Development of the Modern Educational Environment of the Institution of Professional (Vocational-Technical) Education in the Digital Space

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Abstract---The purpose of this article is to substantiate and analyze the problem of information development and educational environment of IP(VT)E in the digital space and identify current issues, it inhibits this process, outlining the author’s vision of solutions. A set of theoretical and empirical methods was used to study the issue. Using these methods the components were identified and they have became key in determining of the main problems. The current problem of development of information and educational environment in the conditions of digitalization of society is researched in the article. The current state of the digitalization process in IP(VT)E and its impact on the development of information and educational environment are studied. Teachers and students faced with some problems in the training and production process, including in the conditions of distance learning, which is caused by certain quarantine restrictions in the conditions of a COVID-19 pandemic. These main problem issues were determined. The analysis of the activities of the IP(VT) in Ukrainian regions was made as for the creation and development of information and educational environment, by developing models and
implementing individual components of the digitalization process; development of electronic educational literature and introduction of 3d-modeling technologies.

**Keywords**—development of information, digital technologies, digitalization, educational management, training.

**Introduction**

Modern conditions for the development of the state and society in the global dimension are determined to the solution of new problems. They change the traditional view of work, education, culture, communication, and other aspects of socio-political life. Because of the changing operational models and functions of industries which are focused on the introduction of new technologies, the task of “providing comprehensive and equitable quality education and encouraging lifelong learning for all” is priority (strategic) task in Ukraine (Verkhovna Rada of Ukraine, 2019b). This approach encourages the search of new vectors for training of specialists. They must be compliant to modern technological development, ensure the availability of vocational education for all categories and the optimal formation of knowledge, skills and abilities.

This task is possible, by creating a computer-oriented educational environment that is ensured by the maximum use of information and communication technologies in all areas of activity. This approach in pedagogy is called environmental (Smolyuk, 2017). It is a source of intellectual enrichment of the student, the development of his competence, motivation to learn. This approach is developmental. This environment “expands access to information technology, the Internet and information resources. It promotes the introduction of distance learning technologies to implement various forms (full-time and part-time) for the training of highly qualified specialists, following effective regional policy and equalization of achievements in socio-economic development in regions and providing by appropriate workers” (Bykov & Zhuk, 2005).

The urgency of implementing these changes in the field of professional (vocational-technical) education (hereinafter – P(VT)E) is especially important in the pandemic COVID-19, when digitalization reduces the negative consequences for the market environment and consumers of educational services (Wang, 2021; Keramati & Ahmadi, 2011). Institutions of professional (vocational-technical) education (hereinafter – IP(VT)E) have new challenges related to improving human resources, technical equipment, tools and methods of training, development of digital content to ensure the quality training of specialists, implementation of online hybrid learning. Such trends exacerbate several inconsistencies and require a powerful, coordinated effort to identify and resolve them (Cedeño et al., 2018). After all, digital technologies, when used effectively, open up opportunities for individualized, flexible and oriented training for future, specialists taking into account the principle of continuity (Derossis et al., 1998; Flor et al., 2001). At the same time, the function of the pedagogical worker is to promote cooperation between students in order to acquire new knowledge.
In the context of this, the priorities for the formation of key skills are changing. The skills of time management, leadership, teamwork, the ability to adapt to new conditions are in demand (Sabodash et al., 2021). The unique advantage of implementing online learning technologies is in the integration of digital competencies into professional ones. This encourages the assessment of: the experience and willingness of both teachers and consumers of educational services to implement and perceive this type of training; the effectiveness of the existing virtual environment to identify the most efficient resources and expand them.

Despite certain advantages of implementing distance learning technologies, the possibilities of practicing professional skills by future specialists online in the areas of mining, electrical engineering, food, engineering, construction and other heavy industries are quite controversial (Reznik et al., 2021). The effectiveness, location and role of these technologies are required to be determined. The aspects of studying this experience are important for the choice of future educational policy, quality and access to digital skills and learning. Now we need take into account the views of the leaders of IP(VT)E as the founders of the strategy of P(VT)E and the compliance of existing practices with modern labor market needs and identify factors influencing the P(VT)E system on the effectiveness of this practice (Rinartha & Suryasa, 2017).

**Methodology**

In accordance with the purpose, the state of development of information and educational environment in IP(VT)E in the context of the implementation of distance learning was analyzed in the study (Jones et al., 2000; Yang et al., 2005). Representatives of various branches of IP(VT)E of seven regions of Ukraine and the city of Kyiv were involved in this process, which were divided into three target groups: 84 pedagogical workers (6 teachers of professional and theoretical training and 6 masters of industrial training from each institution); 98 students (14 second-year students in different areas of training of each institution); 38 people from the management department (7 – directors, 7 – vice directors of educational and production work, 7 – vice directors of educational work, 7 – masters of industrial training).

Indicators were selected for each category of participants. Thus, according to the first indicator “Obstacles are faced by educators during distance learning” the study was implemented for a group of leaders of IP(VT)E; second – “Experience of using distance learning in their teaching activities” – teachers; third – “Provision of computer equipment and other equipment for the effective organization of distance learning” – students. A set of interrelated method was used in the research:

- theoretical: systematic analysis of pedagogical and methodological literature, native legislative documents, scientific publications on reforming the system P(VT)E, statistical materials of the Ministry of Education and Science of Ukraine, Internet resources. This method was aimed to the study of the digitalization process and the essence of information and educational environment in IP(VT)E. As a result, it was established that some aspects of the problem are presented in the works of O.V. Bazelyuk.
vocational education as a global socio-natural process), V.Y. Bykov (cloud computing technologies, ICT outsourcing and new functions of ICT departments of educational institutions and research institutions), O.D. Humenny (start-complexes of educational disciplines for IP(VT)E and information culture of the head), M.O. Ershov (the role of Ukrainian IT education in the global market of information goods and services), I.G. Yanenkova (Industry 4.0 technologies, investments in IP(VT)E), A.M. Gurzhiy (modern information technologies and innovative teaching methods in training), A.G. Kononenko (creation of information and educational environment in IP(VT)E), N.V. Morse (information technology in education), O.M. Spirin (information technology and teaching aids);

• empirical: survey (questionnaire), the method of expert assessments, analysis of documents, statistical data of respondents (teachers, students, heads of IP(VT)E), by indicator groups: I – “the educators are faced with some obstacles during distance learning”; II – “Experience of using distance learning in the pedagogical activity”; III – “Provision of computer equipment and other equipment for the effective organization of distance learning”.

The calculation of empirical data obtained during the study was carried out by determining the average value of the sample by the formula:

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$ (1)

where:

$\sum_{i=1}^{n} x_i$ – the sum of respondents' answers to one question;

n – the total number of respondents.

Results and Discussion

During our research it was determined that as a result of different intensity of application of information and communication technologies various types of information and educational environment are formed. At this environment all information is integrated with the help of its various carriers (Figure 1) (Zhuk, 2004).

![Figure 1. Characteristics of the information and educational environment](image)

According to Zaredinova (2017), the information and educational environment of an educational institution can be divided into seven structural components (strategic, sociocultural, personal, value-semantic, subject-activity, interactive learning environment - structured interaction between participants of the educational process is supported, educational services of virtual environment - a variety of software is used to provide educational services).
communicative, technological), each has its content. It is important to note that the latest technological component of the environment (provides for the introduction of modern educational technologies in management, training, educational and production, development activities) has particular importance today and is obligatory in creating of information and educational environment. The presence of a technological component contributes to the development of new functions of participants in the educational process: information, interaction, communication, learning, etc (Gorda & Anggreswari, 2018).

In our opinion, P(VT)E should be recognized by legally approved standards and promote its development in all formats: formal, non-formal, informal education for both students and other participants of the educational process - teachers, leaders of IP(VT)E, etc. It is confirmed by the state vision in the field of vocational (vocational-technical) education, where one of the main directions of its transformation is to update the content and improve the quality of education, including and due to:

- creation of modern standards of professional (vocational-technical) education according to the competence approach;
- recognition of non-formal and informal education;
- creation of a system of obtaining and independent assessment of full and partial professional qualifications (Ministry of Education and Science of Ukraine, 2019).

In our opinion, the implementation of these directions lies in the plane of modernization of P(VT)E. According to modern observers, such modernization is digitalization now. This process is characterized by electronic-communication interaction between systems, the presence of appropriate electronic-digital devices and tools. Experts claim that in February 2020, the number of Facebook users, having increased by 70% over the year, amounted to 2 million people. At the same time, 81% of native Internet users are registered in at least one social network. For comparison: in the USA this number is 65% (Korrespondent.net, 2012).

Experts also believe that the ability to work in social networks effectively is an important advantage for any professional and soon will become an advantage in any society. According to current challenges, including the challenges caused by a Covid-19 pandemic, IP(VT)E were not ready for change. Managing director of the Directorate of Vocational Education of the Ministry of Education and Science of Ukraine I.V. Shumik thinks the most common problems that IP(VT)E faced during distance learning are:

- lack of experience in organizing distance learning;
- impossibility to transfer practical blocks to a remote format, in particular due to the peculiarities of professions;
- poor provision of institutions and students with gadgets, access to quality Internet;
- unwillingness to master new formats of interaction;
- limited number of e-learning materials (Ministry of Education and Science of Ukraine, 2021).
Our study found that the main problems in the implementation of distance learning among teachers are the lack of necessary technical support and limited access to the Internet; lack of experience in creating and using specialized educational programs, electronic platforms. 70% of managers of IP(VT)E pointed at difficulties in establishing effective interaction with students, not all students have the opportunity to get in touch, express a desire to participate in online activities, do homework (Figure 2).

![Figure 2. Key issues teaching staff of IP(VT)E face during distance learning](image)

This is confirmed in the studies that were conducted as a part of experimental work by the Institute of Vocational Education of the National Academy of Pedagogical Sciences of Ukraine, the experience of pedagogical staff of IP (VT) E on the use of distance professional learning in their own teaching activities was studied there (Figure 3) (Radkevych, 2017).

![Figure 3. Distribution of teachers by the experience of using distance learning in their teaching](image)

According to a study organized in 2019 by the educational center ProDidactica in Moldova, 65% of teachers in the field of P(VT)E said about the need to improve their digital competencies (Ministry of Education and Science of Ukraine, 2020). Leaders of IP(VT)E regions of Ukraine claim that about 10% of their teachers annually take refresher courses to improve their competencies in mastering information and communication technologies, in Moldova - 10-12%. This figure in Azerbaijan until 2020 was about 6% (200 people) of all staff in the field of vocational technical-education (hereinafter - VTE) per year. However, in 2020 this number increased significantly, when about 2,000 teachers and VTE trainers
received intensive training in digital technology, in particular: MS Office, MS Teams, Cisco cybersecurity (European Training Foundation, 2019).

A significant part of teachers (83%) say that they mostly use asynchronous training. In general, the survey found that: 85% of respondents have at least one e-mail box; 92% - have an account on a social network, 74% - have a computer at home; 72% - during teaching use the capabilities of Microsoft Office Word, 49% - presentations; 68% - video materials; 63% - digital images; 9% - capabilities of spreadsheets. Comparing the results of our study with the monitoring studies conducted in Moldova, we can talk about small deviations in the indicators (Figure 4).

The single educational platform for all pedagogical staff was mainly used in the distance learning in IP(VT)E. 93% of teachers, 95% of managers and 89% of students said about it. The information space was mostly hosted on the following platforms: G Suite for Education Google Classroom, Microsoft Teams, Moodle and others. The implementation of feedback from students, teachers was implemented through messengers (Viber, Telegram, Messenger, Whatsapp, etc.) - 96%, used the capabilities of Skype, Zoom and other means of video conferencing - 64%, specialized software (LearningApps, programs-simulators, augmented reality) - 37%, organized educational activities through e-mail - 9%.

Figure 4. Comparative analysis of a survey of teachers in Moldova and Ukraine on the implementation of digital technologies in their activities

During the analysis of Armenia’s experience in organizing distance learning during the aggravation of the pandemic, it was found that at the organizational level new rules of procedure of the educational process were adopted. Modules that can be studied with online resources were identified, mass online courses were developed and changes in educational programs were made. To implement the practical component of cooking courses, teachers have developed detailed video content for cooking various dishes. Confirmation of knowledge, skills and abilities of students was also carried out using a video format. The greatest difficulties for teachers were in organization of entrance exams and determining the level of qualification of students. In order to develop the digital skills of teachers and students, a course has been developed. This course was approved as a mandatory tool for the system of establishing and confirming qualifications for
all participants in the educational process in VTE (European Training Foundation, 2020a).

In Azerbaijan, donor organizations have developed video lessons in 12 specialties, which were broadcast on the national TV channel (www.medeniyettv.az) and YouTube. Such classes lasted 7-15 minutes. They were distributed between theoretical information and practical part and were conducted by highly qualified specialists. The assessment was also a challenge for the VTE of Azerbaijan and was implemented mainly through WhatsApp, Zoom and provided individual communication with each student in turn.

The Baku Center for Industry and Innovation has developed online webinars for students of education in electrical technology using tools for modeling production processes. In parallel with the professional competencies of students are formed digital (European Training Foundation, 2019). In order to expand the capabilities of teachers in the Republic of Belarus, who switched to online training in connection with the Covid-19 pandemic, the Republican Institute of Vocational Education organized a series of webinars on topics: screencasting in the learning process, Moodle settings, distance learning, video lectures, online and offline learning (European Training Foundation, 2020b).

A study of the online vocational training system in Shanghai showed that this process was based on the concepts of quality assurance of practical classes on the Internet. Thus, a team of the most experienced educators from various vocational schools was created. They conducted courses and developed online activities using WeChat capabilities to provide technical advice and guidance on the use of software and the creation of online courses. Distance learning was also implemented through various platforms and Shanghai television. Social media tools such as Tencent Classroom, WeChat Work, DingTalk and public online communication platforms were used to ensure dialogue between teachers and students. Some vocational schools used online tasks and testing to determine "learning, work, practice and assessment". That is, training with the help of information technology was aimed at the implementation of research training methods (European Training Foundation, 2020c).

In general, 95% of IP (VT) E managers assess the effectiveness of distance learning in the regions of Ukraine as less effective than training in an educational institution. About 43% believe that elements of distance learning should be one of the constant tools of interaction between teachers and students, 1% of respondents believe that distance and full-time learning are equally effective. The survey of students conducted in our study showed that the vast majority of respondents (73%) assess the level of quality of distance learning in IP (VT) E as sufficient for the development of their professional competencies in accordance with the requirements of the market environment; 19% of applicants lacked practice-oriented classes and training materials. The majority of respondents (67%) indicate that distance learning is more attractive to them than traditional. According to a study by B. Mulyanti, W. Purnama & R.E. Pawinanto 78.8% of students for higher vocational schools Is. West Java (Indonesia) noted that distance learning is unattractive to them, although most noted the availability of
learning tools, the availability of teaching materials, their active involvement in the learning process and a high degree of teaching (UNESCO Institute for Information Technologies in Education, 2020).

The generalization of the received answers revealed that almost half of pedagogical workers (49%) before the pandemic never used in their pedagogical activity any elements of distance professional training. Other surveyed teachers tried to use elements of distance professional training (15.8% tried to use but not very successfully; 28.6% - once or several times successfully used distance learning in their own activities. Almost every sixth surveyed teacher has a negative experience (15.8% tried to use, but not very successfully.) Only a third of teachers (28.6% and 6.6%) have a positive experience of such activities, and only 6.6% did it systematically and effectively.

In the research the Ministry of Education and Science of Ukraine together with SNU “Institute of Educational Analytics” found that 54.8% of respondents said that all or almost all teachers are provided with the computer equipment and other equipment for the effective organization of distance learning, then as 12.3% confirmed a similar level of support for students. The percentage of answers “majority (75%)” was relatively high, which this time was higher for applicants was 55.7%, and for teachers - 34.5% (Figure 5). The percentage of answers “majority (75%)” was relatively high, which this time was higher for applicants and was 55.7%, and for teachers - 34.5% (Figure 5) (Mulyanti et al., 2020).

Figure 5. Respondents’ answer to the question “How many participants of the educational process of your institution are provided with computers and other equipment for the effective organization of distance learning?”

The implementation of computerization programs and the use of information and educational resources should become one of the priorities in the development of vocational (vocational-technical) education and occupy a prominent place in strategic regulations, because in the XXI century a human capital that develops artificial intelligence technologies based on the processing of various data into a new system of knowledge is very important. The modern economy is becoming more innovative - new, information, economy of knowledge, electronic, network, Internet -economy, Web- economy, Smart- economy, cryptoeconomics (Kovalchuk et al., 2018).
Today electronic services, payment systems, electronic money are used for payments for goods and services. New image recognition systems are emerging in the world - educational, non-educational and self-learning, systems of intellectual decision support. Today, there are some countries with the most developed digital economies in the world. These are Norway, Sweden, Switzerland, the United States, the United Kingdom, Denmark, Finland, the Netherlands, Singapore, South Korea, and Hong Kong (Stepanova, 2017). According to the indices of gross native product and human development, they are divided by the level of digitalization into four groups: countries with limited development, origin, transformation, advanced development (Dyba & Gernego, 2018). Ukraine is on the 60th rank between Peru and Argentina and it is classified as a transformational level of digitalization (Pogoida, 2019). Therefore, it is important for Ukraine to recognize the priority of such a direction of development as digital transformation, which will affect the integration of digital technologies in all spheres of society and the state, they will change the pace of achieving common, economic and social goals, ways to ensure values for themselves, employees, customers and partners (Papadopoulos et al., 2020; Margaryan et al., 2011). As a result of the digital transformation, the goals will be achieved much faster, cheaper and with a new quality (Ukrainian Institute of the Future, 2019).

In general, the digital transformation will fundamentally change the relationship between citizens, businesses, institutions and organizations and, accordingly, between the participants of the educational process. It is important for Ukraine to adopt the Strategy “Ukraine 2030E - a country with a developed digital economy” (Verkhovna Rada of Ukraine, 2019a), which defines that digitalization will be the main tool for achieving the strategic goals of the state. Recognizing this Concept, we believe that in P(VT)E digitalization should become an important component of the development of information and educational environment of the institution. In accordance with the Concept of implementation of state policy in the field of vocational (vocational-technical) education “Modern vocational (vocational-technical) education” for the period up to 2027 among the basic tasks are:

- modernization of the educational environment, which provides innovation, accessibility, transparency, flexibility and openness of the educational process;
- formation of a system of professional qualifications and creation of a single educational environment of professional (vocational-technical) education (Kartashova et al., 2018).

The creation of digital infrastructure in IP(VT)E should include a set of different technologies, products and processes. We analyzed the capabilities of Ukraine’s digital infrastructure and they are proposed by the Strategy “Ukraine 2030E - a country with a developed digital economy”. A set of digital technologies, products and processes for IP(VT)E are developed on the base of the Strategy “Ukraine 2030E - a country with a developed digital economy” (Table 1)” (Ukrainian Institute of the Future, 2019).
Table 1
Complex of digital technologies, products and processes for IP (VT) E in accordance with the Strategy “Ukraine 2030E - a country with a developed digital economy”

<table>
<thead>
<tr>
<th>State</th>
<th>IP(VT)E</th>
</tr>
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<tbody>
<tr>
<td>Supporting (solid) infrastructure</td>
<td>Supporting (solid) infrastructure</td>
</tr>
<tr>
<td>- fixed broadband Internet access infrastructure (BIA);</td>
<td>- internet connection in the computer room;</td>
</tr>
<tr>
<td>- mobile communication and broadband access infrastructure (3G, 4G, 5G);</td>
<td>- students' workstations have permanent internet access through;</td>
</tr>
<tr>
<td>- radio infrastructure;</td>
<td>- mobile communication infrastructure, broadband access (3G, 4G, 5G) and Wi-Fi at the level of the educational institution;</td>
</tr>
<tr>
<td>- satellite communication infrastructure;</td>
<td>- satellite infrastructure, cloud computing infrastructure and cybersecurity infrastructure</td>
</tr>
<tr>
<td>- computing infrastructure (cloud or virtual);</td>
<td>- open data infrastructure;</td>
</tr>
<tr>
<td>- cybersecurity infrastructure</td>
<td>- life support infrastructure (digital educational systems;</td>
</tr>
<tr>
<td></td>
<td>- local network and technical means of multimedia, software of the educational process, platforms for Internet conferences, meetings, webinars, seminars, etc.)</td>
</tr>
<tr>
<td>Service (soft) infrastructure</td>
<td>Service (soft) infrastructure</td>
</tr>
<tr>
<td>- identification and trust infrastructure;</td>
<td>- open data infrastructure;</td>
</tr>
<tr>
<td>- open data infrastructure;</td>
<td>- life support infrastructure (digital educational systems;</td>
</tr>
<tr>
<td>- public services infrastructure;</td>
<td>- local network and technical means of multimedia, software of the educational process, platforms for Internet conferences, meetings, webinars, seminars, etc.)</td>
</tr>
<tr>
<td>- interoperability infrastructure;</td>
<td>- e-commerce and e-business infrastructure</td>
</tr>
<tr>
<td>- e-commerce and e-business infrastructure</td>
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</table>

As can be seen from Table 1, appropriate digital infrastructures should be created in IP(VT)E. The institution should be equipped with an electronic control room, an electronic study room (web-room), an electronic study room for students/parents, a web-library containing educational and methodical content adapted to the tasks and specifics of the IP(VT)E, e-environment – for needs (Ukrainian Institute of the Future, 2019); computer room, electronic workstations; everything should be connected to broadband Internet and local area networks, which should contain appropriate technical means of multimedia, software products, electronic platforms, etc. (Zayets, 2018).

A peculiar analogue of the digital educational environment is the creation on the basis of the educational and practical center of electrical technologies of Kryvyi Rih professional mining and technological lycceum of the internal platform as a tool of technological, organizational and complex-methodical support of the center. At the same time, it combines the coordinated functioning of all components of professional training of future specialists in electrical engineering, by implementing new approaches to the interpretation of educational programs on the basis of integrated learning and open access (Figure 6).
Figure 6. Block diagram of the digital educational environment of the training and practice center of electrical technology

The digitalization of IP(VT)E is characterized by the creation of information and educational environment, which is maximally provided with electronic-digital devices, tools, systems, established electronic-communication exchange between them, it provides integrated (virtual and physical) interaction and creates electronic educational resource. We think that the domestic P(VT)E system should use the opportunity and its own human potential to improve the state's economy by means of digitalization. Therefore, the important goals of digitalization in IP(VT)E should be:

- investment attraction;
- ensuring competitiveness and efficiency;
- technological and digital modernization of the educational process and the creation of experimental high-tech jobs;
- accessibility for participants of the educational process of the benefits and opportunities of the digital world;
- realization of human resources, development of digital entrepreneurship.

The digitalization of Ukraine’s economy requires updating the State classification of occupations, which should present a list of new digital professions, and updating existing ones, including the electrical branch, taking into account labor market requirements and digital trends. It requires the development of new educational and educational-production programs for the training of competitive specialists in IP(VT)E. Such educational and educational-production programs should provide for the formation of general and professional digital competencies, which are basic on the way to the accelerated development of the digital economy in Ukraine.

By digital competence, we mean the ability to use digital media and information and communication technologies, to understand and critically evaluate various
aspects of digital media and media content, and to be able to communicate effectively (Stephanie et al., 2017). Despite the lack of a systematic approach to the implementation of the digitalization process in IP(VT)E, scientist L.E. Vysotska generalized some practical experience in developing models and implementing individual components (Vysotska, 2018), namely:

- Kryvyi Rih Professional Building Lyceum – a model for the implementation of full-time and distance learning and electronic courses in the professions of construction, electrical engineering, culinary branch and trade was created;
- Higher Vocational School №7, Kremenchuk – a virtual portal was created that provides quick access of users to catalogs of theoretical and video materials, online games, test questionnaires, etc.;
- Vinnytsia Interregional Higher Vocational School – an experimental study “Application of modern means of information and telecommunication technologies in the educational process of vocational schools” was held;
- SEI “Interregional Higher Vocational School of Printing and Information Technology” – information and educational environment was developed, the idea of developing an electronic scientific and educational complex “Network Information Technology” – “Virtual Department MVPUPIT” (working title – “Virtual methodical room”) is its structural basis;
- Institute of VTE NAPS of Ukraine, SEI “Odessa Higher Vocational School of Trade and Food Technology” – an experimental study on “Creating an information and educational environment in vocational schools of trade and food technology was held”.

Among the branches of digitalization, the development of electronic educational literature has become widespread (Table 2) (Stoychik, 2020).

### Table 2

<table>
<thead>
<tr>
<th>Educational institutions</th>
<th>Electronic educational literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uzhhorod Higher Vocational Lyceum of Trade and Food Technology, Mukachevo Center for Vocational Education</td>
<td>“Commodity of non-food products” in the profession of non-food products seller, qualification: 3, 4 categories</td>
</tr>
<tr>
<td>Higher Vocational Lyceum No. 3 Mukachevo</td>
<td>“Fundamentals of Radio Electronics” in the profession of electronic equipment and devices regulator, qualification: 3 category</td>
</tr>
<tr>
<td>Uzhhorod Higher Commercial Lyceum of Kyiv National University of Trade and Economics</td>
<td>“Fundamentals of Sanitation and Hygiene in Services”</td>
</tr>
<tr>
<td>Khust Vocational Lyceum in the field of services</td>
<td>“Technology of making men’s pants” in the profession of tailor</td>
</tr>
<tr>
<td>SVTEI “Radomyshl Vocational Lyceum”</td>
<td>Electronic textbook on labor protection</td>
</tr>
<tr>
<td>Kryvyi Rih professional mining and technological lyceum</td>
<td>Electronic textbook on labor protection</td>
</tr>
</tbody>
</table>
There are some developments in the field of application of 3d-modeling technologies in the educational process (Stoychik, 2014; Gulina, 2016), in particular:

- educational 3d-films “Elements of formation of layered deposits and basic information about their discovery and preparation”, “Purpose, body structure of the locomotive 2TE10M and TGM3”, “Drilling holes with a drilling rig Boomer S1D company Atlas Copco” (Kryvyi Rih professional mining and technological lyceum);
- mobile application “Augmented reality KPGTL” with the help of integrated environments “Android Studio”, “Visual Studio”, “Unity 3D”, “Vuforia” and 3d-models of modern production equipment and transport, in particular: pneumatic perforator YT-28 with animation, locomotive 2TE10M, drilling rig Boomer S1D, culinary equipment (Kryvyi Rih professional mining and technological lyceum);
- tutorials containing 3D-animation, which demonstrate the necessary standard actions for maintenance, installation, defecting and repair of electrical installations in the profession “Electrician for repair and maintenance of electrical equipment” (Mariupol Professional Engineering Lyceum).

**Conclusions**

According to the results of the research of the problem it was determined that modern digital technologies significantly change the structure and functions of
management, the conditions of the educational and production process and the ways of interaction between its participants. It was determined that the state educational policy in the country is aimed at modernization of the educational environment, its innovation, accessibility, transparency, flexibility, openness and the formation of a single educational environment of vocational (vocational-technical) education.

The most common problems in IP(VT)E are: the lack of some professional experience of teachers; poor provision of CL(PT)O and students with gadgets; limited access to quality Internet; a number of e-learning materials, there is a positive dynamics of model development and implementation of individual components of the digitalization process; development of electronic educational literature and introduction of 3d-technologies.

At the same time, there are certain limitations in the training and production process of IP(VT)E caused by the Covid-19 pandemic. These questions are: further active creation and implementation of electronic educational resources in the educational process, in particular: virtual classrooms, workshops, electronic textbooks, sites, blogs, video tutorials, etc.; increasing the level of competence of teachers in the development of electronic educational resources; search for ways to ensure quality training of students for training and production activities in the information and educational environment of the institution and they need to be solved.

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