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CONTENTS

PAPERS

FULL PAPERS






Assessing Augmented Reality Possibilities in the Study of School Computer Science <i>Vasyl Oleksiuk and Olesia Oleksiuk</i>	5
Comparing Google Lens Recognition Accuracy with Other Plant Recognition Apps <i>Zhanna Bilyk, Yevhenii Shapovalov, Viktor Shapovalov, Anna Megalinska, Sergey Zhadan, Fabian Andruszkiewicz, Agnieszka Dołhańczuk-Śródka and Pavlo Antonenko</i>	20
Construction of an Education Model of Natural Disciplines' Students in the Distance Learning Conditions <i>Nataliia Valko, Viacheslav Osadchyi and Liudmyla Kuzmich</i>	34
Use of Information and Communication Technologies in the Organization of Blended Learning of Future Vocational Education Professionals <i>Svitlana Kucher, Roman Horbatiuk, Olga Serdiuk, Mykhailo Ozhha, Natalia Hryniaieva and Mark Fridman</i>	44
Virtualization Technologies in the Training Future IT Specialists to the Subject "IP Telephony" <i>Maksym Pavlenko, Liliia Pavlenko and Vitaliy Mezhuyev</i>	52
Application of R Programming Language in Learning Statistics <i>Liliia Pavlenko, Maksym Pavlenko, Vitalii Khomenko and Vitaliy Mezhuyev</i>	62
Development of Media Education in Ukraine: Current State and Modern Requirements <i>Iryna Naumuk and Nataliia Valko</i>	73
Features of Implementation of Augmented and Virtual Reality Technologies in the Psycho-correctional Process of Development of Emotional Intelligence of High School Students in Terms of Professional Self-determination <i>Hanna Varina, Kateryna Osadcha, Svetlana Shevchenko and Olena Glazunova</i>	85
Main Determinants of the Use of Cloud Technologies in the Development of Professional Stability of the Future Specialist in the Conditions of Adaptive Learning <i>Hanna Varina, Kateryna Osadcha, Svetlana Shevchenko, Valentyna Voloshyna, Ivan Riznitskii and Aleksandr Uchitel</i>	101
The State of ICT Implementation in Ukrainian General Secondary Education Institutions in 2019 and 2020 <i>Tetiana Vakaliuk, Dmytro Antoniuk and Olga Kalinichenko</i>	115
Trends in the Development of e-Learning for Civil Servants <i>Yevhen Khrykov, Olga Ptakhina, Tetiana Sych, Dmytro Dzvinchuk and Maryna Kormer</i>	126
Perception and Interpretation of Emoji in the Pedagogical Process: Aposterior Features of Artificial Digital Language <i>Rusudan Makhachashvili, Svetlana Kovpik, Anna Bakhtina, Nataliia Morze and Ekaterina Shmeltser</i>	141
Guessing Games Experiments in Ukraine. Learning towards Equilibrium <i>Oleksii Ignatenko</i>	156

The Implementation of Inquiry-based Learning in the Organization of Students' Research Activities on Mathematics <i>Kateryna Vlasenko, Olha Rovenska, Iryna Lovianova, Oksana Kondratyeva, Vitaliy Achkan, Yana Tkachenko and Mariya Shyshkina</i>	169
The Formation of a Successful Personality of Primary School Children during Media Education Implementation (Using Praxeological Tales) <i>Hryhorii Tereshchuk, Iryna Kuzma, Oleksandra Yankovych, Halyna Falfushynska and Iryna Lyakhova</i>	181
Using Personal Smart Tools in STEM Education <i>Yevhenii Shapovalov, Zhanna Bilyk, Stanislav Usenko, Viktor Shapovalov, Kateryna Postova, Sergey Zhadan and Pavlo Antonenko</i>	192
Analysis and Summarization of the Experience of Developing Adaptive Learning Systems in Higher Education <i>Kateryna Osadcha, Viacheslav Osadchyi, Vladyslav Kruglyk and Oleg Spirin</i>	208
Psychological Security in the Conditions of using Information and Communication Technologies <i>Larysa Zhuravlova, Liubov Pomytkina, Alla Lytvynchuk, Tetiana Mozharovska and Valerii Zhuravlov</i>	216
Media Education Technology at Preschool Educational Institutions <i>Volodymyr Chaika, Iryna Kuzma, Oleksandra Yankovych, Kateryna Binytska, Oksana Pysarchuk, Tetiana Ivanova, Halyna Falfushynska and Iryna Lyakhova</i>	224
Features of the Use of Software and Hardware of the Educational Process in the Conditions of Blended Learning <i>Dmitriy Bukreiev, Alona Chorna, Iryna Serdiuk and Vladimir Soloviev</i>	236
Web-based Support of a Higher School Teacher <i>Vitaliy Achkan, Kateryna Vlasenko, Iryna Lovianova, Olha Rovenska, Iryna Sitak, Olena Chumak and Serhiy Semerikov</i>	245
Digital and ICT Literacy Skills as One of the Key Competences of Future Foreign Language Teachers <i>Tetiana Konovalenko, Yuliia Nadolska, Olga Serdiuk, Tamara Poyasok and Andrii Striuk</i>	253
Implicit Potential of Immersive Technologies Implementation in the Educational Process at the Universities: World Experience <i>Kateryna Binytska, Olha Bilyakovska, Oleksandra Yankovych, Galyna Buchkivska, Olena Binytska, Valentyna Greskova, Inna Ocheretna, Oleksandr Burov and Svitlana Lytvynova</i>	264
Opportunities and Ways of using Laboratory Equipment in a Distance Learning Environment <i>Liudmyla Vasylieva, Denys Mikhieienko, Iryna Getman and Maryna Kormer</i>	275
Augmented Reality in the Literary Education of Primary School Children: Specifics, Creation, Application <i>Liudmyla Nezhyva, Svitlana Palamar, Halyna Vaskivska, Olha Kotenko, Liudmyla Nazarenko, Maryna Naumenko and Andrei Voznyak</i>	283
Using Intelligent Agent-managers to Build Personal Learning Environments in the E-Learning System <i>Nadiia Pasko, Oleksandr Viunenko, Svitlana Agadzhanova and Karen Ahadzhanov-Honsales</i>	292
Digital Twin of an Educational Institution: An Innovative Concept of Blended Learning <i>Liubov Kartashova, Andrii Gurzhii, Valentyn Zaichuk, Tamara Sorochan and Feliks Zhuravlev</i>	300

Training Teachers-to-Be to Create Infographics and Its Expert Evaluation <i>Nadiia Olefirenko, Nataliia Ponomarova, Vira Andriievaska, Olena Gulich, Andrii Gaidus and Iryna Lyakhova</i>	311
The Algorithm of Electronic Multilingual Terminological Dictionary Compilation <i>Tetiana Vakaliuk, Oksana Chernysh and Vitalina Babenko</i>	323
Features of Utilization Information and Communication Technology in the Process of Teaching the "Environmental Impact Assessment" Course <i>Iryna Barna, Liudmyla Hrytsak, Halyna Henseruk and Svitlana Lytvynova</i>	332
Organisation of Business English for Specific Purposes Course on Moodle <i>Hanna Shalatska, Olena Zotova-Sadylo, Oksana Balanaieva and Hennadiy Kravtsov</i>	346
Innovative Methods of Information Visualization in Transport Logistics and Training Organization <i>Olena Mikhailutsa, Tatiana Melikhova, Andriy Pozhuyev and Hennadiy Kravtsov</i>	360
Educational Trainings as One of the Effective Forms of Digital Competence Development of Secondary School Teachers <i>Tetiana Hodovaniuk, Tetiana Makhometa, Irina Tiahai, Mariia Medvedieva, Svitlana Pryshchepa and Andrei Voznyak</i>	372
Practical Activity Organization of Primary School Students with using e-Simulators <i>Nadiia Olefirenko, Vira Andriievaska, Nataliia Ponomarova, Olena Gulich, Lyudmila Ostapenko and Iryna Lyakhova</i>	382
Information and Communication Technologies in Application, Dissemination and Evaluation of Erasmus+ Jean Monnet Activities <i>Mariia Galaburda, Olena Kuzminska and Mykola Halaburda</i>	396
Using the LearningApps.org Online Service in the Moodle System in the Process of Training of Specialists in Economic Specialties <i>Roman Horbatiuk, Uliana Dudka, Vitalii Kabak, Liliia Rebukha, Olga Serdiuk and Ivan Riznitskii</i>	403
Peculiarities of using LearningApps Service in the Process of Developing a Motivational Component of Professional Training of Future Professionals in Terms of Adaptive Learning <i>Hanna Varina, Viacheslav Osadchyi, Svetlana Shevchenko, Kateryna Averina and Evgeniy Lavrov</i>	416
Development of Future Foreign Language Teachers' Soft Skills by Means of ICT in Ukrainian Universities <i>Natalia Bondar, Tetiana Konovalenko and Ivan Riznitskii</i>	425
EdTech Landscape in Ukraine: Smart Education Future in Digital Age <i>Maryna Nehrey, Larysa Zomchak and Abdel-Badeeh Salem</i>	434
Moodle Tools for Educational Analytics of the Use of Electronic Resources of the University's Portal <i>Olena Glazunova, Maksym Mokriiev, Olena Kuzminska, Valentyna Korolchuk, Nataliia Morze, Liliia Varchenko-Trotsenko and Roman Zolotukha</i>	444
Integrated Use of the LearningApps.org Resource and Information Devices in the Process of Biology School Course Studying <i>Alla Stepanyuk, Liudmyla Mironets, Tetiana Olendr, Ivan Tsidylo and Maryna Kormer</i>	452
The Current State of using the Cloud-based Systems of Open Science by Teachers of General Secondary Education <i>Maiia Marienko</i>	466

Analysis and Prospects of the Future Teachers Training of the Integrated Course "Natural Sciences" <i>Nataliia Valko and Viacheslav Osadchyi</i>	473
Formation of Information Culture of Vocational Education Specialists <i>Oksana Voitovych, Roman Horbatiuk, Ihor Voitovych, Mariya Shyshkina and Nadiia Shostakivska</i>	480
The Use of Serverless Technologies to Support Data Processing within the Open Learning and Research Systems <i>Ihor Bezverbnyi and Mariya Shyshkina</i>	489
Model of the Competences in Educational Robotics <i>Nataliia Morze and Oksana Strutynska</i>	495
Using Unity to Teach Game Development <i>Vladyslav Kuznetsov, Mykhailo Moiseienko, Natalia Moiseienko, Bohdan Rostalny and Arnold Kiv</i>	506
Expanding Opportunities for Professional Development through the Use of Integrated Teaching <i>Svitlana Bodnar, Viktor Koval, Nataliia Stuchynska, Tetiana Lesina, Larysa Filippova and Antonina Kichuk</i>	516
The Development of Creative Thinking as an Important Task of Educational Process <i>Arnold Kiv, Kateryna Kolesnykova, Tatyana Koycheva, Alina Vinkovska and Ivan Donchev</i>	528
Modern Information and Communication Technologies in Professional Training of Sociology Students: The Mainstreaming of the Needs and Significance <i>Liudmila Kalashnikova, Alla Lobanova, Iryna Hrabovets, Liudmila Chernous, Viktoria Chorna, Yevhen Davydenko and Feliks Zhuravlev</i>	535
Research of Teachers' Occupational Health by Means of Digital Technologies <i>Halyna Meshko, Oleksandr Meshko, Iryna Trubavina, Nadia Drobyk, Vasil Grubinko, Nadiia Bilyk and Nataliia Habrusieva</i>	544
MOOCs Types and Course Development <i>Zarema Seidametova</i>	560
Ensuring the Effectiveness of e-Learning based on Online Technology Analysis of Factors Influencing the Cognitive Independence of Students <i>Evgeniy Lavrov, Viktoriya Logvinenko, Viacheslav Osadchyi, Olga Siryk and Yana Chybiriak</i>	569
Some Geometric Objects Related to a Family of the Ballistic Trajectories in a Viscous Medium <i>Zarema Seidametova and Valerii Temnenko</i>	578
An Inverse Method of the Natural Setting for Integer, Half-integer and Rational "Perfect" Hypocycloids <i>Zarema Seidametova and Valerii Temnenko</i>	584
AUTHOR INDEX	591

Formation of Information Culture of Vocational Education Specialists

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Keywords: Vocational Education, Specialists, “Digital Technologies”, “Sphere of Service (Tourist Service)”, Information Culture.

Abstract: This article reflects the system of multilevel continuing professional teaching of vocational education specialists. The basic principles of this process are investigated and the structure of training of vocational education specialists is determined by means of the analysis of the state standards of preparation of graduates in a specialty “Professional education”, educational programs and curricula. There is made comparative analysis of the maintenance of preparation of graduates of a specialty “Professional education” on specializations “Digital technologies” and “Sphere of service (Tourist service)” for formation of their information culture.

1 INTRODUCTION

Main peculiarities of modern society is informatization of all spheres of human life: from simple document management to solving complex production problems (Fedorenko et al., 2019). Herewith, of great importance is the interaction of all members of society with various computer technologies for information processing. However, the average level of computer training of the adult population today is insufficient to meet the growing needs of both production and service. The modern labor market, which was being intensively transformed in the conditions of a pandemic, puts forward new requirements to the content and process of professional training. After all, today the employer needs a specialist who has deep knowledge not only in the field of professional activity, but also in information technology. In modern education, it is unthinkable to train professionals who cannot using information technology. At the same


time, the specificity of computer technologies lies in their intensive dynamics of development: every five years the technologies are significantly updated, new opportunities for high-speed data access appear, new applications with convenient functionality for almost every employee (Lehka and Shokaliuk, 2018). This explains the fact that in higher education institutions, the training of specialists for the using of information technology always lags behind the needs of practice, and this creates a certain disparity in society (Asherov et al., 2005).


2 LITERATURE REVIEW


Note that the training of professionals capable of professional and production-technological activities is a priority area of development of higher education and requires special attention from the state and the proper use of information technology in the educational process has significantly affected the higher education system in general and professional in particular.


Thus, we believe that today it is not enough to form the ICT competence of specialists, or “skills of the use of information and communication technolo-

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gies” (Ministry of Education and Science of Ukraine, 2019), or “the ability to search process and analyze information from different sources” (Ministry of Education and Science of Ukraine, 2020). This is not enough for a specialist who will work in the post-industrial information society and such a task cannot be solved by studying one or two computer science disciplines. We need to talk about something much more voluminous in the essence and content – the information culture.

Despite numerous studies of the concept of “information culture”, most scientists analyze it from the standpoint of individual sciences, which limits the vision of this phenomenon in modern society. The first attempts to analyze the genesis of information culture, to identify its historical and social conditionality were made in (Curry and Moore, 2003; Khan and Azmi, 2005; Labouitz and Tamm, 1987; Leonhardt, 1988; Lubar, 1999; Metz, 1986; Mordue, 1995; Oliver, 2004; Porter, 1995; Rubanov, 1989; Szecskö, 1986; Travica, 2005; Welsch, 1989; Widén-Wulff, 2000; Zambare, 2003). The formation of information culture at various levels of education were studied in (Abitova et al., 2020; Almazova et al., 2018; Babenko, 2018; Boamah and Salahshour, 2021; Ibashova et al., 2017; Lauri et al., 2021; Lepik and Kannukene, 2018; Mullins, 2019; Virkus and Salman, 2020).

The main components of information culture by Karagodov (Karagodov, 2000) include:

- information (computer) literacy;
- information competence;
- information value-content component;
- information reflection.

Information competence and information literacy were considered by Karagodov (Karagodov, 2000) to be key, because they provide a procedural component of human information activities, form a certain value attitude to knowledge, and are the basis for information culture.

According to (Kyrychenko, 2016), “the information culture of the individual is formed in the process of socialization in its broadest sense. Basic competencies that are part of the structure of information culture of the individual are formed under the influence of a wide range of factors of the social environment, not limited to the training process and labor training conditions within specific professions, which until recently were associated with direct functional use of ICT”.

Under the “information culture of the educator” Ramsky (Ramsky, 2013) perceives “an integral indicator of the level of his perfection in the information

sphere of activity, which is manifested in the specifics of pedagogical activity and the system of professional qualities”. In the information culture of the individual (as well as in the information culture of the educator), he identified the following interrelated components: information and intellectual potential, information worldview, information values, information needs, information and operational activities.

Klimenko (Klimenko, 2006) identified in the content of the concept of “information culture such important elements as the ability to use information technology, computer literacy; knowledge of information and information environment; ability to work with information; to build their information activities and behavior in a post-industrial society”. However, it should be noted that there is a “contradiction in understanding the essence of information culture in pedagogical sciences, which is confirmed by representatives of this field of knowledge, who note that the formation of information culture of future specialists is often considered on the basis of a monodisciplinary approach in such areas: basics of library and bibliographic knowledge; reading culture, basics of rational work with the book; basics of informatics and scientific and technical information; computer technology and basics of computer literacy” (Stepanov, 2012). Important components of the information culture of the tutor are: “information knowledge and skills of the user to use a personal computer, peripherals; mastering the skills of working with software, using application programs to search, process and transmit information; information knowledge and skills of the tutor, which include knowledge of sanitary conditions and modes of safe use of computers in the educational process; formation of professional skills in the development and implementation of teaching materials; mastering educational software; ability to education and self-education” (Kuzemko, 2016). Attempts to overcome such a narrow understanding can be found in theoretical works in the field of pedagogy: for example, Galeta (Galeta, 2011) notes: “information culture today is still mainly an indicator not of general culture in its socio-technical aspect, but professional. The ability to work with information technology was often combined, at best, with knowledge of computer science, mathematics and English, scilicet those areas that provide practical human interaction with the technical means of obtaining and providing information. However, when looking at information culture more broadly, it should be noted that general methods of providing knowledge and skills should not be sought only within a computer situation. The real limits of the application of information culture are much wider; the range of its content is much richer”.

Analysis of approaches to the essence of information culture, formed in philosophy, culturology, economics and other fields of knowledge, allowed Belyakov et al. (Belyakov et al., 2018) to see that understanding of this phenomenon in different sciences has its differences due to the influence of system-forming categories of these sciences, and the tasks set by the researchers. Common to the above approaches is the understanding of information culture as a component of general culture in society, as well as the recognition of determinative links between the level of information culture and the development of a particular area of professional activity of the individual. Differences in the perception of the studied phenomenon concern the wide or narrow coverage of the features of information culture: from the skills of mastering certain information technologies (computer literacy) to mastering knowledge and skills in almost all areas of human activity. In the first case, we obtain a set of certain characteristics that can be formed by mechanical assimilation of algorithms, without awareness of their direction and value features. In the second case, there is a synthetic combination of categories inherent in different sciences, which greatly complicates the possibility of studying the features of information culture.

In our opinion, information culture is a complex formation of information worldview (system of human views on information), information literacy (system of skills to work with information) and literacy in the field of information and communication technologies (actually, ICT competence).

Levels of manifestation of information culture:

- target – a person’s need to receive relevant, reliable information and interest in it;
- cognitive – knowledge and ability to apply them;
- value – evaluation of information, attitude to it, own judgments and interpretations;
- behavioral – a reaction to the received information.

Thus, information culture is a system of material and mental means of realizing the relationship between people, society and the information environment, which was formed in the process of informatization of society.

Information culture in higher education institutions is implemented as a system of multilevel information technology training of future professionals in vocational education, which is based on the principles of continuity, continuity and sufficiency of informatization of the educational process, integration of special and information disciplines, formation of professional information environment and single informa-

tion space in institution of higher education (Nikolaenko, 2006). Therefore, we can consider it the most important factor in successful professional activity and security of the graduate in the information society.

3 RESULTS

The aim of the work was to analyze the training of future professionals in vocational education in higher education institutions in the context of studying the prospects of forming their information culture.

First of all, let’s find out what specializations future specialists in vocational education can acquire and what qualifications to get. According to the order of the Ministry of Education and Science of Ukraine No 292 from 21.03.2016 “On approval of the List of specializations for higher education in specialty 015 Professional education (by specializations)”, which is the formation and placement of the state order there were 22 specializations, but after implementation of the order of the Ministry of Education and Science of Ukraine No 1223 from 23.09.2019 “On amendments to the order of the Ministry of Education and Science of Ukraine from 21.03.2016 No 292” (Ministry of Education and Science of Ukraine, 2016) there are only 9 left:

- 015.31 Construction and welding;
- 015.32 Electronics, metrology and radio telecommunications;
- 015.33 Power engineering, electrical engineering and electromechanics;
- 015.34 Mechanical engineering;
- 015.35 Mining, processing and transportation of minerals;
- 015.36 Technology of light industry products;
- 015.37 Agricultural production, processing of agricultural products and food technologies;
- 015.38 Transport;
- 015.39 Digital technologies.

Of course, higher education institutions in the conditions of autonomy have the right to train specialists in other educational programs, but public funding was provided only for these, which accordingly contributes to the professional orientation of entrants and ensuring competition for these specializations.

As for the analysis of the qualification that will be obtained by graduates of these specializations, we turn again to the standards of higher education at the first (Ministry of Education and Science of Ukraine,

2019) and second (Ministry of Education and Science of Ukraine, 2020) educational levels, we find only the educational qualification “Bachelor / Master of Vocational Education (by specialization)”.

The objectives of training in the standard of training of bachelors are specified as training of specialists capable of carrying out educational activities on professional training of technical specialists, skilled workers and workers in trade and services (according to the Classifier of professions 003:2010 (hrliga.com, 2010)) areas according to specialization. The objectives of training in the standard of master’s training were defined as follows: training of specialists capable of solving complex problems and problems of specialization of vocational education in professional activities and / or in the learning process, which involves research and / or innovation and uncertainty of conditions and requirements. Also for masters the field of professional activity is more clearly defined, where the graduate of educational programs in the specialty can work according to the Classifier of professions 003:2010 (hrliga.com, 2010) and the International Standard Classification of Occupations 2008 (ISCO-08) (International Labour Office, 2012): 23 Teachers; 235 Other training professionals; 2351 Professionals in the field of teaching methods; Professionals in the field of relevant specialization.

Given the above information, it becomes clear that a graduate of this specialty at the first (bachelor’s) level must be ready to work in institutions of professional, vocational, professional higher and higher education in the following positions:

3340 Other specialists in the education: teacher-trainee; educator; dormitory educator; educator of vocational school; industrial training instructor; instructor of industrial training of workers of mass professions; laboratory assistant; master of industrial training; master of the training ground; master of the training center; methodologist for vocational rehabilitation; tutor of professional training.

A graduate of this specialty at the second (master’s) level must be ready to work in institutions of professional, vocational, higher professional education and higher education in the following positions:

- 2310 Tutors of universities and institutions of higher education: assistant, tutor of higher education;
- 2320 Tutors of general secondary education institutions: tutor of a vocational school, tutor of a vocational institution;
- 2350 Other professionals in the education: tutor (teaching methods), educator-methodologist, methodologist.

As for the engineering component of the educational program and the qualification itself, in terms of current trends in vocational education at all levels and the focus of educational programs on dual training, which provides for coordinated interaction of the educational and industrial spheres for the training of qualified personnel of a certain profile within in organizationally – different forms of training (Ministry of Education and Science of Ukraine, 2018), it should be left for this specialty and integrated into the system of training a specialist who is able to work both directly in the workplace and in the educational institution in the relevant positions. After all, unlike the profession of “teacher”, which provides for the teaching of fundamental sciences in the content of relevant school subjects at the academic level, “tutor of professional, vocational and technical higher education” must carry out the educational process taking into account the profile of specialties. The person who teach, should provide professionally oriented training of higher education students of such institutions, and therefore its training should be appropriate: both production and pedagogical.

Taking into account the basic principles of higher education development in Ukraine within the Bologna process, as well as the specifics of professional training, we offer a scheme of educational process based on fundamental and psychological-pedagogical training with a dynamic model of professional disciplines (figure 1).

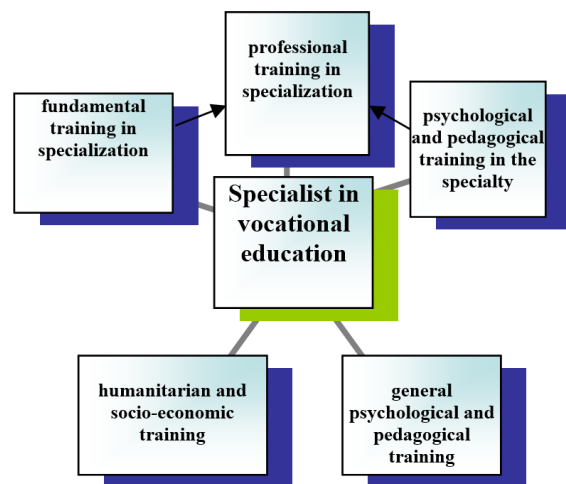


Figure 1: Structural scheme of training future specialists in vocational education.

Ensuring quality training of future specialists in vocational education involves the gradual implementation of this scheme. The whole process was divided into separate levels, at each of which the disciplines of certain cycles are studied, according to the principle

that at the end of each level the applicant receives a certain amount of basic knowledge with their further expansion and deepening at the next stage.

In our opinion, the content of training of future professionals in vocational education should be based on the following principles:

- formation of information culture of the specialist, appropriate to the current level and prospects of information processes and systems, which is possible only with the integrated using of modern technologies in the educational process of higher education, as a set of three interrelated components – objects of study, tools for professional disciplines and practical training with the use of new educational technologies;
- basics of information technology (office programs: text and spreadsheet editors, programs for creating presentations; graphic editors; Internet technologies; database management systems), information systems architecture and system software; elements of programming and the Internet of Things should be studied by applicants for higher education in the form of professionally oriented courses, taking into account the profile of future professional activity;
- in the content of information training should be distinguished invariant part, which includes fundamental methodological knowledge studied in lectures, and a variable, dynamically changing part related to computer software and hardware, and studied in practical and laboratory classes;
- to increase the professional competence of the graduate in the field of information technology in the curriculum it is necessary to introduce disciplines focused on the professional orientation of future professionals in vocational education;
- for the implementation of individual educational trajectories in the curriculum should provide disciplines of the information cycle, taking into account the different levels of computer training of higher education, as well as the area of future professional interests;
- computer-oriented educational technologies used in the educational process should be rationally combined with traditional technologies of higher education and supported by modern technical means.

Thus, the training of future professionals in vocational education involves a combination of knowledge in the field of information technology with the ability of their methodological application in the pedagogical

process. Consider the implementation of the developed structural scheme of training a future specialist in vocational education (figure 1) on the example of subject specialization: “Digital Technology”, where information technology is both a means of learning and a subject of study from the standpoint of the profession.

A feature of the specialization “Digital Technology” is the rapid changes in the content of educational disciplines of professional and practical training, which is associated with the intensive development of computer technology and information technology. Since professional (engineering) training is important in the formation of future professionals in vocational education, we will focus in more detail on the disciplines that determine its professional orientation (figure 2).

The first level of training of future professionals in vocational education is based on the study of disciplines of the fundamental cycle, where special emphasis is placed on “Introduction to Informatics – Information and Communication Technologies”, “Higher Mathematics”, “Computer Physics”, “Software” and forms the basis for the transition to professional training starting from the first semester.

Knowledge of document automation and means of graphical presentation and data editing is required for presenting information using information technology. These tasks are solved in the course “Software”. The course considers the basics of computer data processing using Microsoft Office. In addition, fundamental knowledge of computer layout based on PageMaker and the ability to work with vector and raster graphics (Corel Draw, Photoshop) were formed here.

After completing the first level of training, a significant number of applicants for higher education (over 80%) use the possibilities of information technology in the process of self-study of disciplines of professional and practical training, in particular, in the process of individual research tasks, coursework and more. At the same time, the previously acquired skills of working with applied and tool products, information resources of the Internet find practical application.

The second level involves the study of disciplines: “Application and Web Programming”, “Operating Systems and System Programming”, “Computer Graphics”, “Computer Systems Hardware”, “Computer Aided Systems”, “Software in Production”, the purpose of which is to form professional competencies in understanding and using information technologies. “Application and web programming” involves mastering modern, object-oriented methods of working in Visual Studio, as the most common and uni-

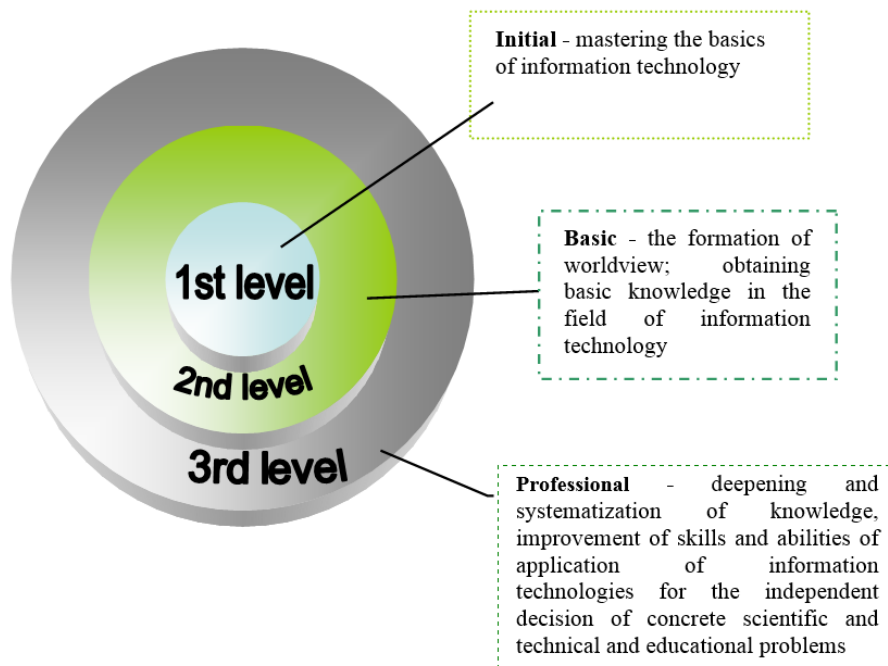


Figure 2: Comparative formation of professional training of future specialists in vocational education.

versal package of programming environments. The main purpose of the discipline “Operating Systems and System Programming” is to acquire knowledge about modern operating systems Windows and Linux, the principles of their structure, operation and administration. These disciplines form in future professionals in vocational education the ability to design and operate the most common currently operating systems, using elements of programming. This allows integrating the study of computer science, eliminating elements of tautology in the presentation of the material, as well as using information technology to solve applied problems. In addition, knowledge of these subjects was consolidated when solving problems in the Mathcad system, as well as the WinMachine software package.

At the same time, the discipline “Methods of professional training” is studied at the second level. The purpose of the course is to deepen engineering, technical, psychological and pedagogical knowledge and skills and also their integration and provide opportunities for the formation of a holistic phenomenon – information culture, both from the standpoint of engineering and from the standpoint of pedagogical training.

Examples of dynamic integration are the disciplines that form the visual and design basis of engineering training, in particular: “Descriptive Geometry”, “Engineering Graphics”, “Computer Graphics”. Having received at the first level an idea of the im-

age of spatial objects on the plane, at the second level knowledge in the field of geometric, machine-building and construction drawings with the subsequent application of computer technologies (graphic editor Compass-Graph, AutoCAD, SolidWorks, etc.) is formed.

At the third – professional level – training of future specialists in vocational education is differentiated. Depending on the specialization, the profile disciplines were taught, which deepen and systematize the knowledge obtained at the first two levels in relation to the chosen direction of professional activity.

At this level, the formation of skills for independent solution of scientific, technical and educational problems becomes important. That is why a course project was implemented here, which integrates the disciplines of fundamental and professional training and provides for the implementation of tasks that actually appear in the production or management field. Practical classes are held more in the form of discussions and trainings, which also contributes to the formation of a specialist who is able to make independent decisions, work in a team, formulate and convey the necessary knowledge to other individuals.

Given that information technology is rapidly updated and partially modified, at the final level the disciplines that are most dependent on such trends are studied, namely: “Information security in computer networks”, “Intelligent systems and technologies”, “Web technologies and web design”.

Disciplines of professional orientation are based on mastering the software which is universal from the point of view of studying of the planned educational material and, besides, allows to form design thinking. We are talking about the WinMachine software package, Matlab and Compass environments, which are currently the most promising.

As for the processes of formation of information culture of future specialists in vocational education of other specializations, where computer science disciplines are much less, we want to analyze their content on the example of specialization "Service (Tourism)".

The first level of training of future specialists in vocational education specialization "Service (Tourism)" is implemented on the basis of studying the disciplines of the fundamental cycle, with special emphasis on "Introduction to Informatics – Information and Communication Technologies", "Mathematics for Tourism", "Physics", which generally resembles the first level of the previously analyzed specialization "Digital Technologies". After studying these disciplines, higher education students have formed a basis for the further formation of information culture and readiness to use computer technology in the study of other disciplines of professional and practical training.

The second level involves the study of the discipline "Methods of using computer technology in the study of professional disciplines". At the same time, the discipline "Methods of professional training" is studied at the second level, thanks to which it is also possible to form technical and psychological-pedagogical knowledge and skills in an integrated form and to provide preconditions for the formation of information culture.

At the third professional level the discipline "Information systems and technologies in tourism" is studied, the main purpose of which is to form and develop professional competencies in the use of information technology in professional activities. However, it should be noted that tutors of geographical and environmental disciplines regularly use information technology in their classes, which provides a dynamic development of information culture of future professionals in vocational education specialization "Service (Tourist Services)". That is, depending on the specialization, the profile disciplines are taught, which deepen and systematize the knowledge obtained at the first two levels in relation to the chosen direction of professional activity.

During the implementation in the educational process of the proposed method of forming the information culture of future professionals in vocational education to diagnose the level of formation of informa-

tion culture of future professionals in vocational education in specializations "Digital Technologies" and "Tourist Services" was conducted testing information culture of students at the following levels:

- 1 – initial (D, E),
- 2 – basic (B, C),
- 3 – professional (A).

Lets consider the results of comparing of the two samples (for specializations "Digital Technologies" and "Tourist Services") regarding to the level of formation of their information culture.

The analysis of test results showed that the basic level of information culture of future professionals in vocational education in the specialty "Digital Technologies" only 5.9% higher than the level of students specializing in "Tourist Services" and the professional level - by 5.7%. Figure 3 shows a summary of the results, which indicate that we have developed a method of forming the information culture of future professionals in vocational education in the specialties "Digital Technologies" and "Tourist Services" is within acceptable margin of error.

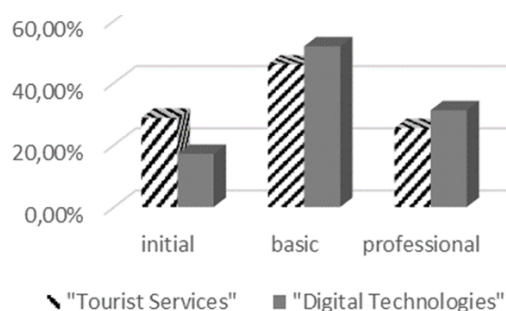


Figure 3: The level of formation of information culture of future professionals in vocational education.

Statistical significance of differences in the levels of student achievement and substantiation of hypotheses, which were put forward to determine the differences between the distributions of students in the control and experimental samples was carried out using the Pearson test (χ^2). The choice of this technique was due to the fact that the criterion χ^2 applies to samples with a large number of respondents and allows on the basis of comparing the values of the calculated χ^2_{exp} and tabular for critical values χ^2_{tab} to conclude a significant or insignificant difference in the distribution of respondents sign (the level of formation of their information culture). The technology of the method assumes that the greater the difference in the values of χ^2_{exp} and χ^2_{tab} , the more significant are the differences between the distributions in the samples. We compare these distributions statistically in

Table 1: The level of formation of information culture of future specialists in vocational education.

Groups	Level of academic achievement					
	initial		basic		professional	
	students	in %	students	in %	students	in %
"Tourist Services"	52	28.7	83	45.9	46	25.4
"Digital Technologies"	34	17.1	103	51.8	62	31.1

order to identify differences in the levels of academic achievement of students in control and experimental groups and determine their statistical reliability.

For the initial and alternative hypotheses we take the following statements:

H₀: the difference in the achieved levels of formation of the information culture of the groups is insignificant and invisible at the level of significance of 0.05;

H₁: the level of formation of information culture of these groups in both cases differs and this difference is statistically significant with a probability of 0.95.

We calculate for each discipline Pearson's criterion χ^2_{exp} , using the formula

$$\chi^2 = \sum_{i=1}^n \frac{(x_i - y_i)^2}{y_i}$$

For $P = 0.95$ and $q = 2$ (q is the number of degrees of freedom; $q = n - 1$, where n is the number of evaluation levels – in our case $n = 3$) the critical value $\chi^2_{tab} = 5.99$ (according to the table of critical values).

It turned out that $\chi^2_{exp} = 0.07$ does not exceed the critical, which confirms the effectiveness of the proposed method of forming information culture specialists in vocational education of both samples of specialists in vocational education in the specializations "Digital Technologies" and "Tourist Services".

4 CONCLUSIONS

Thus, the multilevel system of information technology training in higher education is the single integrated complex, the main task of which is the practical implementation of information technology at all stages of study at the university and in the further professional activities of future specialists in vocational education.

The use of information technology should be scientifically sound, have a methodological basis that will allow asserting the formation of information future professionals in vocational education.

In the process of learning, higher education students must obtain a certain system of knowledge,

which consists not of separate courses, but of complex, integrated disciplines that cover certain areas of professional training.

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