ADVANTAGES AND DISADVANTAGES OF APPLICATION OF THE MOST COMMON INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE EDUCATIONAL PROCESS OF INSTITUTIONS OF GENERAL SECONDARY EDUCATION

Olesya Tokarska[i] [ID]
Svitlana Karpliuk[ii] [ID]
Maryna Liutynska[iii] [ID]
Alona Nieliepova[iv] [ID]
Liliia Martynets[v] [ID]

ABSTRACT

The purpose of this article is to analyze the current state of application of the most common information and communication technologies in the educational process of institutions of general high school in Ukraine and in the world under the influence of information and the technological revolution to modernize. General scientific methods were used, such as analysis and synthesis, the theory of innovation by I. Schumpeter with additions by B. Twiss and M. Lapin, as well as the theory of social interaction by P. Sorokin. An empirical study was carried out on the advantages and disadvantages of the introduction of information and communication technologies in the educational process, research was carried out with 120 people, including 20 parents, 50 students and 50 teachers. As a result of the study, the basic trends of modern reform of general secondary education under the influence of information and communication technologies were investigated and the main positive and negative aspects of global information and communication trends were analyzed, as well as the consequences of incorporations as well. and delayed urgent reforms.

Keywords: Information and communication technologies. Educational information environment. Distance education. General high school. Professional skills.

VANTAGENS E DESVANTAGENS DA APLICAÇÃO DAS TECNOLOGIAS DE INFORMAÇÃO E DE COMUNICAÇÃO MAIS COMUNS NO PROCESSO EDUCACIONAL DE INSTITUIÇÕES DE ENSINO SECUNDÁRIO GERAL

VENTAJAS Y DESVENTAJAS DE LA APLICACIÓN DE LAS TECNOLOGÍAS DE INFORMACIÓN Y COMUNICACIÓN MÁS COMUNES EN EL PROCESO EDUCATIVO DE LAS INSTITUCIONES DE EDUCACIÓN SECUNDARIA GENERAL

RESUMO:

O objetivo deste artigo é analisar o estado atual da aplicação das tecnologias de informação e comunicação mais comuns no processo educacional de instituições de ensino médio geral na Ucrânia e no mundo sob a influência da informação e da revolução tecnológica para se modernizar. Foram usados métodos científicos gerais como análise e síntese, a teoria da inovação de I. Schumpeter com acréscimos de B. Twiss e M. Lapin, bem como a teoria da interação social de P. Sorokin. Realizou-se estudo empírico sobre as vantagens e desvantagens da introdução das tecnologias de informação e comunicação no processo educacional, foram realizadas pesquisas com 120 pessoas, incluindo 20 pais, 50 alunos e 50 professores. Como resultado do estudo, as tendências básicas da reforma moderna do ensino secundário geral sob a influência das tecnologias de informação e comunicação foram investigadas e os principais aspectos positivos e negativos das tendências globais de informação e comunicação foram analisados, bem como as consequências das incorporações bem sucedida e atraso nas reformas urgentes.

Palavras-chave: Tecnologias da informação e comunicação. Ambiente educacional da informação. Educação a distância. Ensino médio geral. Competências profissionais.

RESUMEN:

El propósito de este artículo es analizar el estado actual de aplicación de las tecnologías de la información y la comunicación más comunes en el proceso educativo de las instituciones de secundaria general en Ucrania y en el mundo bajo la influencia de la información y la revolución tecnológica para modernizarse. Se utilizaron métodos científicos generales, como el análisis y la síntesis, la teoría de la innovación de I. Schumpeter con adiciones de B. Twiss y M. Lapin, así como la teoría de la interacción social de P. Sorokin. Se realizó un estudio empírico sobre las ventajas y desventajas de la introducción de las tecnologías de la información y la comunicación en el proceso educativo, se realizó una investigación con 120 personas, entre ellos 20 padres, 50 alumnos y 50 docentes. Como resultado del estudio, se investigaron las tendencias básicas de la reforma moderna de la educación secundaria general bajo la influencia de las tecnologías de la información y la comunicación y se analizaron los principales aspectos positivos y negativos de las tendencias globales de información y comunicación, así como las consecuencias de las incorporaciones. y retrasó reformas urgentes.

Palabras-clave: Tecnologías de la información y la comunicación. Entorno de información educativa. Educación a distancia. Escuela secundaria general. Competencias profesionales.

INTRODUCTION

New information and communication technologies are changing the educational process in educational institutions. The National Strategy of Educational Development in Ukraine states that the introduction of modern information and communication technologies in the educational process is at the forefront, which should ensure the improvement of the educational process, efficiency and accessibility of education in general, as well as training future professionals for the transition to post-industrial society. This is ensured by the gradual informatization of education, the creation and implementation of information educational environment.

Education, information and communication constitute the basis of development, initiative and well-being of the individual. Along with this, information and communication technologies have a huge impact on almost all aspects of life. The progress of these technologies opens up completely new prospects for achieving higher levels of development of the digital society. The consolidation of role of ICT in the society is reflected in international instruments such as Incheon Declaration UNESCO: "Education 2030" on universal inclusive quality education and fair quality education and lifelong learning.

Education, as one of the basic elements of the social structure, is constantly influenced by external factors that determine various changes. One of such factors is scientific and technological progress, the development of computer technology, the ability to ensure the availability of the Internet for every person. Nowadays, almost everyone interacts with information and communication technologies in the course of their daily lives, through which work and personal tasks are solved, information is received and exchanged, interpersonal computer-mediated communication is implemented.

Informatization of education as a phenomenon lies in the focus of modern sociological and pedagogical research devoted to the analysis of the issues of creating and introducing technological innovations into the learning process at various levels of the education system, assessing the real and possible negative and positive consequences. The system of general secondary education is most prone to changes connected with the introduction of various technological innovations in the educational process.

General secondary education plays a decisive role in the formation and development of information culture, remaining one of the main social tools of human adaptation. Therefore, the primary role in these processes belongs to the informatization of general secondary education, development and implementation of information and communication technologies in the educational process.

According to research conducted by the International Telecommunication Union, at the beginning of 2019, more than half (51, 2%) of the world's population regularly use the World Wide Web. All countries of the world are ranked according to the ICT Development Index in obedience to 11 criteria, which include both the ability to access to IT technologies, and the breadth of their application and the ability of the population to use them. According to this ICT index, the leaders are Iceland (8, 98), South Korea (8, 85), Switzerland (8, 74), Denmark (8.71), Great Britain (8, 65), Hong Kong (8, 61), The Netherlands (8, 49), Norway and Luxembourg (8, 47 each), Japan (8, 43). Ukraine, for comparison, ranks the 79th place with an ICT index of 5, 62.

Consequently, one of the current problems of modern age is the investigation of the impact of informatization on the educational space. The purpose of this academic paper is a theoretical analysis and empirical study of the advantages and disadvantages of the use of information and communication technologies in secondary education.

The purpose of this study is a theoretical analysis and empirical study of the advantages and disadvantages of the use of information and communication technologies in the establishments of secondary education.

Achievement of target goal involves solving the following research problems, namely:

- to describe the components and tools of information and communication technologies;

- to analyze the advantages and disadvantages of using ICT in secondary education institutions by surveying all participants of the educational process.

LITERATURE REVIEW

Consideration of the issues of modern education development within the framework of the information society formation is at the intersection of different areas of scientific thought. Considering the features of teachers' activities in school technological innovations, Admiraal et al. (2017) applies the following classification: teachers who use information and communication technologies with a focus on the pupil; teachers who take a critical look at the application of ICT at schools; teachers who are uncomfortable when using information technology. Such systematization can be used in the organization of professional development activities for teachers, training, advanced training course, etc.

Tulinayo et al. (2018) analyze the problems of digital technology dissemination at higher educational institutions with limited resources on the example of Africa. Barriers for implementation of information and communication technologies are as follows: high cost, social-economic and technological conditions, lack of a systematic approach to teaching and learning, low staff awareness, limited infrastructure and lack of digital skills. However, Le Roux & Evans (2011) argue that information and communication technologies, used in developed countries in South Africa, will help bridge the digital divide in secondary education and can have a positive impact on the spread of advanced technologies for the rest of the African continent.

Dzikite et al. (2017) consider the competences of teachers in the sphere of information and communication technologies as a component of effective implementation of integrated teaching and learning. Universities should compensate the lack of adequate knowledge for teaching in the digital society through additional training and continuous professional development of employees. In this context, Kaplan & Haenlein (2016) pay attention to external resources - online courses with open access, such as: Massive Open Online Courses (MOOC), Small Private Online Courses (SPOC), social media and Cookie Monster, which allow attracting unlimited number of both teachers and students. Herewith, Kolodziejczak & Roszak (2017), based on a study conducted at three Polish medical universities, propose to use the internal resources of educational institutions by introducing the Learning Content Management System (LCMS) - a portal for effective distance education.

Horton (2018) notes that such international organizations as UNESCO emphasize the wide, free access of the world's population to open resources in order to improve information literacy and the introduction of information and communication technologies. At the same time, Jordan (2015) analyzing the massive Open Online Courses (MOOC) concludes that since their creation the number of MOOC visitors has decreased, however, the completion rates have increased, which indicates the interest of users in learning outcomes.

Khuanwanga et al. (2016) analyzing the experience of developing indicators and standards for assessment of professional training in Thailand, conclude that knowledge of information technology should be a mandatory component for evaluating the skills and competences of future teachers. d'Aquin (2016) argues that the use of information data in education for teaching and learning opens up opportunities for new services and believes that education is an ideal option for the use of information and communication technologies. Conducting research in this direction, Davie (2015) emphasizes that due to the development of information and communication technologies in education, the number of teachers may change. For instance, in Singapore, information technologies have led to a decrease in the hiring of teachers, the number of which has been reduced by almost three times, at the same time, wages, annual payments at the beginning of the school year have increased and the amount of free time has increased.

When investigating information technologies, scientists pay attention to the communication component of their implementation. Luo & Zhang (2017) note that student - teacher and student - student interactions significantly enhance the sense of community among participants in the educational process, whereas the continued use of e-learning has a negative impact, and heads of institutions have to provide appropriate mechanisms to encourage distance learning. At the same time, Wenxiu (2015) characterizes new media communications based on Laswell's "5W" model, which focuses on: "Who (says) what, to whom, in which channel, with what effect". Analyzing these five components (communicator, information, media, audience and effect), the author argues that information technologies will have greater opportunities and broader prospects for development.

A number of researchers analyze the feasibility and effectiveness of applying information and communication technologies in the study of individual disciplines. M. Tsarenko and L. Polishchuk (2011) substantiate the use of information and communication technologies in the study of foreign languages. Bogdanovs`ka (2013) reveals the features of the formation of students' cognitive independence and the specifics of the development of their critical and creative thinking through interactive tools at history lessons.

Vakalyuk et al. (2018) analyze the features of the use of smart cards in teaching pupls at school. Panchenko & Khomyak (2018) characterize cloud technologies for the training of future sociologists. Dubovy`k (2017) reveals the essence and types of information and communication learning technologies; he focuses on the issues of training a modern teacher. Tkachenko et al. (2017) analyze information and communication technologies in the process of teaching the basics of nanosciences at secondary schools. At the same time, Simonson et al. (2017), analyzing the features of the use of information and communication technologies, emphasize that distance learning should be equivalent, not identical to what can be conducted in a traditional environment. Equivalence theory helps the teacher individually get an approach to the development of instructions for each pupil, without trying to duplicate what is happening in the classroom.

METHODS

Currently, the use of information and communication technologies in public life is significantly expanding, as the impact of these technologies on society is systemic. In order to theoretically analyze the application of information and communication technologies, the participants of the educational process have applied the theory of innovation of I. Schumpeter with additions of B. Twiss and M. Lapinim and the theory of social interaction of P. Sorokin. Analysis and synthesis have been used as research methods. The empirical research has been conducted through a questionnaire survey of 120 consumers of information services in the general secondary education system, including 20 parents of students, 50 schoolchildren, 50 teachers; sampling error is not more than 3, 5%.

While conducting theoretical consideration of the advantages and disadvantages of the use of information and communication technologies, the theory of innovation by I. Schumpeter has been applied with amendments made by B. Twiss and M. Lapinim, as well as the theory of social interaction by P. Sorokin (analysis of the features of social interaction of participants in the educational process during implementation of information services in the system of general secondary education; consideration of information services from the point of view of the leaders of social interaction in the educational process).

In order to achieve the goal of the research and to solve the set goals, a systematic approach has been used, which allows studying the processes of formation and development of information culture from different positions as an integral characteristic and the main component of the structure of the information society's culture. Along with this, the structural and functional analysis has been applied for the theoretical analysis of the advantages and disadvantages of information and communication technologies, which makes it possible to consider the factors of creating, receiving and implementing information services in the structure of general secondary education.

The analysis and the synthesis are the methods of studying the advantages and disadvantages of using information and communication technologies in the system of general secondary education; the analysis makes it possible to identify the features of the subject in order to study them separately as part of integral whole (the study presents a general description of the means and components of information and communication technologies; features of their application in educational activities); the synthesis is a combination of parts obtained in the process of analysis into an integral whole. Structural-genetic analysis and synthesis provide means for penetrating most deeply into the essence of the subject of the research - the advantages and disadvantages of ICT and identifying the cause-and-effect relationship. The empirical basis of the study was a survey conducted among 120 consumers of information services in the general secondary education system, including 20 parents of students, 50 schoolchildren, 50 teachers; sample type - random.

RESULTS

In order to achieve the goal outlined it is planned to characterize the components and tools of information and communication technologies in secondary education; to analyze the pros and cons of ICT application in high school. ICT tools most often used by participants in the educational process in the secondary education system are as follows:

1. Software of general and special purpose: word processors, spreadsheets;

2. Programs for processing graphic images or graphic editors, programs for processing, cutting, playing sound and video, software for touch (interactive) boards;

3. Software for the development of e-learning products, basic programs for creating educational web pages, sites, portals;

4.   Internet services: teleconferencing, or newsgroups (Usenet), e-mail, file hosting services, file sharing networks, IRC (Internet Relay Chat), voice communication i video conferencing, social networks, blog (network diary), social services for saving multimedia resources, social Wiki services, etc.

The advantages of information and communication methods, which have been most often identified by our respondents, are as follows: the formation of skills for the implementation of creative activities - 13%; pupils' access to information banks, the ability to promptly receive the necessary information - 27%; objectivity during testing and assessing the knowledge, skills and abilities of pupils - 42%; intensification of the learning process and the possibility of involving pupils in research activities - 9%; increase of cognitive activity and motivation of knowledge acquisition due to the variety of forms of work - 9% (Figure 1).

**Figure 1.** Advantages of ICT application in the system of general secondary education.
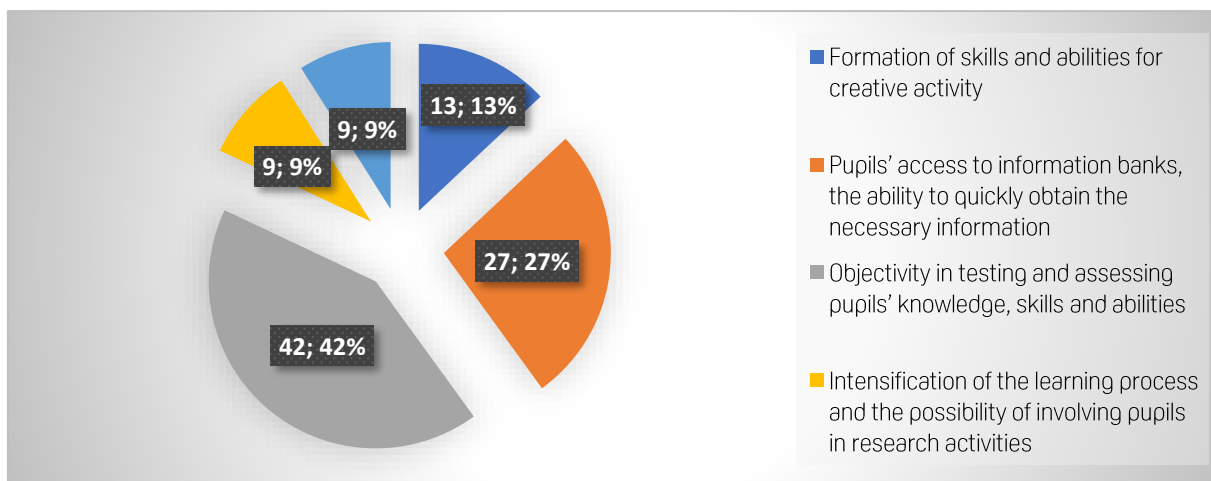
Source: Search data.

Thus, the biggest advantage of using information and communication technologies is objectivity in testing pupils' knowledge and the ability to quickly obtain the necessary information.

The interviewed participants of the educational process at secondary schools have identified the following disadvantages and problems in the use of ICT, namely: many pupils and teachers don't have computers for home use - 15%; teachers do not have enough time to prepare for a lesson with subsequent application of the computer - 32%; insufficient computer literacy of teachers - 23%; it is difficult to integrate a computer into the structure of lessons - 21%; lack of direct contact between participants in the educational process - 9% (Figure 2).

Figure 1. Disadvantages of ICT application in the system of general secondary education
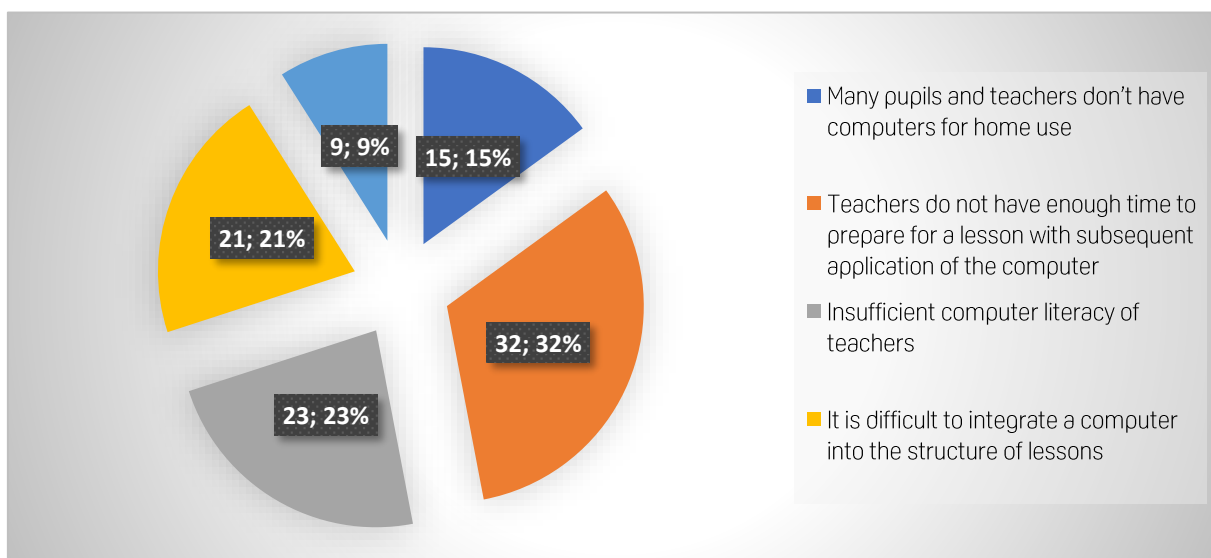
Source: Search data.

According to the results of the survey presented in Figure 2, the biggest disadvantage of using information and communication technologies is the lack of time to prepare for lessons with subsequent application of the computer, which may be caused by overload of teachers.

The results of the study have revealed that it is not enough just equipment with modern computers and high-quality Internet connection of a general educational institution for the use of information services by teachers. Teachers should have various technical means in their personal use for the implementation of indirect communication. According to the data of the research, the vast majority of teachers (86%) use personal gadgets to perform their daily work, including for communication with their colleagues, pupils and their parents.

Along with the problem of providing teachers with computer equipment, their quality and constant Internet connection, in the process of development of the information services system it is also important to choose the most optimal and effective software with which these services are provided. One of such IT-products is Net School Ukraine - a network system designed to create a single information environment of the educational institution. It supports the following types of users: system administrator; principal / deputy principal; class teacher / teacher; pupil; father; technical staff. Access rights to different parts of the educational institution's database are flexibly defined for each type of the user.

The peculiarity of the Net School is that it is an integrated complex system on the scale of an educational institution, and not a system that automates any type of activity. Net School supports the traditional way of managing the educational-bringing-up process, and at the same time it brings modern technology to the school. The information environment of the educational institution on the basis of Net School is a full-fledged communication, as well as opportunities for cooperation and teamwork. Another option of the educational resource's electronic management is "Ukraine. Education Management Information System". The software package "COURSE: Education" includes the following key components: computer program "COURSE: School" and its satellites "Course: School +" and "Course: Site"; "COURSE: Preschool"; ISUO portal (information system of the educational institution) and the portal "My knowledge".

Along with this, teachers often use the following tools: Zoom for online lessons; Human school - convenient and modern tools for the educational institution (learning management system, analytics, school social network, and reflection); "New knowledge" - the use of electronic class diaries and magazines; convenient distance learning system; "Unified School" - an information and communication system designed for educational institutions, pupils and their parents, it includes an electronic journal and diary; Moodle - a learning platform that will help create effective online learning in your own environment, there is an opportunity to create courses and about 20 activities; Google Classroom is a free web service created by Google for educational institutions.

For the purpose of undertaking distance educational courses, the following ones are used, namely: Prometeus, which represents about 100 free online courses, including courses for preparation for EIT (external independent testing), English and education of a modern teacher; Ed-Era - a project that creates free online courses (about 50 at present time) and a wide range of educational content using IT (history, mathematics, human rights, English, biology); iLEARN - online courses in the main subjects of external independent testing, webinars with the best tutors, tests, podcasts, self-paced training materials; Learningapps - a designer of interactive tasks that makes it possible to conveniently and easily create electronic interactive exercises for promoting activity, independence, efficiency, connection of theory with practice, a combination of collective and individual forms of educational work, etc.

As part of a questionnaire in September 2019, teachers, pupils and their parents were asked to express their attitude to the means of information and communication technologies. The results show that the majority of respondents find it difficult to answer (55%), but they were positively described by 45% of the participants. By the way, it is interesting to note that a similar survey was conducted a year later (September 2020 under the conditions of the COVID-19 pandemic and the transition of most educational institutions to distance learning); the ICT was positively assessed by 95, 5% of respondents in the educational process.

In the course of conducting the survey with parents it was necessary to find out their attitude to the electronic form of information, as well as its positive aspects: a certain transparency to the educational process is provided, and, consequently, the effectiveness of parental control over the learning process of their child is improved. The use of information services in the sphere of general education leads to increased control over the pupil's learning process, as well as makes it possible to carry out constant monitoring of the learning process by parents - this opinion was expressed by 57% of parents surveyed.

However, this indicates to a contradiction between the need to develop skills of self-control, a certain independence in the education of pupils and strengthening, expanding the means of their control. This contradiction can lead to difficulties in the formation of skills and attitudes among schoolchildren towards independent responsibility for the process and learning outcomes in a general education institution.

Parents have a strong interest in obtaining information that will be useful for them in helping to educate and raise their children. Some of the parents (32%), as part of the recommendations for improving the submitting of information services at school, have suggested periodic e-mails of characteristics of their child's behavior and progress and more information about events in the classroom and school.

Following this line of reasoning, the contradiction has been revealed between the necessary and real amount of information needs of the main participants in the educational process, which can be met by them through the use of information and communication technologies. It has been noted that not all information needs of parents concerning the educational and upbringing process of their child at school are met through the existing system of indirect communication.

In fact, the problem of lack of information about pedagogical methods, recommendations for working with each child for parents has been empirically confirmed. The control function, although not losing its importance, is not enough. Without solving the problem of filling information services with pedagogical pieces of advice for parents, it will be impossible to say that information services in the general education system are an effective means of improving the quality of the educational process. Based on this, there is a problem of willingness and ability of teachers to provide this information.

The main users of information services in the general education system are also teachers, in addition to pupils and their parents. Therefore, it is logical to proceed to the analysis of the readiness level of teachers of secondary schools to use information services in their work. Teachers, as subjects of the educational process, should, first of all, be able to fully work with the software in order to give parents all the information they are interested in about the peculiarities of teaching their children, various activities, and, in the future, pedagogical recommendations.

It is worth paying special attention to the process of working with electronic journals and diaries, namely how it fits into the everyday routine activities of a schoolteacher. Teachers need to optimize working hours, eliminate excessive "paperwork". According to the data obtained from the analysis of open questions of the questionnaire, comments were received from 58% of teachers, confirming the increase in workload due to the simultaneous introduction of electronic and paper diaries and journals. Teachers should be able to keep only one type of journal, as filling in two documents in parallel can have a negative impact on the effectiveness of the direct functions of the teacher.

However, according to our teachers' survey, self-education for 76% is of high importance; however, it is in last place. The share of teachers engaged in self-education in their free time is 32%. That is, only every third teacher has an opportunity and implements the goal for professional development and is ready to devote part of his free time to self-education.

The results of our survey of teachers indicate a clear need for knowledge about modern information technology (54, 3% in the group under 40 years, 70, 5% in the group over 40 years). Thus, teachers need to develop competencies to work with technological innovations.

According to a survey of teachers conducted in 2019, only 23% of respondents said that they use information and communication technologies for interaction, and in May 2020 – 95, 3%. Most often, they use ICT for visualization during the lesson (87%), the implementation of knowledge control (60%), as well as laboratory workshops (19%).

Figure 3. Forms of work of teachers with information technologies in the educational process (depending on the time spent on self-education per week) (in % to the number of surveyed teachers)
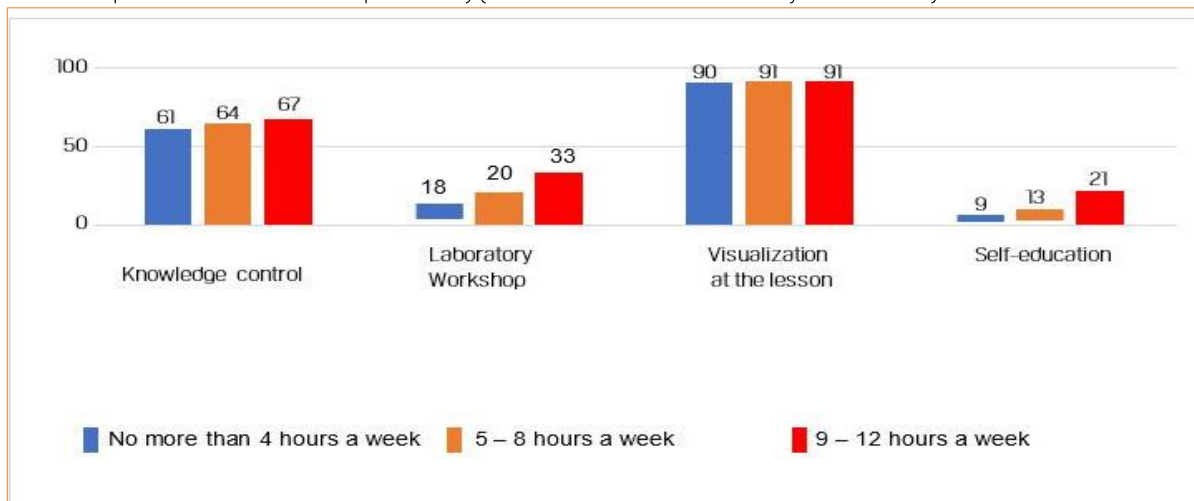
Source: Search data.

The data presented in Figure 3, indicate that teachers spend much less time on self-education compared to visualization in class, knowledge control and laboratory workshops. Thus, 9% of teachers spend less than 4 hours a week on their self-education and only 21% of teachers spend 9 to 12 hours a week on it.

Summarizing the theoretical and empirical study of the advantages and disadvantages of applying information and communication technologies in general secondary education, we can state a tendency to their rapid introduction into the educational process.

DISCUSSION OF RESULTS

In the era of the Fourth Industrial Revolution, we are talking about cardinal social shifts caused by changes in the ways of perceiving the world, systems of life meanings, values, identities and forms of communication and human interaction, and, therefore, in culture in its broadest sense. In Geneva, at the next World Summit on the Information Society (WSIS), held in March 2018, the focus was on learning about the best practices in implementing national strategies for building the information society in the context of achieving the Sustainable Development Goals. The issues of overcoming digital inequality, strengthening trust and security in the use of ICT, introduction of digital technologies in the economy, trade, and education were discussed. The summit reaffirmed its commitment to the principles of information technology implementation set out in the Geneva Declaration of Principles as of 2003.

The main priority of this document centers around creating an information society "focused on the interests of people, in which everyone is free to create information, knowledge, access, use and share it. The person, community and people must be able to implement their full potential by promoting their sustainable development, improving their quality of life on the basis of the purposes and principles of the Charter of the United Nations, fully respecting and supporting the Universal Declaration of Human Rights" (LONDOR, 2020).

For any type of learning, communication is an integral part of the pedagogical process. As it has been noted by S. Dzikite et al. (2017), the level of communication depends on its effectiveness, and distance learning is no exception. Interaction between pupils and teachers during distance learning takes place within an artificially created communicative space. The communicative space presupposes the formed situation of interaction, in which there is a place, time and mutual desire for communication, aimed at achieving the goals of the learning process. Under the conditions of distance learning, this process is more complex, forasmuch as it is generated by the need for joint activities, perception and understanding of others in cyberspace. The difficulty of distance learning lies not only in stimulating pupils to inner work, but also in the ability to develop a dialogue that allows students expressing a variety of proposals. The main purpose of communication is to attract and motivate participants to learn (KOBERNYK, ZVYNYATS'KIVS'KA, 2020).

EU research data on the use of ICT tools by teachers in these countries indicate that the majority (52, 7%) of

teachers make full use of information and communication technologies, 34, 75% try to do it, and 13, 7% and 13, 4% use with difficulty or do not use ICT at all (Digital competence and digital literacy in higher education research: Systematic review of concept user, 2019). This trend was correlated with the results of our study until 2020.

According to the investigations of Yu. Berzin and O. Maltsev (2016), more than half of school teachers associate themselves with the image of "hamster in the spinning wheel". In this regard, it is extremely important to pay attention to the fact that the implementation of information services should not negatively affect the need to optimize working hours, to strengthen the already busy workday of the school teacher. Improving oneself as a specialist is a necessary condition for teachers' readiness to advise parents on raising children. In order to solve the problem outlined, the leading place should be given to the administrative body of the school, which should monitor the level of professional training of the entire teaching staff (RUBAN, 2006). If necessary, the school administration can interact with education authorities at the local level, in order to conduct professional development courses for staff. Along with this, improving the computer literacy of the teaching staff of the secondary school is possible through the organization of specialized advanced training courses on ICT competencies, training seminars that can be held within the school, with the invitation of experts from education authorities, participation in online courses and conferences, distance seminars.

Teachers of secondary schools should possess established orientations and attitudes towards the use of information technology as a tool for interaction of participants in the educational process, during which they will be able to indirectly give methodological and pedagogical recommendations to both pupils and their parents. B. Berzin (2016) represents the results of a survey of teachers according to which this social-professional group has a pronounced need for knowledge about modern information technology (44, 6% in the group under 40 years, 76, 5% in the group over 40 years). Such results are quite comparable to the fact that in the first place more than half of school teachers, according to a study by D. Yanbekova, understand innovations in education as "the use of modern information technology by teachers in their teaching".

Thus, school teachers need to develop competencies to work with technological innovations. The results of our teachers' survey also indicate such a need (54, 3% in the group under 40 years, 70, 5% in the group over 40 years). According to a survey conducted by A. Semenov & Uvarov (2017), 95, 3% of teachers have used information and communication technologies for: visualisation during the lesson (87%), knowledge control (60%), for laboratory workshops (19%). Another important issue noted by B. Kolodziejczak & M. Roszak (2017) is the ability of teachers to provide parents with information about the necessary pedagogical methods of working with their children through a form of computer-mediated communication, in order to improve the quality of education and upbringing in the family and school. In order for every teacher to have such an opportunity, the priorities of his activities in his free time should be directed to self-education aimed at improving his professional skills as a teacher, gaining knowledge about modern methods of interaction with pupils and their parents.

It can be noted that with an increase in the level of school teachers' constant self-improvement as specialists, there is a growing understanding of the need to use information technologies in teaching not only to control knowledge and demonstrate the material, but also to implement computer-mediated communication with other participants of the educational process (FREEMAN, 2017). Thus, the level of readiness of school teachers to use information services in the process of teaching pupils depends on the solution of two main issues. Firstly, it is the additional workload, increasing the amount of work through the introduction of information and communication technologies in the daily work of the teacher. Secondly, these are orientations and attitudes to the use of information services as tools for networking of teachers, pupils and their parents.

CONCLUSIONS

The purpose of the present investigation was to study the advantages and disadvantages of using information and communication technologies in secondary education, by characterizing the components and means of information and communication technologies and analyzing the features of ICT use in high school by questioning teachers, pupils and their parents. We have analyzed the system of modern general secondary education in the context of implementation and dissemination of information and communication technologies, identified general areas, revealed the main components and tools of information and communication technologies, and described the advantages and disadvantages of using ICT in secondary education.

When speaking about advantages, the following ones have been highlighted, namely: the formation of skills for the implementation of creative activities, the ability to quickly receive the necessary information, objectivity in testing and assessing the knowledge, skills and abilities of pupils, intensification of the learning process and the

ability to involve pupils in research activities, increase cognitive activity and motivation to acquire knowledge through a variety of forms of work. Problems in the use of ICT are as follows: many students and teachers don't have their personal gadgets; overload of teachers, their lack of digital literacy, the difficulty of integrating information and communication technologies into the lesson structure, the lack of direct contact between participants in the educational process during the use of such technologies.

It has been revealed that teachers often use the following tools: Zoom, Human School, New Knowledge, Unified School, Moodle, Google Classroom, Prometeus, Ed-Era, iLEARN, Learningapps, etc. Eloquent is the fact that during the year the number of participants in the educational process who use information and communication technologies increased from 55% to 95, 5%. The workload of teachers remains a problematic issue, who often have to do double work (for example, draw up both paper and digital documentation), which contributes to the fact that self-education for 76% is of high importance; however, it is in last place. That is, only a third of teachers implement the desire for self-education. The significance and practical application of the results of the study is that the advantages of information and communication technologies in the educational process of general secondary school should outweigh their disadvantages, by further optimizing the working hours of teachers and overcoming their congestion. The prospect of further research is to investigate the features of the use of information and communication technologies at all levels of the educational process.

REFERENCES

ABRAMOVA, O. Web-tools as a means of improving the skills and organization of self-education of the modern teacher. *Pedagogika i prosveschenie,* n. 4, p. 34-46, 2017 .(In Russian), 2017.

AL-AWLAQI, M. A.; AAMER, A. M.; & HABTOOR, N. The effect of entrepreneurship training on entrepreneurial orientation: Evidence from a regression discontinuity design on micro-sized businesses. *The International Journal of Management Education*, In press, 2019.

ALEIXO, A. M., Leal, S., & Azeiteiro, U. M. Conceptualization of sustainable higher education institutions, roles, barriers, and challenges for sustainability: an exploratory study in Portugal. *Journal of Cleaner Production,* 172 (20), 1664–1673, 2018.

ALEMU, G. A theory of metadata enriching and filtering: Challenges and opportunities to implementation. *Qualitative and Quantitative Methods in Libraries,* 5, 311–334, 2016.

ARIM, R. *A profile of persons with disabilities among Canadians aged 15 years or older, 2012.* Resource document. Statistics Canada, Catalogue n. 89-654-X. Available at: http://www.statcan.gc.ca/pub/89-654-x/89-654x2015001-eng.pdf. Access: 15 Feb. 2017.

ARQUERO, J. L; ROMERO-FRÍAS, E. Using social network sites in higher education: An experience in business studies. *Innovations in Education and Teaching International,* 50(3), 238–249, 2013. https://doi.org/10.1080/14703297.2012.760772 . Access: 15 Feb. 2017.

BANDERA, C.; COLLINS, R.; PASSERINI, K. Risky business: Experiential learning, information and communications technology, and risk-taking attitudes in entrepreneurship education. *The International Journal of Management Education,* 16(2), 224–238, 2018.

BLACK, R. D.; WEINBERG, L. A.; BRODWIN, M. G. Universal design for learning and instruction: Perspectives of students with disabilities in higher education. *Exceptionality Education International,* 25(2), 1–16, 2015.

BODZIN, M. A. C.; SHINER, K. B; STARLIN, W. *The Inclusion of Environmental Education in Science Teacher Education.* USA: Springer. 352 p., 2010.

BROOKS, D. C.; POMERANTZ, J. *ECAR study of undergraduate students and information technology, 2017.* Resource document. EDUCAUSE Center for Analysis and Research, October, 2017.

BRYCHAN, T.; PACKHAM, G.; MILLER, C.; BROOKSBANK, D. The use of Web sites for SME innovation and technology supportservices in Wales. *Journal of Small Business and Enterprise Development,* 11 (3), 400–407, 2004.

BURGSTAHLER, S. Universal design of instruction: From principles to practice. In S. E. Burgstahler (Ed.), *Universal design in higher education: From principles to practice* (2nd ed., pp. 31–64). Boston: Harvard

Education Press, 2015.

CRAVERO, C. Socially responsible public procurement and set-asides: A comparative analysis of the US, Canada and the EU. *Arctic Review on Law and Politics, 8*, 174–192, 2017.

DZIKITE C.; NSUBUGA, Y.; NKONKI, V. Lecturers' Competencies in Information and Communication Technology (ICT) for Effective Implementation of ICTIntegrated Teaching and Learning in Textiles and Clothing Degree Programmes. *International Journal of Educational Sciences.* v. 17, Issue 1-3. p. 61-68, 2017.

EAGAN, M. K.; STOLZENBERG, E. B.; ZIMMERMAN, H. B.; ARAGON, M. C.; WHANG SAYSON, H.; RIOS-AGUILAR, C. *The American freshman: National norms fall 2016.* Los Angeles: Resource document. Higher Education Research Institute, UCLA., 2017.

FENGCHUN, M. Ensuring effective use of ict in teaching and learning, *Vidkryte osvitnie e-seredovyshche suchasnoh universitetu, Issue. 1.* [Online]. 2005. Available at: http://nbuv.gov.ua/UJRN/oeeemu_2015_1_20. Access: 25 Feb. 2019.

FINAL REPORT PREPARED FOR THE EUROPEAN COMMISSION COMMUNICATIONS NETWORKS, Content & Technology by Deloitte, Ipsos Mori. Available at: https://ec.europa.eu/digital-single-market/en/news/2nd-surveyschools-ict-education. Access: 03 May. 2020.

GOOGLE FOR EDUCATION [Electronic Resource] Available at: https://www.google.com/edu/products/productivity-tools/. Access: 03 May. 2020.

HALCHEVSKA, O. A. Vykorystannia mizhnarodnykh naukometrychnykh baz danykh vidkrytoho dostupu v naukovykh doslidzhenniakh. *Informatsiini tekhnolohii v osviti.* n. 23. S.115-126, 2016.

PÕLDOJA, H.; VÄLJATAGA, T.; KAIRIT TAMMETS, K.; LAANPERE, M. Web-Based Self- and Peer-Assessment of Teachers' Educational Technology Competencies, *Advances in Web-based Learning - ICWL 2011: 10th International Conference, Hong Kong, China, December 8-10, 2011,* p. 122 – 131, Springer, 2011.

HERSHKOVITZ, A.; FORKOSH-BARUCH, A. Integrating mobile technology in higher education instruction [translation]. *Academic Teaching, 6,* 21–29, 2017.

JONES, B.; WILLIAMS, N.; & RUDINGER, B. Designing and implementing an assistive technology lab for post-secondary education. *Education Sciences, 8*(1), 2018.

JORGENSEN, M.; FICHTEN, C.; KING, L.; HAVEL, A. *Proceedings of the Ed-ICT International Network Montreal Symposium: Stakeholder Perspectives.* Resource document. Montréal, Québec: Adaptech Research Network., 2018.

KAPLAN ANDREAS M.; Haenlein Michael Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the Cookie Monster, *Business Horizons,* v. 59, 2016.

KNIGHT, W.; WESSEL, R. D.; MARKLE, L. Persistence to graduation for students with disabilities: Implications for performance-based outcomes. *Journal of College Student Retention: Research, Theory & Practice, 19*(4), 362–380, 2018.

LE ROUX C. J. B.; EVANS, N. Can cloud computing bridge the digital divide in South African secondary education? Information development. v. 27. n. 2. p. 109–116, 2011.

LSAC ANNUAL STATISTICAL REPORT 2017 CHAPTER. December, 2018. Available at: https://growingupinaustralia.gov.au/research-findings/annual-statistical-report-2017/use-technology-classroom. Access: 03 May 2020.

МЕТОDЫ YSSLEDOVANYI Y ORHANYZATSYIA ЭKSPERYMENTOV. Pod Red. K.P. Vlasova. Kharkov : Humanytarnыi Tsentr, 412 s., 2013.

NATSIONALNA STRATEHIIA ROZVYTKU OSVITY V UKRAINI NA 2012-2021 ROKY [ELEKTRONNYI RESURS]. Available at: http://zakon5.rada.gov.ua/laws/show/344/2013#n10. Access: 03 May 2020.

NAUCHNЫE RABOTЫ: METODYKA PODHOTOVKY Y OFORMLENYIA, avt.sost. Y.N. Kuznetsov. 2 e yzd., dop. y

pererab. Mynsk: Amal feia, 544 s, 2000.

OFFICIAL WEB SITE OF THE INTERNATIONAL TELECOMMUNICATION UNION. Available at: http://www.itu.int/en/ITU- D/Pages/About.aspx. 1. ITU (2017), International Telecommunication Union official website. Available at: www.itu.int/en/ITU- D/Pages/About.aspx. Access: 03 May 2020.

OVCHARUK, O. Problems of evaluation of information and communication competence in the system of general secondary education: general approaches, *Informatsiini tekhnolohii i zasoby navchannia*, Tom 44, n. 6, p. 83-92, 2014. (in Ukrainian).

PANCHENKO L.; KHOMYAK, A. *Cloud technologies for training future sociologists of visualizing data of social and demographic statistics*. Transactions. Georgian Technical University. Automated control systems. n. 2(26) Georgia, Tbilisi, GTU. C. 153-156, 2018.

RESULTS OF THE ONLINE SURVEY "Needs of teachers in improving the professional level on the use of digital tools and ICT in quarantine". Available at: https://lib.iitta.gov.ua/719908/1/Результати%20опитування%20вчителів%20з%20питань%20використання%20IKT%20в%20умовах%20карантину_2020.pdf. Access: 03 May 2020.

ROSENBAUM, J. E. Disabilities and degrees: Identifying health impairments that predict lower chances of college enrollment and graduation in a nationally representative sample. *Community College Review, 46*(2), 145–175, 2018.

SHEVCHENKO, L. Preparation of future teachers for innovative pedagogical activity: Contextual approach. *Information Technologies in Education*, n. 1 (30), pp. 180-190, 2017, doi: 10.14308/ite000628 (in Ukrainian), 2017.

SIMONSON M.; SMALDINO S.; ALBRIGTH M.; ZVACEK S. *Teaching and learning at a distance: Foundations of distance education* (4th ed.). Boston, MA: Pearson. 374 p., 2017.

SIMONSON, M.; SMALDINO, S.; ZVACEK, SUSAN, M. *Teaching and Learning at a Distance: Foundations of Distance Education,* Charlotte, North Carolina, USA: Information Age Publishing, 2014.

VAKALIUK, T. A.; PRYSIAZHNIUK, H. YE. *Vykorystannia khmaro oriientovanykh intelektualnykh kart pry navchanni matematyky uchniv zahalnoosvitnikh shkil*. Aktualni pytannia suchasnoi informatyky: Tezy dopovidei II Vseukrainskoi naukovo-praktychnoi konferentsii z mizhnarodnoiu uchastiu "Suchasni informatsiini tekhnolohii v osviti ta nautsi", prysviachenoi 10-ii richnytsi funktsionuvannia Internet-portalu E-OLYMP (09-10 lystopada 2017 r.) za red. T. A. Vakaliuk. Zhytomyr: O.O.levenok. Vyp. 5. S. 352-354, 2017.

VAKALIUK T. A.; SHEVELOVA, M. K. *Vykorystannia informatsiinokomunikatsiinykh tekhnolohii v zahalnoosvitnikh shkolakh dlia pidvyshchennia yakosti osvity*. Informatsiino–komunikatsiini tekhnolohii yak zasib pidvyshchennia yakosti osvity: Zb. nauk. pr. /red. kol.: V.Ie. Bereka (hol) ta in. Khmelnytskyi: Vydavnytstvo KhOIPPO. S. 40-45, 2015

[i]Graduate Student, Zhytomyr Ivan Franko State University (Ukraine), Department of Pedagogy, Vocational Education and Management of Educational Institutions. E-mail: labait@meta.ua. ORCID: https://orcid.org/0000-0002-8761-8182.

[ii]Candidate of Pedagogical Sciences, Associate Professor, Zhytomyr Ivan Franko State University (Ukraine), Faculty of Physics and Mathematics, Department of Applied Mathematics and Computer Science. E-mail: leonardW@gmail.com. ORCID: https://orcid.org/0000-0002-6988-0531.

[iii]Postgraduate, Teacher of Computer Science, Pavlo Tychyna Uman State Pedagogical University, Department of Pedagogy and Educational Management, «Liko-school»(Ukraine). E-mail: ivanovaP123@gmail.com. ORCID: https://orcid.org/0000-0003-1553-8607.

[iv]Candidate of Pedagogical Sciences, Associate Professor, National University of Life and Environmental Sciences of Ukraine, Faculty of Information Technologies, Department of Information Systems and Technologies. E-mail: olenatkach@ua.fm. ORCID: https://orcid.org/0000-0003-2215-8311.

[v]Doctor of Pedagogic Sciences, Associate Professor, Head of Department, Vasyl' Stus Donetsk National University, Department of the Pedagogy, Physical Education and Education Management. E-mail: salut09@gmail.com. ORCID: https://orcid.org/0000-0002-4736-5467.