with parents and students in the educational process
Creating guidelines for digital educational resources available to all creators of educational content to set minimum quality standards at the national level	Lack of appropriate structures to support teacher training for hybrid education
Creating a national database with educational resources, such as master classes, available in open code mode through collaboration with the private sector, civil society, and educators	Imperfect structure of course hours for individual activities, teamwork.
Collaborate with the private sector and civil society to develop national e-learning platforms that give all students access to digital learning resources and allow teachers to monitor students' individual educational progress.	Lack of well-established cooperation between the private sector and civil society
Increasing the internal capacity of the MES to digitalize education and implement a hybrid system.	Limited administrative capacity for the digitalization of education and implementation of a hybrid learning system

Table: author's own development

A hybrid education model combines traditional teaching/learning methods with digital tools and resources. Technology is not just a content delivery tool, but also a resource that supports and facilitates the development of new skills.

Technology and digital learning resources complement the direct interaction in the classroom between instructors and students and allow for better management of the time that instructors spend with students through the ability to perform various didactic activities (learning, deepening, practical application, individual learning, teamwork, self-assessment), assessment, etc.) in different work environments, synchronously or asynchronously. This flexibility in didactic activities allows educators to devote more time to deepening and demonstrating content, activities that require direct interaction with students, and allow students to go through the learning content at their own, appropriate pace according to their needs [15]. In addition, hybrid education encourages students' individual development by allocating the time and resources necessary for independent learning that becomes part of regular didactic activities. In contrast to this approach, the current teaching/learning model involves several didactic activities (learning, deepening, demonstration, assessment) during course hours. Such an educational model does not take into

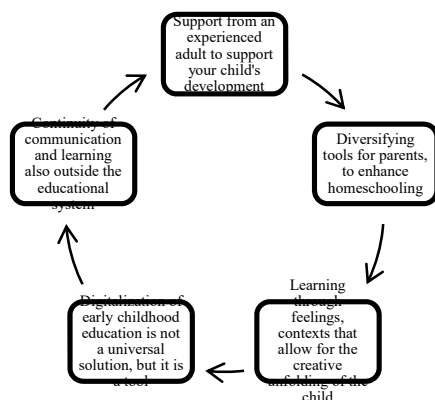
account the specific needs of students in the pace of learning, nor the need to prioritize certain activities by the teaching team for better understanding of the content, nor does it allow for asynchronous completion of the learning content [16]. A negative aspect of the lack of asynchronous learning in the current educational model is the accumulation of gaps between students. Without the ability to reduce these gaps by allocating more time to work with students who need additional support, they may find it difficult to continue their learning journey, such difficulties are also one of the reasons for dropping out of school [17].

Another important component of hybrid education is equitable access to quality educational resources for all students. The success of some didactic activities, such as teaching certain content, depends almost exclusively on the prior preparation of these activities by the teaching staff. Thus, there are great differences, for example, in learning, including at the level of one school.

In this context, qualitative differences inevitably create disadvantages for some students.

4. Results

Hybrid education offers a solution available to all students other than the classroom through materials such as master classes that students can access and take at their own pace. The availability of these materials can also reduce the time teachers spend teaching in the classroom, allowing them more time for other activities necessary to understand the content, such as deepening and applying concepts learned through individual or teamwork. Hybrid education also, from this perspective, better manages the time devoted to direct teacher-student interaction and frees teachers from certain repetitive tasks, allowing them time to create new educational resources and adapt those resources to the different learning needs of students. Hybrid education can improve the quality of teaching, increase access to quality education, and democratize the educational process through access to more resources and instructors in different fields and learning units.



[Figure 2] The flexibility of the Hybrid Learning Model in Early Childhood Education

- Neuroscience research suggests that the experiences we have in the early years of life are the foundation on which the rest of our lives are built.
 - Human beings are a dynamic combination of human genes (nature) and environmental influences (stimulation of development through education). They are inseparable and interact with each other.
 - Direct interaction with an adult is one way to learn fundamental knowledge.
 - Between the ages of 2 and 7, children go through a pre-operational stage when they are developing their ability to use language and think. At this age, children need to actively learn using concrete materials with lots of hands-on experience.
 - Early learning and development occurs in an environment that is protective, stimulating, and accepting of children. They need interesting experiences where they can interact with other children, adults, and different materials and have frequent discussions that need to be stimulated. These ideas about early learning and development have direct implications for how learning continues in the educational system. The most important of these relate to:
 - Accompanying an experienced adult to support the child's development and direct interaction with the child (in different contexts: playing games, reading a story, doing experiments or hands-on, artistic or domestic activities, exploring nature). Activities suggested by teachers that can be done at home require the involvement of a responsible adult (parents, other family members) and certain parenting skills (including digital). Thus, in early childhood, continued learning outside of the early education system involves the tools of parents and relatives to reinforce learning at home with learning and information resources. This aspect of ongoing communication with parents and emphasizing the importance of children's early access to education is especially important in any context, not just that of hybrid education.
 - Even if it takes place in the space of the home rather than the group room, learning requires specific materials, exploration through the senses, contexts that allow for creative development.
 - The digitalization of early childhood education (and not only), while not a universal solution and cannot replace a responsible adult interacting with the child, is a tool that strengthens the work of the educator.
- It is important to ensure continuity of communication and learning outside the educational system, reinforcing learning through play and exploration, in the context recommended by the teaching staff, including the use of technology under the supervision of an adult. In this sense, it is important to provide quality and diverse learning materials appropriate to the age of the children.
- To ensure the construction of proper interaction with teachers and colleagues, in case of exceptional situations

requiring temporary suspension of courses, the hybrid component can facilitate connection on synchronous platforms (video meetings), periodic, brief, in small groups, which trains communication, and also builds skills such as respect for the allotted time of a colleague for communication.

In this way, the hybrid education model can be successfully applied to early learning as well as to other educational phases. The flexibility of this model and the ability to increase the degree of participation in educational activities and continue education outside of the school space, while following the recommendations of the teaching team, present undeniable advantages over the current model of teaching and learning, which is based solely on the interaction in the classroom. between the student and the teaching team and on the delivery of educational content.

5. Discussion

The hybrid model of education emerged as a response to the diversification of methods in a distance education environment. For this reason, [18] consider the hybrid model of education as a teaching and learning method that combines active learning methods and digital learning resources in a digitalized environment to improve students' learning experiences. In hybrid learning, according to [19], technology complements personal activities rather than replacing them as a tool for developing skills and competencies. The author notes that in the hybrid education model, technology and digital learning resources support the learning process and enable teachers to perform didactic activities in offline and online environments, synchronously and asynchronously. Solidarize, because the student learning experience is enhanced by the ability to prioritize in-person teaching tasks that require more direct student-teacher interaction. European scholars [20] appeal to complementarity, allowing instructors to allocate more time for individual work and to personalize students' learning journey by tailoring work with them to their instructional learning needs. During didactic activities, the whole hybrid learning process is dynamic and can be adapted to the specific needs of the students as well as to the different types of educational content to be completed [21]. The way the three components of hybrid education are combined can vary from one work session to another, from one topic to another, from one module to another, thus offering more flexibility for both teacher and student in determining the best ways. go through different educational content[22]. The authors [23] complement these statements by believing that different approaches can be chosen, from class to class and from discipline to discipline, depending on several criteria: class needs, grade level, the complexity of content, method of student learning desired, time spent on content, content previously discussed, etc. This flexible approach to teaching allows for both continuous assessment and

adaptation of the effectiveness of teaching and learning methods. used by teachers and students, as well as allocating the necessary time to repair some gaps, if any, and the time needed to assess students' individual educational path [24]. If teachers identify gaps caused by different rates of student learning, the hybrid education model allows them to adapt teaching through asynchronous instruction to the individual needs of students [25]. We believe that in the context of hybrid education, the teacher becomes a facilitator of the learning process. The learning process is no longer focused only on the accumulation of information, but primarily on the development of skills and competencies that enable knowledge through the use of digital learning resources in the individual learning process. In this perspective, [26] write that the instructor directs the learning experience to the student, which allows for an individualized learning process and course of education for students, which allows for the development of necessary critical and analytical skills throughout life. In addition, this approach also promotes collaborative learning activities, such as peer learning [27]. This allows the instructor to facilitate learning groups that can provide students with the support and necessary cues as they go through some of the (more) difficult tasks.

6. Conclusions

In difficult crisis situations, the education system aims at the digitalization of the educational process and the diversification of teaching methods. Literacy, adaptation, analytical skills, critical thinking, basic STEM knowledge, digital and communication skills and are important for the competitiveness of young people and for the development of Ukraine. Developing these important skills for a digitalized society and economy requires a diversified, comprehensive approach to the challenges facing the education system in Ukraine. In the context of the rapid great changes facing societies, equal and equitable access to quality education, as well as access to lifelong learning, should be strategic priorities. The changing role of the teacher in the modern learning process has created a need for training, development of necessary skills through training courses, exchanges of experience, improvement of digital skills, professional advice, and access to modern educational resources. To enable hybrid learning, learning actors must have access to relevant educational resources, such as master classes or (asynchronous) bespoke courses, and must have the digital tools necessary to view such content. Moreover, in order to diversify educational methods, the educational system should encourage and support lifelong learning with regard to providing access to educational content, such as master classes, in the open, and both for students as well as for those who have graduated/left school (university). Access to resources for further professional development is essential for developing

the skills needed to implement and adapt the content of digitalized education.

The transition to a hybrid model of learning requires ongoing investments to ensure that the infrastructure is secure and that all students and faculty have access to that infrastructure. But with war and large populations who, for certain reasons, cannot be educated offline, this investment is sorely needed. To improve the quality of offline and online education, national infrastructure programs in areas close to the battlefield and providing staff to support these communities in their use should be considered. From a security perspective, all software and hardware resources involved in the training process should provide maximum security, so it is necessary to: maintain software through upgrades for cyberattacks, protect investments and minimize administrative costs by providing safeguards for hardware; adopt scalable solutions at the nationwide level. The infrastructure and digital technology resources used in the educational system must comply with European and global standards for the use of technology in the online environment and access to the Internet in full safety to: protect students from the influence of inappropriate content; safety of the whole family by controlling access to hardware devices We consider it extremely important that the digitalization of the educational process takes place in the safest environment for the entire population (remote and close to the action).

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Insert acknowledgment, if any.

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