

Digitalization of vocational education under crisis conditions

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Abstract. The rapid development of technologies and their application in all branches of the economy calls for digitalization of education as a prerequisite of improving the quality of vocational training. Digital technologies in their turn allow to diversify the mode of training according to the needs arising under various circumstances. In some countries like Australia and Canada, online and blended learning are the only possibly form of training due to learners' remoteness to schools. But as recent experience shows, introduction of online education was the only way out to sustain it under the conditions of the COVID-19 and now by the wartime and absence of access to educational facilities. In this was, the necessity of digitalization of education is constantly growing together with its increasing range of applicability. Now all production processes and processes of the service sector are under the influence of digital technologies, because modern machines are operated by computers. Modern military equipment is also digitally based and operated. Thus, working in modern industries and services requires a high level of digital literacy, which presents a challenge for the system of vocational education. Under modern conditions, irrespective of their positive or negative origin, vocational schools (VS) should be ready to train specialists for various spheres of industry capable of working with constantly changing digital technologies. This fact puts forwards certain requirements to digital literacy of both students and teachers, who have to cooperate through digital devices and software to attain the set educational goals. All these circumstances require the equal level of digital literacy of both teachers and students to provide educational institutions with the latest material base and digital resources.

Keywords: education, vocational training, digital transformation, digital technologies, digital literacy, innovations

1. Introduction

Vocational education (VE) is known to be one of the pillars of successful economic development of any country because it trains professional staff for its different branches. Graduates of VS present a majority at the labour market and bear not only a greater share of taxes, but also perform diverse types of tasks to sustain any industry or sphere of economy. Therefore,

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VE occupies a special place in the structure of the labor market. Vocational schools (VS) in this regard fulfill an important task to train future qualified workers, able to perform their professional tasks in conformity with the needs and requirements of the labour market. Social development largely depends on the dynamics of educational development, and among the main factors for ensuring the economic stability of the state is the absence of worker vacancies at the labor market, compliance of vocational training with employers' needs, and a high level of professional competencies. According to analytical sources, as of 01.01.2022, there were 1,513 VS operating in Ukraine which hosted 01.02.2022, 234,380 students [21]. In recent years, the admission to VS is performed in accordance with the regional demand requested by the representatives of local authorities and business organizations.

Unfortunately, we have to state that the labor market is still in dire need of qualified workers, whose training would fully meet the requirements of employers. However, in Ukraine, until recently, VE lacked the desired popularity in comparison with the higher education. That is why a number of measures initiated by the Ministry of Education and Science were aimed at popularizing vocational education and increasing its role in society.

The latest war events in Ukraine have intensified and extended the demand for qualified workers in the country. There emerged an urgent need for builders, transport workers, logistics, the IT sector specialists, etc to eliminate the consequences of Russian aggression and rebuild the infrastructure of Ukraine. However, educational facilities in the regions of military actions have been destroyed, while other educational institutions in the conditions of the martial law have been forced to switch to a distant or blended type of learning. This fact determined new vectors of digitalization of VE: by modernizing it to create a digital environment for feasibility to work under such circumstances. Currently, online lessons incorporate various digital services and applications, which urges all the parties (students and teachers) to have digital literacy skills, and therefore, the development of their digital competence.

Considering innovations in all spheres of life, including education, production and services, a training process at VS requires the implementation of a competence-based approach. On the one hand, it is developing students' ability to use digital technologies in their education, on the other hand, students have to understand that production technologies and services, for which future qualified workers are trained are digitalized.

1.1. Theoretical background

The experience of training qualified workers is highlighted by Bazyl et al. [1], Nychkalo et al. [16], Pohorielov [18], Radkevych et al. [22], Stoychik et al. [29], Svyrydiuk et al. [30]. However, a special interest of our research is the European experience of training future workers.

According to the [31–33], there is a need for a digital transformation of the educational process, the introduction of digital technologies into curricula to meet the changing needs of the global labor market, because digital technologies can raise student achievement and motivation to solve problems.

Morze and Strutynska [14], Siemens [28] raise the issue of generational differences in digital learning, and this is a mismatch of digital skills between teachers and students, which can slow down the learning process. The equal level of digital literacy of students and teachers would significantly improve their involvement, responsibility for the performance and increase

learner's autonomy. Therefore, measures on eliminating the discrepancy between the digital literacy level of students and teachers should be considered.

Suffice it to say that Ukraine has been a participant in the Turin process since 2010, the main purpose of which is to analyze the national vocational education systems of the partner countries of the European Education Foundation and, as a result, further modernize these systems in accordance with European standards.

Regional reports summary of the Turin process-2016 (Ukraine) defines a list of factors that significantly influenced the socio-economic development of Ukraine, namely [8]:

- deterioration of regional economies as a result of shrinking industrial production and reduced foreign investment;
- negative trends in the labor market (decreasing employment and rising unemployment rates, etc.);
- consequences of the temporary occupation of the Autonomous Republic of Crimea and certain areas of Donetsk and Luhansk regions.

The identification of these factors enables to determine the general trends in the development of vocational (vocational and technical) education and at the same time consider the European experience in training future workers. In this context, we think it appropriate to focus on some of the best foreign scientific research on the experience of training future workers in foreign countries.

We are interested in the Polish experience of organizing a vocational training system. It comprises specialized lyceums for their closer collaboration with general education schools and facilitates retraining (post-graduation training) of their graduates [9]. Bocharov [2] notes that the reform of the education system in Poland has set the following tasks: bringing education closer to the realities of modern life, educating a modern person devoid of stereotypes of the past, democratizing the education system taking into account European experience, preparing for the country's accession to the EU, as well as the possibility of self-regulation of the new education system.

Suffice it to mention Rindfleisch and Maennig-Fortmann [25], who describing the model of vocational education in the Federal Republic of Germany, highlights extremely positive experience of dual education, which implies combination of training at a vocational school and enterprise. In this case, up to 70% of practical training of students is carried out in real production conditions, while about 30% of the time is allocated for theory. At the same time, enterprises providing professional training must have the necessary equipment available for organizing the educational process [2, 25].

The analysis of scientific sources gives an authority to claim that the issue of digitalization of education, in the conditions of martial law as a crisis form of organizing the educational process, is new for scientific research. This confirms the relevance of the discussed research topic.

2. Problem statement

Nowadays, the professional education system in Ukraine is in the process of reformation. For the most part, there is a discrepancy between the professional training of VS graduates and

the needs of employers, and therefore the labor market. In response, a number of reforms of vocational training system have been implemented in Ukraine starting from 2019. However, these reforms also need to be adjusted, since the years 2020–2022 put forward new challenges and difficult trials for Ukraine, which have largely affected the ways and methods of organizing the educational process in all institutions, especially in VS. If 2020 was the first year of the COVID-19 pandemic, which forced educational institutions to switch to distance and mixed forms of education, February 24, 2022, added to the problem. The war unleashed by Russia against Ukraine has greatly affected all social domains, including education. According to the Ministry of education and science of Ukraine, as of April 16, 2022, more than one thousand educational institutions in Ukraine were destroyed or damaged. The total amount of damage caused to domestic educational institutions, according to preliminary data, is estimated at 5 billion USD [27]. At the same time, some educational institutions are forced to leave their territories and move to safer cities. Schooling and training were suspended for 2 weeks and then educational institutions switched to distance learning.

Taking into account the COVID-19 pandemic and the current situation in Ukraine, we support Richey [24], who emphasized that educational technology is “the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources”.

In this respect, we aim to show the interdependence of a level of digital literacy of VS students with their exposure to digital technologies in the educational process, the importance of availability of updated digital equipment for the feasibility of digital education in critical conditions.

3. Methods

The article is based on the following methods: theoretical method of analysis and synthesis of the latest research on the issue of applying digital technologies in the educational process, which enabled to single out the main problems of digitalization of education at a current stage and the vectors of its improvement. The statistical analysis of digital equipment and software supply of vocational schools of Vinnytsia, Khmelnytskyi, Kyiv and Sumy regions was conducted to define the problems hindering the effectiveness of digitalization of education at the current stage. The received data included questionnaires, classroom observations, and opinion surveys and were interpreted using the main theses of the competence-based approach, systemic, synthetic methods to explore the students’ and teachers’ perception of the problem and their experience of using digital technologies for educational purposes.

4. Results

In most research digitalization of education is referred as the implementation of digital technologies in the educational process. If educational technology is seen as a broad concept incorporating pedagogical, educational, and informational communicative technologies, then it must conform to the requirements of the technological process and be systematic, effective, optimal, predicted, and reproducible [7].

The Presidential Decree “On priority measures for the development of vocational education”, included the creation of the Council for the development of vocational education as an advisory body reporting to the President [20], as well as the concept of the State target social program for the development of vocational education for 2022–2027 [4] define that the main task of developing VS is to study the needs of the labor market and train future skilled workers following these needs. We have already noticed a shortage of qualified workers in certain areas of the domestic labor market. This is confirmed by the following data: for example, since 2012, the number of applicants who chose to study at VS has decreased by 66% [10]. Compliance of admission to VS with the requirements of the labor market is analyzed in tables 1 and 2.

Table 1

Compliance of admission in 2021 with the requirements of the labor market (based on [21]).

Region	The most popular professions	Match	Mismatch
Vinnitsia region	212	51	161
Donetsk region	181	45	136
Zhytomyr region	162	34	128
Transcarpathian region	208	34	174
Kyiv region	161	33	128
city Kyiv	201	53	148
Mykolaiv region	195	42	153
Odessa region	170	38	132
Ternopil region	252	42	210
Ukraine	4730	1040	3690

Analyzing the presented materials, we can conclude that the process of determining the needs of the regional labor market is a fairly responsible step for forming a request/demand for professional training of future qualified workers. Table 1 shows that the discrepancy between the training of future skilled workers and the needs of the labor market on the whole in Ukraine makes up 78%, while in some regions it is even bigger (Transcarpathian region – 84%, Ternopil region – 83%), suffice it to mention the list of professions which supply meets or does not meet the demand at the labor market. As an example, the profession of “computer operator”, which is now considered out of date and is planned to be removed from the classifier of professions, is still in demand in Vinnitsia, Donetsk, and Kyiv regions. Promising for the labor market of almost all regions are the professions “waiter”, “mechanic of wheeled vehicles”, “plasterer”, etc., but unpromising – “room-maid”, “secretary”, “postman”. Interestingly, the profession of “clerk” for the 3 regions that we analyze is unpromising (Vinnitsia, Transcarpathian, Kyiv), while in the Donetsk region it is in demand.

On the one hand, under the existing martial law in Ukraine and considering prospective country restoration, there arose the need for qualified welders, carpenters, bricklayers, painters, locksmiths, mechanics, electricians, facers, that is, construction specialists is being updated. On the other hand, the list of specialists in the sphere of services has shrunk, which should be considered in the recruitment for the 2022–2023 academic year.

At present, we have been witnessing not only military invasion, but also a hybrid war on all

Table 2

Professions offered that coincide (do not coincide) with the needs of the labor market (based on [21]).

Region	Professions that meet the needs of the labor market		Professions that do not meet the needs of the labor market	
Vinnitsia region	4112	computer operator	4115	secretary
	4222	administrator	4144	clerk
	5123	waiter	4211	sales floor cashier
	6113	gardener	5142	room-maid
	7231	locksmith for the repair of wheeled vehicles	6113	gardener
			7136	plumber
		7222	turner	
Donetsk region	4112	computer operator	4115	secretary
	4144	clerk	4141	archivist
	5123	waiter	4190	accountant
	7111	miner	4211	salesfloor cashier
	7231	locksmith for the repair of wheeled vehicles	4222	administrator
	8333	driver of underground machinery	5142	room-maid
		7111	miner for the repair of mine workings	
		7215	slinger	
Transcarpathian region	7133	plasterer	4112	computer operator
	7212	gas welder	4142	postman
	7136	plumber	4144	clerk
	7436	seamstress	4190	accountant
	8211	turner		
Kyiv region	4112	computer operator	4115	secretary
	5123	waiter	4142	postman
	7133	plasterer	4144	clerk
	7231	locksmith for the repair of wheeled vehicles	4211	sales floor cashier
			5111	flight attendant
		5220	seller of non-food products	

fronts. It strengthens the need for information protection in all domains. Usually, specialists in the digital economy and digital security are trained at higher education institutions. However, VE is a primary stage for further enrollment to these institutions for many applicants. The most popular profession at VS is “information and software processing operator”, the standard of which was approved in 2017, and, of course, needs to be updated. In particular, for example, if the credits of the syllabi “Maintenance of Information Systems Hardware”, “Installation, debugging and support of software”, “Debugging and maintenance of network systems”, “Completing configuration and equipment complexes of information systems” are updated, in our opinion, the credit “Information processing”, which implies the development of skills for technological operations for processing text documents, creating and processing presentations, creating Adobe Reader files and working with them, etc., is not appropriate for studying on a larger scale at VS, since the listed skills are already obtained at high schools while studying computer science

course.

Despite the general enthusiasm regarding the potential benefits of digital technologies in education, there are significant challenges to digital adoption and usage in education. One can categorize these challenges in terms of (1) access, (2) motivation, skills and competences, and (3) evidence of outcomes [6].

Among the problems of realization online education are the insufficient or lack of necessary equipment, bad Internet coverage, these are the problem related to material support. Due to certain economic drawbacks educational establishments of all levels in the country have outdated digital equipment. Little is done for optimization of this domain. Only 33% of respondents admitted to having special software and using digital devises for teaching and learning (figure 1).

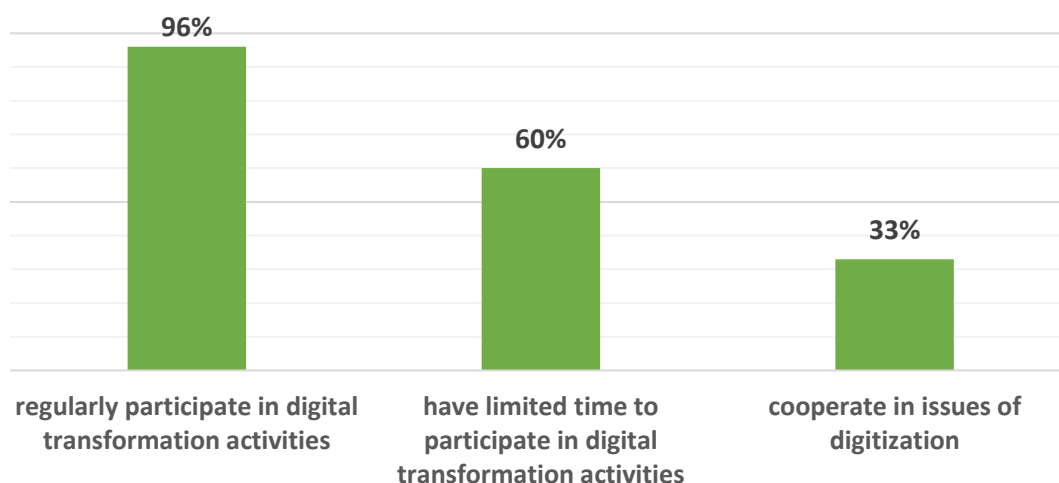


Figure 1: Results of VS principals’ survey on teachers’ use of digital technologies at lessons (based on [3]).

We have conducted separate studies on the availability of computer equipment at VS in Vinnytsia region. In 28 institutions surveyed, 8 persons share 1 computer. Suffice it to note that the use of computer equipment in (VS) is of priority when studying the subjects “Computer Science”, “Information Technologies”, as well as when mastering such professions as “information processing and software operator”, “tourism agent”, “digital book-keeping accountant”, “manager’s secretary”, etc. However, training other subjects for other professions also requires digital equipment with free access for students and teachers.

Notwithstanding, that the quality of computer equipment (hardware and software) influences the effectiveness of working with it. According to the survey, over the past 5 years, the (VS) of Vinnytsia, Khmelnytsky, Kyiv and Sumy regions purchased 36% of the total number of available computers, 64% of printers and multifunction devices. Hardware and software of a digital device are known to be interdependent: when installing software, one should follow minimum hardware requirements. In turn, each new version of the operating system requires more powerful hardware. Figure 2 shows the upgrade levels of operating systems installed on computers in VS of Vinnytsia region.

Figure 2 shows that only 27% of all computers in VS have an operating system Windows 10

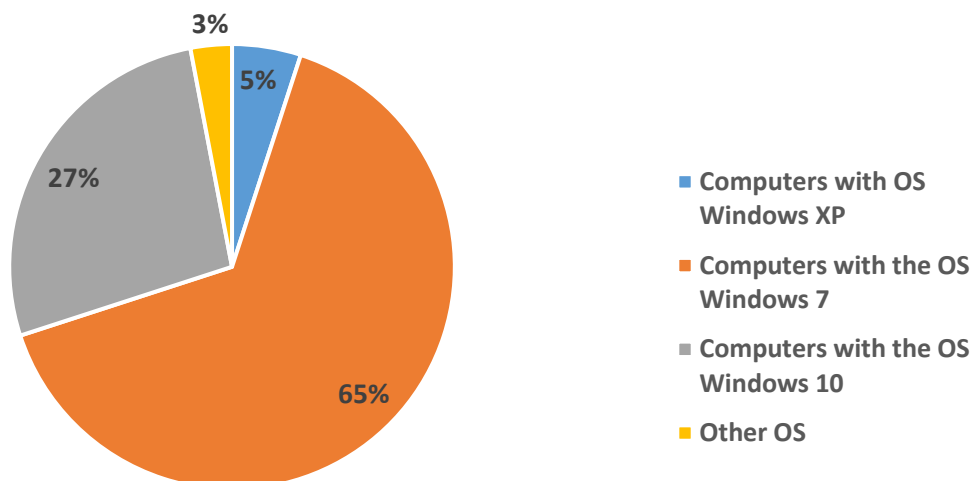


Figure 2: Using operating systems versions of the VS.

compatible with modern software, interfaces of the Internet study platforms. We can also notice a tendency of retreat from outdated software, yet it is much unclear taking into consideration these 65% of other operating systems. In addition, 28% of the surveyed VS teachers in these regions admitted to use their own laptops when conducting lessons for the students of these educational institutions, 45% noted that the equipment they work with needs upgrading, and only 8% of teachers who took part in the survey noted that they did not have any problems with updating the database of computer equipment.

Due to enormous displacement of VS teachers and students as well as VSs themselves, the only way to ensure the continuity of teaching and learning was online education. For this purpose, the UNESCO decided to support the education in Ukraine by:

- providing computer software and equipment for online teaching and learning;
- developing various digital education platforms and content;
- developing a higher education e-assessment system.

According to Sadik [26], digital technologies make education more inclusive both for students and teachers. Through this equal involvement they improve their digital practices. Under the conditions of war, it is the only way to sustain the educational process. April 7, 2022 the Ministry of education and science of Ukraine published a letter on completing the academic year at institutions of vocational (vocational and technical) education. It suggests organization of the study process (theoretical part) incorporating digital technologies (on-line) and postponing the implementation of the practical part of training students upon abolishing the military state [12]. But thanks to digital technologies students and teachers can at least model the processes and prepare various projects.

This calls for a high level of digital literacy of both teachers and students. Suffice it to mention that it is a challenge for teachers to educate “digital natives” as Prensky [19] called them. Due to the recent global and home events, we are on the verge of more significant changes in the

concept of education, predicting the conventional education will no longer be able to approach modern students and teachers, develop necessary skills and competencies [17].

Both teachers and students can assess their level of digital literacy at the European framework of teachers' digital competence. The Ukrainian platform "Diiia" contains tests to determine the digital literacy of citizens, among them – "Digital Programs for teachers". In April 2021 the Ministry of education and science launched a project to introduce an online tool called SELFIE for assessing the digitalization state of an educational institution, the level of digital competencies of participants in the educational process [13].

It is clear that in the rapidly digitalizing world, teachers also need to adapt to new realities. During this period, in most educational institutions, educational methodology departments developed recommendations for conducting classes using remote technologies and posted them on the websites on the "Methodological room" page.

In addition to methodological assistance, teachers of the VS have completed a large number of trainings, master classes, webinars, etc. on improving the level of digital literacy over the past period (table 3).

A significant contribution to the development of digital competencies of VS teachers was made by the Ministry of education and science of Ukraine through the implementation of the European program "EU4Skills: Better Skills for Modern Ukraine" (<https://eu4skills.info/en/>), aimed at implementing reforms in (VS). Within the framework of this program, teachers of pilot institutions had the opportunity to participate in training programs to improve the level of digital competencies.

The transition to distance learning led to updating teachers' needs in mastering software tools, namely, the needs:

- 1) to conduct training sessions online using programs for organizing video conferences – Zoom, Google Meet, Microsoft Teams, etc.;
- 2) place and upload training materials in online services (Google Classroom, Microsoft Office 365);
- 3) maintain educational websites and blogs.

Our research suggests that teachers' digital skills during the quarantine have significantly increased due to 2 factors: 1) the above-mentioned measures of raising teachers' digital literacy; 2) teachers' intensive use of digital devices for teaching. During this period, they mastered the skills of working with Zoom, Google Meet, Microsoft Teams, Google Classroom, etc., as evidenced by the results of our survey. The survey involved 312 teachers of Vinnytsia, Kyiv and Khmelnytsky regions VS – 196 teachers and 116 masters of industrial training (figure 3).

The research shows, that teachers find a lot of positive aspects of digitalization of education. They can find and share necessary pictures, charts, graphs with students instantaneously, which saves time for other activities. This cannot be done in the classroom without any Internet access and a computer. Sharing a screen is another advantage, because students can immediately download it and have necessary information close at hand. So, teachers welcomed this opportunity and mastered it envisaging its significant benefits. Another advantage is learning materials and tools accumulation which can be improved in the process and used for the next generation of students.

Table 3

Special measures to improve the level of teachers' digital competence.

Institution	Measures
University of Educational Management of the National Academy of Educational Sciences of Ukraine	<p>Special courses:</p> <ul style="list-style-type: none"> • “Electronic educational platforms for distance learning of general secondary education”; • “Digital remote testing systems”; • “Using Zoom and Google Meet to conduct online classes”; • “G Suite: an effective tool for building the information and educational environment of an educational institution”; • “Features of creating electronic educational resources to maintain the distance educational process”; • “Google services for organizing distance learning”; • “Information culture of the head of a vocational education institution in the era of digitalization”; • “Innovative technologies in informal education as a component of teachers' self-development”; • “Vectors of digitalization of teachers' professional development”; • “Teacher's professional development in an innovative educational environment”.
Institute of vocational education of the National Academy of Educational Sciences of Ukraine	<p>Webinars:</p> <ul style="list-style-type: none"> • “Practice of students' independent work”; • “Organization of distance learning by means of LMS Moodle”; • “Creating SMART complexes in the distance learning system”; • “Organization of distance learning in vocational education institutions”; • “Organizational and pedagogical conditions of distance professional training”; • “Teacher's self-educational activity in the context of distance learning”; • “Using mobile applications in distance learning”; • “Organizational and pedagogical conditions for the development of SMART complexes”.

Suffice it to note, that we also need to address the problem of digital educational environment, a set of technological environments, information and communication technologies, a system of modern pedagogical technologies that provide training in a modern information educational environment.

For this purpose, the Draft Concept of digital transformation of education and science up to 2026 was ratified. It identifies the main problems of educational transformation including its digitalization. To them refer: outdated database of digital equipment; insufficient digital competencies of all participants in the educational process; lack of a high-quality digital educational environment [11].

Motivation as another factor determining the effectiveness of digital teaching and learning. Annually, VSs of Vinnytsia region participate in the contest for the best project in the field of development and application of information and innovative technologies in management activities, educational process and research work. The theme of the submitted projects indicates

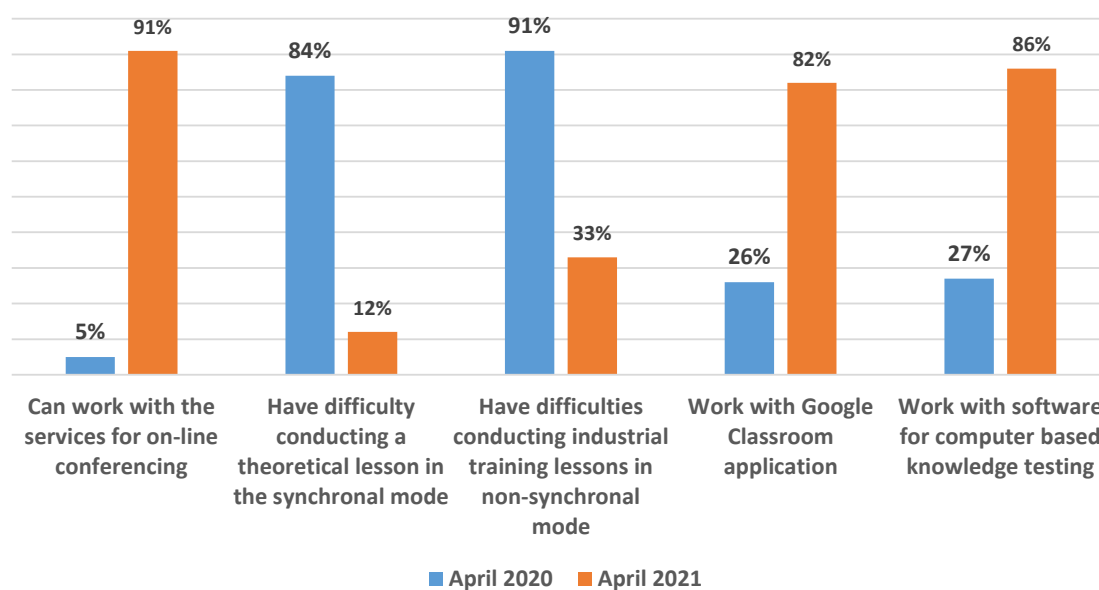


Figure 3: Improvement of VS teachers' software skills of maintaining distant and mixed forms of education (2020–2021).

the motivation of contestants to the use of digital technologies at VS and the simultaneous possibility of implementing projects both during lessons and in extracurricular activities, which expands the range of using digital equipment (table 4). For example, for the period 2008–2021, through participation in the grant program, the state educational institution “Vinnytsia higher vocational school of the service sector” purchased equipment (computers and multimedia tools) for the sum of 295,000 UAH.

Speaking about the level of digitalization of the educational process during the wartime (February – April 2022), suffice it to admit, that almost all the teachers and students (except those on the territories of active military actions with vast destructions) could continue the educational tasks and complete the academic year.

Far serious is the problem of the psychological condition of the participants of the educational process. Despite teachers' efforts to maintain the study process online, about 30% of VS students have lost interest and motivation to study. 44% have psychological difficulties coping with the assignments, and 5% do not participate in online lessons, devoting their time to volunteering or communal defense. There is no doubt that under such conditions the role of psychologists in supporting all participants in the educational process is hard to underestimate.

Yet, the rapid development of technology creates new challenges for the professional training of skilled workers. For example, nowadays, Germany possesses 309 industrial robots per 10 thousand skilled workers. This means that a specialist working at the relevant enterprise must develop skills in working with automation systems, and artificial intelligence, be able to control robotic systems and have developed technological thinking. And, if not long-ago specialists in robotics and artificial intelligence were trained only at higher education institutions, now the

Table 4

Grant awarded projects submitted within the Regional program for the development of information and innovative technologies (Vinnytsia region, 2020–2021).

VS	Topic of the project submitted for the contest	Year
SVEI “Vinnytsia interregional higher professional school”	“Laboratory for network and information security of the training and practical center for modern IT technologies of the State Technical University “Vinnytsia IHVS”	2020
Higher art vocational school No. 5 in Vinnytsia	“Creation of an educational cluster of 3D modeling of ceramic, wood and metal items”	2020
SVEI “Vinnytsia higher professional school of the service sector”	“Creating an interactive career counseling center”	2020
SEI “Center of vocational education No. 1 in Vinnytsia”	“Deployment of an innovative educational and digital learning environment by the Google G Suite for Education Service System in the SEI “Center for vocational education No. 1 in Vinnytsia”	2021
SVEI “Vinnytsia interregional higher professional school”	“Video studio of distance education of an institution of professional (vocational and technical) education”	2021
SEI “Brailov vocational Lyceum”	“Safety and comfort in the digital environment of a vocational education institution”	2021

world practice has a priority of professional education.

One of the most promising professions of our time is mechatronics, a branch of applied robotics science that combines mechanics and electronics. Mechatronic systems are used in various fields: cosmonautics, aviation, mechanical engineering, food processing, etc., and require highly qualified specialists to maintain them. German experience of dual training eliminates the problem of non-compliance of training laborers with employer’s needs because the process of professional training takes place directly in production (or in the service sector) with the involvement of specialists in the relevant field in the training process.

Training of future specialists in mechatronics in Germany is carried out by Siemens, which is a compulsory part of vocational education: every year Siemens trains up to 500 thousand skilled workers for the German economy. Simultaneously, students have the opportunity to study on expensive equipment (in Germany, businesses invest up to 50 billion euros per year to train specialists in artificial intelligence and robotics, while at the University of North Carolina, such annual training of one student costs from 25 thousand to 44 thousand dollars) [17].

Ukraine participates in different European educational programs. In the frames of the program “EU4Skills: Better Skills for Modern Ukraine” a higher vocational school No. 21 in the city of Mykolaiv received half a million UAH for the equipment of industrial training workshops and laboratories for professional training of future electricians, for their mastering renewable energy and mechatronics systems. The institution has specialized laboratories for “robotics and smart home devices”, “power electrical equipment” and “electric lighting and start-up equipment”. According to the data, this contributed to improving the level of professional training and creating an innovative educational environment for professional training [3].

The process of digitalization also largely applies to the transport industry. Currently, transport systems are undergoing significant changes in operation, and therefore repair. In addition, the introduction of the latest technologies for regulating traffic has led to the emergence of intelligent transport systems, which are a mixture of computer, information technology, and telecommunications developments along with knowledge in the automotive and transport sectors [5]. Unmanned control technologies, neural networks, and artificial intelligence are the reality of the present and the prospect of the future. We are experiencing the importance of unmanned drones for different military purposes, which present complicated automated devices operated remotely. Their creation, operation, repair and maintenance call for a high level of digital literacy and technological thinking. Therefore, to improve the level of professional training, the organization of the educational process according to new, productive educational technologies for the motor transport profile should cover the following elements, which can be applied to all the disciplines of vocational training [23]:

- supply the educational process with information sources and necessary equipment;
- introduction of innovative production technologies with high educational potential;
- a creation of an innovative climate among teachers aimed at comprehensive professional development;
- close cooperation with stakeholders, social partners, and employers with their involvement in organizing the professional training process;
- availability of a modern highly equipped enterprise as a social partner for conducting training of qualified labor resources following the needs of the labour market;
- available prospects for the introduction of advanced educational technologies.

Training of future qualified workers requires the implementation of the latest approaches to professional training and the introduction of modern forms and methods of training. Thus, we should highlight the educational technologies decisive in the education of the future [15]:

- corporate online training (a training model that allows students to move along their route using adaptive formats);
- competence measuring (assessment of competency and individual learning progress);
- flipped learning technology (a form of blended learning with advanced homework assignments);
- alternative learning styles (learning styles that offer students a more interactive experience – writing code in a browser, completing online tasks);
- competency-based online training (involves combining training modules, taking into account flexibility and adaptability to the changing labor market), etc.

In general, talking about the digital transformation of the educational space, in our opinion, can include the following:

- replenishment (updating) of the educational institution's digital equipment base;
- participation in grant programs for the digitization of education;
- a creation of STEM laboratories in educational institutions;
- development of electronic content libraries of educational and methodical materials;

- improving the qualifications of pedagogical workers in information and digital competence.

These and other measures will contribute to increasing the level of digital transformation of the educational process.

5. Conclusion

The conducted research enables us to state that the digital transformation of vocational schools is an urgent process accelerated both during the distant learning due to COVID restrictions and primarily by global modernization through the digitalization of production processes. The process of digital transformation of VE implies a high level of digital competency in all its participants, which calls for the search for and realization of effective forms of teaching and learning by applying digital technologies. Measures should be taken to eliminate a digital divide between teachers' and students' digital skills for effective participation in the training process.

Although, the war in Ukraine hindered the digitalization of VE in terms of its supply with equipment, through a forced shift to online mode of training it accelerated the use of digital technologies and thus digital competencies of teachers and students. The military conditions and the economic challenges have also made adjustments in the list of professions in demand, that should be trained only incorporating digital technologies. Since digital technologies are considered as rapidly developing and expensive, their application requires constant upgrading alongside with upgrading of corresponding skills to work with them and sustain the educational process. Thus, it is possible only on the level of interested parties – governmental, regional or municipal or other future employers who can provide VS with the necessary equipment and upgrade the software. Having access to high-quality digital equipment and the necessary skills to work with it will raise students' and teachers' confidence and motivation.

Considering the applicable and practical nature of vocational education, it should be realized on a competency-based, student-centered approach, so that a student acquires necessary skills to maintain complex automated digital processes at production, etc.

Further research may be dedicated to studying the ways of enhancing students' performance under conditions of online training.

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