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Збірник наукових праць «Педагогіка вищої та середньої школи» містить матеріали, присвячені висвітленню теоретико-практичних проблем педагогіки вищої та загальноосвітньої школи, становлення і розвитку освітньої парадигми, інтеграції психолого-педагогічних чинників в організацію навчально-виховного процесу.

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Contents

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Informatization of education as a pledge of the existence and development of a modern higher education

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Abstract. This article focuses on the special significance of education informatization as the main aspect of the existence and development of a modern higher education. The process of computerization of education is considered as the main basis of informatization in the historical aspect. This paper emphasizes the importance of implementing information and communication technologies (ICT) in the learning process of free software and the interest of scientists in the field of education. The interest of modern scholars is analyzed in the consideration of such problems as the application of ICT in education; problems of informatization of education and goals of informatization of education; didactic and psychological aspects of application of ICT in the educational process; problems associated with the widespread introduction of ICT in higher education institutions and informatization of education in general. The article's focus is on the importance of the acquired skills and abilities as a result of informatization of education and implementation of the educational process of ICT. The goals of informatization of education at a modern higher educational establishment are determined. The primary goals of informatization of education are singled out. The types of education that are directly related to ICT are considered. It is acknowledged that the practice of implementing ICT in the educational process of higher educational institutions are expanding every day and yields only positive results. The conclusions highlight the relevance of this study. It is noted that educational activity based on the use of ICT is a basis for changing the

structure of the educational process for both teachers and students.

Keywords: informatization, education, higher education, computerization, information and communication technologies.

1 Introduction

1.1 Research problem

Currently, informatization of education is the main factor in the existence and development of a modern higher education, because its primary objective is the development and growth of the potential of each individual. Informatization of education is a set of interrelated organizational and legal, socio-economic, educational, methodological, scientific-technical, industrial and management processes. These processes are aimed at providing information, computing and telecommunication needs (other needs related to the implementation of methods and tools of information and communication technologies — ICT) of participants of the educational process, as well as those who manage and maintain this process (including those who provide its scientific and methodological support and development) [2]. Informatization of education increases the efficiency and intensification of the educational process by using information technologies and implementation of new methodological developments in learning process [37, p. 34]. Informatization of education envisions and catalyzes the general processes of development of society and education. Basic components of education and education systems such as content of education, methods, tools and technology of training and education, organization of education and training systems are gaining essential specific features [2].

1.2 Problem statement

Considering the goals of informatization of the educational process of higher education, we identified a number of problems associated with legal, economic, educational, methodological, and scientific and technological processes. Implementation and application of ICT in the training of future professionals will play an important role not only as a tool for the disclosure and development of individual abilities of the individual, but also as a catalyst for comprehensive informatization of society. ICT in education are part of pedagogical technologies aimed at the establishment of knowledge and the acquisition of acquired skills and abilities that, under the slightest effort, can be adapted to the individualities of any person who wants to study.

According to Vladyslav Ye. Velychko, the use of information technologies in educational activities will enable future specialists to use a wide range of modern methodological approaches and technologies and will help to reveal their inner creative potential, become a "visual guide" to the skills and abilities of information technology use to achieve higher learning results [37, p. 75].

Many studies are devoted to the problems of informatization of education and the purposes of informatization of education. The most significant of them belong to Valerii Yu. Bykov [2], Mikhail P. Lapchik [12], Serhii A. Rakov [23], Myroslav I. Zhaldak [40], etc. Theoretical aspects of the application of ICT in education are reflected in the writings of such researchers as Serhiy O. Semerikov [27], Vasilii I. Soldatkin [28], Oleh M. Spirin [29], Aleksander V. Spivakovsky [3], Myroslav I. Zhaldak [4] and others.

The problems associated with the widespread introduction of ICTs in higher education institutions and informatization of education are considered in the publications of Roman S. Hurevych [5], Andrii M. Hurzhii [6], Maiia Yu. Kademiia [5], Nataliia M. Kiianovska [8], Mariia A. Kyslova [11], Alla F. Manako [13], Oleksandr V. Merzlykin [16], Nataliia V. Morze [21], Andrii M. Striuk [15], Yurii V. Tryus [36], Vladyslav Ye. Velychko [37] and many others.

Modern education requires the variety of the forms, methods and techniques of the organization of educational activities. The preference should be given to the forms, methods and techniques that use information technology, which can personalize the process of learning, enrich the acquired knowledge and allow individuals to become effective in professional activities [37, p. 74]. The introduction of the latest ICT into the educational process will accelerate the realization of such an objective as informatization of education. Currently, it is possible to share the features of this process from the experience of other countries such as the United States, South Korea, England, Finland, Estonia, Ireland, Bulgaria, Germany, Switzerland and others [8]. Such experience gives modern scholars a clear understanding of the integrity of building a system of informatization of education through the introduction of ICT in the educational process of higher educational institutions.

1.3 Research aim

The purpose of the article is to emphasize the importance of introducing ICT into the educational process of higher educational institutions and emphasizing to highlight the special significance of informatization of

education as the primary aspect of the existence and development of a modern higher education.

2 Theoretical bases of the study

Informatization of education is aimed not only at the formation of knowledge, but centered on the person who can apply the acquired knowledge and skills to work with information resources for successful activity in any sphere of public life and for the innovative development of society [2]. The level of innovation development of society directly depends on the level of informatization of education. Informatization of society is a process of education and establishment of each individual of a new generation in conditions of qualitative improvement of modern information and technical structures and processes created for the satisfaction of needs and the realization of life existing rights of a modern citizen [32, 33].

The basis of the process of informatization of education is the process of computerization of education, which started at the beginning of the XX century. In general, the process of computerization of education of scholars and researchers (Valerii Yu. Bykov [2], Nataliia V. Morze [21], Serhiy O. Semerikov [26], Illia O. Teplytskyi [25], Vladyslav Ye. Velychko [37] and others) is divided into three stages, but the initial date varies from the 20-ies XX century to the 50-ies of XX century. So, for example, Serhiy O. Semerikov, determined the beginning of the first stage is exactly the 20-ies of XX century. According to him, the first stage (20–50$^{\text{th}}$ years of the twentieth century) is described as the period of application of mechanical, electromechanical and electronic individualized devices [18, 26], with which the teaching material was provided and the control and self-control of knowledge were implemented — the technology of programmed learning. The second stage (50–80s of the twentieth century) is characterized by the wide introduction of computers into practical training activities. And the third stage (since the 80s of the last century) is specified as the stage of personal computers and computer networks [27].

Informatization of education is inextricably linked with existing learning models. In the 1950s and 1960s computer technologies were actively used in the implementation of the theory of behaviorism. The cognitive model of learning inherent in the 70–80s was used to develop critical thinking. Constructivism of the 90s with the use of computer technology solved the problem of changing personal relationships and building a social model. Modern information technologies have enabled the development of a new learning model — connectionism. Connectionism is evolving due to modern

trends — distance education, mobile learning, mass open online courses, e-education and cloud technologies [35].

It is important that the entire initial stage of the development of informatization, which involves the development of computers and software related to universities. The development of computer technology needed highly skilled specialists who were trained directly at universities where the first computers were built [37, p. 62]. Informatization of education is definitely connected with the development of material and technical bases and the preparation of complexes of educational methods for their use. A significant factor in the delay of the development of informatization of education, as well as the informatization of society as a whole, is the lack of sufficient financing of these projects by the state. That is why groups of programmers created free distribution software [30]. Thanks to these software products, teachers have had more opportunities to use computers in the learning process, which gradually led to the widespread use of ICT in educational activities which resulted in the informatization of education [34]. The first software products used in university education belonged to open software as there was no global software commercialization. It should be noted that such software had limited scope and was used primarily for mathematical calculations [17, 24].

Lecturers of mathematical disciplines mastering software products of the indicated orientation and using this knowledge and their own developed techniques during the training of students of mathematical specialties became the first example of the introduction and application of information technologies in university education. These actions have shown that such implementation greatly facilitates availability teaching material and the interest of students. The experience of using mathematical software products while working with students proved to be invaluable and fundamental to lecturers of other disciplines. Understanding the benefits and needs of pedagogical workers in such educational products, programmers actively create and recycle existing computer programs that effectively begin to be used during lectures and laboratory and practical classes.

Further evolution of informatization of education, which took steps from equipping educational institutions with electronic computers of the first generation to the application of the most modern tools of ICT, reflects both the achievements of scientific and technical progress. Cybernetics, computer science, IT industry, and achievements in the appropriate training of teaching and management education, computer level oriented scientific and methodological support of the educational process, automated systems of education and training led to the widespread introduction of ICT in

educational practice [2]. Consequently, ICT are rapidly being introduced into the educational activities of higher education institutions and step by step, with the help of graduates of higher education, mastering other branches of education such as secondary schools, technical schools, schools, etc.

ICT of teaching are a variety of pedagogical technologies used to optimize the construction of the educational process and represent a set of educational organization programs aimed at learning and acquisition of skills and abilities, the specificity of which is expressed in the emphasis on the development of students not only to perceive and use the knowledge provided, but to independently obtain knowledge from a variety of sources of information. These technologies can radically change the function of the teacher in the educational process, as well as the attitude and perception of the educational material by those who study. ICT are one of the major factors in implementing a personal approach to each individual. Due to the combination of traditional learning technologies and ICT, the efficiency of the development of individual abilities the educational process is improved, the quality of education increases, an understanding of the importance of creating its own educational path is formed.

Through the use of ICT in education, all those who had not previously been able to afford it were given the opportunity to study and gain knowledge and skills in a variety of categories and areas. For example, people with special needs for whom, having regard to their physical condition and state of health, previously, higher education was not an achievable dream, now due to existing technologies and developed methods, they are able not only to acquire knowledge, but also desired diplomas.

Over the last four decades, a large number of educational software products, both free and proprietary, have been developed and implemented in various educational areas. Prepared educational and methodical literature, which was done to emphasize the need to use ICT at all levels and in all areas of education. Vladyslav Ye. Velychko noted that the main directions of the use of ICT in the educational activity of higher educational institutions are [37, p. 124]:

- an element of the methodology of scientific research;
- an integral part of the education management system;
- object of studying;
- a learning tool.

Each of them is in close contact with others.

Currently, there are many types of education directly related to ICT. Such types of learning as distance learning, e-learning, mobile learning, blended training, etc., expand opportunities and choices for anyone who wants to study or improve their own qualifications or receive additional education. These opportunities are associated with the emergence of new, virtually unlimited pedagogical opportunities that have arisen as a result of the introduction of ICT in education and successfully used. For the individualization and differentiation of the educational process the use of additional information educational resources resulted in a wide range of pedagogical methods and technological training options. Changes in the nature of educational communications are increasing the procedural and multimedia characteristics of study and the expansion of the space of innovative pedagogical activity [2].

By scientists and researchers definition there is a classification of pedagogical software tools, based on which pedagogical orientation that is the realization of certain didactic functions in the learning process [37, p. 125]:

- demonstration programs (designed for a demonstration of the training material of a descriptive nature);
- training programs (aimed at the acquisition of new knowledge; implemented usually in the form of a dialogue);
- simulators (provide the formation and consolidation of practical skills, and also used in self-education activities);
- control programs (designed to control a certain level of knowledge and skills. Application of such programs enables to increase the efficiency of training, to intensify and increase the productivity of the teacher, provides the necessary stability and invariance and independence from subjective teacher settings);
- simulation and simulation programs (allowing to simulate objects, phenomena and processes of the real world. Their effectiveness is achieved when the process or the phenomenon cannot be practiced (micro and macro world). In the process of using such programs, abstract concepts become more specific and easier to perceive by those who learn);
- information and reference programs (intended for search and output the necessary information for educational, methodological and other purposes. Such programs include electronic encyclopedias, knowledge

bases. Today the value of their application is to organize access to information through modern telecommunication networks;

- programs for problem learning (designed to activate cognitive activities of students through the formulation of various problems and tasks that need to be resolved through attempts and errors).

The practice of ICT implementing in the educational process of higher educational institutions is spreading every day. Many software products, techniques and technologies that were used at the beginning of the education informatization were subject to multiple changes and updates. Currently, ICT are rapidly being implemented in the educational process of higher education institutions. If the first introduction involved the use of software products for purely mathematical calculations and the teaching of disciplines in the mathematical cycle, then this range is almost limitless [14]. Educational software products are used during teaching of any discipline, from psychology and jurisprudence to philology, physical education and music. The wider the range of different software applications within a particular discipline, the more it benefits those who study, as they get new functional capabilities that significantly affects the learning process and is more beneficial in achieving the identified goals.

ICT are innovative pedagogical technologies of the education system used to create new opportunities. The transfer of knowledge (the activities of the teacher), the perception of knowledge (the activities of students), the assessment of the quality of education and the comprehensive development of personality during the educational process [39], makes the educational process more intense and productive through the use of multimedia capabilities, intersperses interpersonal communication provides the search for information from various sources, creates convenient circumstances for communication in the most appropriate form [31].

Scientists paid much attention to the use of ICT in education and described in their doctoral dissertations. So, for example, it is noticed that a computer science teacher with fundamental knowledge in the field of informatics is needed even in secondary school [12]; the main goal of computer science students is the formation of professional informational competencies, which are based on public order, state higher education standards and personal choice of a student, the function of fundamentalization of informatics education is the basis for the formation of new qualities of a future specialist [27, p. 68]; vocational guidance function of the fundamentalization of informatics education has the following structural components: target, content, technological and the

final ones [21]; multimedia in education — a promising direction in the field information processing of human activity, integration of heterogeneous data computer systems in order to more fully present the results of intellectual production in science, art, education, industry etc. [1]; informative awareness — the ability to implement the systemic knowledge, skills and abilities of acquiring and transformation of information in various fields of human activity for the qualitative performance of professional functions and conscious prediction of the consequences of its activities [22]; informational competence includes the ability to independently search, analyze and select the necessary information, organize, transform, store and transfer it using real objects and information technologies [7]. Information competence is the main component of the information culture as part of the overall culture of the individual [4]; information culture is a collection of informational worldview, systems of value orientations, knowledge, skills, providing purposeful and effective independent activity with the purpose satisfaction of own and professional needs in information products [9]; informatization of education is one of the most important elements of culture in general, characterizing the material and spiritual development of society, the level of organization of information processes, the degree of satisfaction of the needs of people in informational communication, timely, reliable and exhaustive information and provides a coherent vision of the world [4]; the use of ICT in education includes skills and work skills in the information and communication pedagogical environment, the ability apply multimedia teaching aids for the tasks of professional activity, the ability to use knowledge control with the help of a computer, the ability to use ready-made electronic tools and independently develop their own multimedia teaching aids, forms Internet communication skills [9] and many other works devoted to informatization of education and the use of ICT in education [19, 20].

Informatization of education is stipulated by branch directions. Considering the goals of informatization of education Valerii Yu. Bykov noted that at the present stage of development of society and education the main goal is to prepare those who are studying for active and productive life in the information society, to provide high-quality, affordable and effective education, to create educational conditions for life-long learning at the expense of widespread introduction into the educational practice of methods and means of ICT and computer-based technologies [2]. Informational education provides two strategic goals. The first of these is to increase the efficiency of all types of educational activities through the use of ICT. The other is in elevation the quality of training specialists with

a new type of thinking that meets the requirements of the information society [10].

In accordance with the current legislation, the Law of Ukraine on National program of informatization, the informatization means a set of interrelated organizational, legal, political, socio-economic, scientific and technical, production processes aimed at creating conditions for meeting the information needs of citizens and society through the creation, development and use of information systems, networks, resources and information technologies based on application of modern computing and communication technology [38].

3 Results of the study

Every teacher who works now and in the future should know that informatization of education is a modern resource getting answers to questions that are of interest to educators and students. Possessing skills using information resources is the major way of improving their own professional ability. And this is also one of the goals of education informatization.

For the primary goals of informatization of education we have to include the following components as:

- establishment of skills of self-education and self-realization;
- advancement of the potential of each person and its development;
- development of the educational spectrum of services for people with special needs;
- increase in the quality of education;
- formation of skills for building own educational trajectory;
- raising the fundamental level of general and education [2];
- creation of new special methods, tools and educational technologies [2];
- raising the level of pre-professional training of higher education students of general school [2];
- increasing the aptitude to analyze the extended knowledge and skills of students;
- expansion of methods and means of teaching using modern scientific and technical developments;
- providing favorable conditions for those wishing to upgrade their qualifications;

- development of postgraduate education and adult education;
- expansion of limits and possibilities of self-realization [2];
- establishment of the society with the informatively experienced population [37];
- development of the intellectual potential of the nation;
- enhancement and modernization of traditional forms of training curriculum.

The degree of informatization of education is a direct reflection of the level of informatization of society, which is why the information development of education becomes the major factor in the growth of the general level of training of students. Students develop skills to create and implement the latest technologies for future professional activity and form the theoretical basis of knowledge while studying at a pedagogical higher educational establishment.

4 Conclusions and prospects of future research

Based on the evidence mentioned above and on the fact that informatization of education is the main contributor of the existence and development of modern higher education and society as an intertwined entity, we can state that the informatization of education of all levels should become one of the major and important tasks of the state. As already noted, informatization of education is the foundation of the informatization of society as a whole, precisely because the problems of informatization of objects of education should be given the highest priority at both the local and state levels. Informatization of education directly influences the content of education and the methods of its organization. Educational informatization has pedagogical goals and objectives. It provides the necessary conditions for the integration of the educational system of Ukraine into the world information space. Educational activity based on the use of ICT becomes the foundation for change in the structure of the working process of teachers and forms a new perception of the educational material by those who learn. Educational activity affects the development of self-education through the use of information learning resources, thereby gaining experience in the use of ICT both in everyday life and future professional activity. The widespread introduction and application of ICT in the educational sector is a pillar of the development of scientific research and development. The educational software products

are improving constantly. There is an ongoing development of pedagogical technologies based on ICT. New educational courses and methods are being developed and implemented in educational areas, as well as various forms and technologies of training. The attention paid to the education of informatization by scientists increases the introduction of ICT into the educational process at all levels and in all branches of education. We concluded that informatization of education is a constant process, which enhances the development of society, improving the quality of life and education and the expansion of new forms and methods of teaching.

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Digital transformation of learning environment: aspect of cognitive activity of students

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Abstract. Peculiar features of digital environment include: integration of ICTs; use of local and global networks and resources; support and development of qualitatively new technologies of information processing; active use of modern means, methods and forms of teaching in the educational process. The organization of activities in terms of digital learning environment provides appropriate changes in the interaction between subjects of the educational process.

Today, means and technologies of the information and communication networks (ICNs), in particular the Internet, which custom and operational-procedural properties were changed at the initial stage from closed local to open ones at present, become widespread. The development of ICNs (from closed local to open ones) changes the typology of learning environments. The following models of learning environments, which widely use ICT and ICN tools (with basic features that characterize them) are distinguished: using the local communication network for presentation of educational information; using the local communication network and open network resources; using open network resources; for independent use of open network resources directly in the classroom by a student; for use of open network resources by a student in the process of independent learning activity; for use by a student educational resources, specially created by a teacher, as well as resources of an open networks in his independent learning activity.

Keywords: cognitive activity, learning, learning (academic) environment, digital transformation, competencies, ICT.

1 Introduction

According to experts in the field of Economics 4.0 and modern production [8], consumer trends as a reaction of progressive groups of society to social challenges, leading to changes in the culture of behaviour,

in 2019 will increasingly focus on various aspects of consumer and technology interaction. A modern person watches changes in technology and is forced to adapt to them both at the workplace and in everyday life. The most noticeable are: evolution of customer interface, integration of devices, provision of access to software products, services and resources in the cloud. The speed of life leads to the gradual replacement of human labor with bots or programs. Robotics in mass production, processing and use of large volumes of data, rapid updating of knowledge, availability of information and, at the same time, the difficulty of converting it into knowledge — these and other signs of the information age lead to the need to make self-education a necessary element of every person's life.

Technologies are crucial in routine problems solving. Internet of things should ensure compatibility between all devices and provide mobility. However, the experience of typical tasks solving does not help to find effective solutions. Progressive ideas are born in the man's learning process of the world at the intersection of disciplines. Consequently, in our opinion, in modern conditions, a person armed with skills of rapid adaptation, working with data, productive communication, which is characterized by flexibility of thinking, the ability to concentrate, analyse, make conclusions, is able to create its own product, is ahead.

Here are some examples that we think, illustrate the rapid growth rate of transition in all areas of human life to digital technologies:

The number of people on the planet using the Internet is rapidly increasing.

So, according to [29] over the past 5 years, this growth is 6–9% per year.

Moreover, according to results of long-term study of consumer trends of Ericsson, based on an online survey of 5097 primarily Internet users, almost half of the respondents in the survey think that, for better or worse, the Internet of skills (AR/VR experience [30]) has replaced many of the simple pleasures of daily life, and as many as 42% say the Internet needs to be changed fundamentally if it is going to be a force for good in society again. 60% would like glasses with on-screen instructions that help you repair almost anything, and 56% even want to learn how to dance using an instructive AR experience [8].

Growth is the tempo of digital communication between people. So, the number of e-mail accounts in the world is about 5 billion, mostly at the expense of private ones. As of January 2019, the number of Facebook users, one of the most popular electronic social networks, is 2.320 billion people and has been steadily increasing ever since. By the way, as of December 2018, already 30.95% of Ukrainians use a social network. According to the

company "Vhaschno" (https://vchasno.com.ua), which provides business services in docflow, storage and exchange of documents online appeared to be 70% cheaper than paper ones.

For example, in Ukraine, the official participant of the public procurement system ZAKUPKI.PROM.UA sent 316,100 documents per year, saving UAH 5,057,400.

At the beginning of 2019 (according to the site populationpyramid.net), with a total population of about 7.678 billion people, we have the following (Fig. 1).

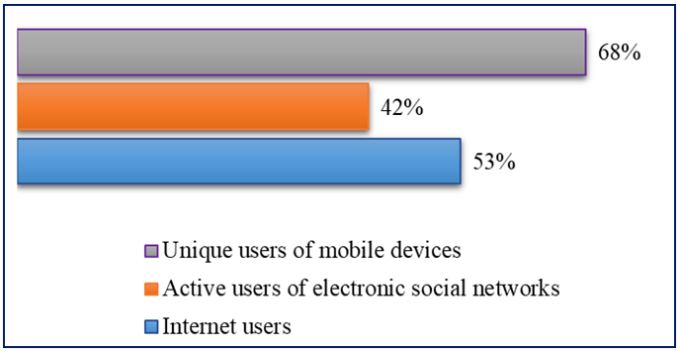

Fig. 1. The share of users from the total population by selected groups

Technological changes in science, economics and society lead to social, political and cultural changes. These changes cause new problems, the solution of which takes time. Social systems unavoidably experience periods of economic decline and growth while educational systems go through reforms. Changes in education, among other things, cause some contradictions. The following should be identified:

1. At the level of *the global information space*: between innovative updates of information and communications technologies as well as networking technologies from one side and the slow reaction of the state and the educational system to these trends on the other side.
2. At the level of *the national educational system*: between the emergence of the latest technology, technology and the new generation of means for training, management and scientific research and late response of education managers to the choice, implementation and spread of innovation.

3. At the level of *the educational institution*: between the need to develop a modern educational environment and the conservatism of leaders and pedagogical staff in the period of innovation transformations.

The dynamics of factors' development of external and internal environment directly affects the development of the innovative capacity of educational institutions and its implementation in the educational process. This requires a substantial transformation of the education system based on:

- psychological, pedagogical and didactic principles of digital education;
- new approaches to the selection of educational content;
- principles of flexibility and adaptability of pedagogical systems;
- principles of equal opportunities for all parties of the educational process;
- new forms, methods, technologies and means of teaching and learning that are implemented in modern educational environments.

We have analysed demographic trends, namely of world (PopulationPyramid.net): proportion of so-called millennials (age from 20 to 40 years old) — the most productive population, teenagers and young people (from 10 to 19 years old) who will take jobs in a few years. Millennials make up 30% of the world's population. Despite some differences in distribution, in Ukraine, the proportion of the Millennials does not have any statistical difference (28.7%). The proportion of people aged 10–19 years to 16.1%. For Ukraine, this percentage is much lower — 9%. Among the features the Millennials obtain, psychologists mention: short-term concentration, pragmatic thinking, intelligibility in information, orientation on trends and social networks, extra-territorial activity (want to act "here and now").

The next generation will live and work under somewhat different conditions, including: high level of automation for production processes, job cuts, competition in design of things, machine intelligence and 5G networks, rapid loss of actuality of acquired skills, etc. Transformation of society, primarily, will be associated with the development of new technologies. Information and communication technologies change the nature of relations within society, including within the sphere of education. These technologies cause a lot of changes in the economic, political, social and cultural spheres and, as a result, form new requirements for the field of education, laying the foundations of its new architecture. These

bases include the results of the MEP-revolution in education (Ronald M. Harden [4]); virtualization and gamemization of education (Elizabeth Corcoran [7], Jane McGonigal [12]); The new achievements of cognitive psychology (Robert L. Solso, M. Kimberly MacLin, Otto H. MacLin [28]) and the possibility of their use for the formation and development of cognitive skills and abilities.

Global Education Futures Initiative connects the development of new education practices with active use in the educational process:

- unique approaches and access to carriers of key competencies;
- modern educational, in particular a digital, environment that supports the whole education / learning process, as well as the development of courses, interaction with communities, etc.;
- individual educational trajectory of each student (with possibility of full asynchronous education, with combination of educational process and extracurricular activities, with tutoring of this trajectory by mentors);
- flexible assessment system focused on supporting student's motivation;
- resources (students and teachers) for individual and group learning experiments;
- flexible architecture of educational institutions, which allows to realize a large number of educational formats for independent and group activities of students;
- horizontal education in communities, including the use of electronic networks;
- joint learning processes with real-life carriers.

Due to widespread use of mobile devices with access to the Internet there are changes in the organization of training. The boundaries between formal and informal education become less clear.

2 Related work

In previous studies, we analysed and compared new technologies, educational models, their impact on formation of learning environments, that are increasingly used in general education institutions, allowing us to address the issue of expanding student access to learning resources, and expanding opportunities for collaboration and cooperation [27]. In order to organise approaches to formation of learning environment in which

ICTs and the Internet are actively used, a comparative analysis of different models of learning environments has been conducted on the main features that characterize these models [17].

Problems of use of network technologies for conducting educational studies on natural sciences course in general secondary educational establishments, formation of system of knowledge by means of network technologies are studied [31].

Problems of projecting of informational and educational environment for the education of high school students on the basis of technologies of electronic social networks are investigated. The possibilities of using information and communication technologies and technologies of electronic social networks in the system of general secondary education are revealed [26]. The scientific and methodological foundations of formation of subject competences taking into account the basic principles of practical and personally oriented learning are proved. Forms and methods of studying which promote increase of formation level of pupils' subject competence are elicited [18]. The problems of increasing information and communication competence of all participants of the educational process are looked into. Possible changes in the teaching method, when new objects appear in the system of learning tools — services of electronic social networks, are analysed. It is paid attention to change of emphasis from communication network to organization of productive discussion and collaboration with cooperative learning methods for students [16, 19].

The authors of the article revealed results of research on solving the current psychological and pedagogical problems of designing information and educational environment, different models of using electronic social networks in teaching senior students, development of certain elements of computer-oriented methodological systems, evaluation of educational process results in the open information and educational environment of training students and the critical problem of users' safety on the Internet, the formation and development of information and communication competencies of all participants of the educational process. A number of methods, related to: the formation of safe and responsible use of social networks and critical evaluation of Internet content; using electronic social networks to provide group interaction; organization of independent work of pupils (on an example of physics) and design and research activity of students (on an example of mathematics); prediction of aggressive behaviour of pupils; support for the education of disable children; the organization of informal education of youth are suggested. Much attention is paid to changing the emphasis from network communication to productive

discussions creation, as well as from collaboration to cooperative learning methods [20].

3 Research methodology

Currently, the Cabinet of Ministers of Ukraine approved the Concept of development of digital economy and society in Ukraine in 2018–2020 [5]. In fact, this is a roadmap for digital transformation of Ukrainian economy. The document defines key policies, priority areas, initiatives and projects of "digitalization" of Ukraine for the next 3 years. In particular, this is "digitization of educational processes and stimulation of digital transformations in the education system".

The release of revised wording of key competencies for lifelong education coincided with the adoption of the Concept [10]. Mathematical competence and competence in science, technology and engineering (mathematical competence and competence in science, technology and engineering) and digital competence are determined as key [9].

The formation of above key competencies is possible on the basis of modern educational technologies using ICT tools, electronic educational resources, electronic social networks, which allow to reduce the educational load and simultaneously to intensify the educational process, in particular, from natural and mathematical disciplines, providing learning and cognitive activity with creative, research orientation.

Futhermore, opportunities for individualization and differentiation of training increase, opportunities for self-education skills form, metasubject and subject skills, ability to put the knowledge into practice through the wide introduction into the interactive process of studying individual work of students are developed.

The means and technologies of the ICN, including the Internet, forming a computer-technological platform of educational, in particular learning environment of modern education, primarily open, transform the traditional educational environment into "an environment of computer-mediated communication — an integrated education and information environment with distributed educational resources and a communicative infrastructure of supporting educational communities of different types" [23].

It is understood that a considerable part of the didactically grounded and specially organized educational and cognitive activity of students is carried out on the Internet, has specific features [22], transforming into a modern form of training due to a number of factors:

1. The Internet is a network of information environment of modern

society, and its role as a source of scientific and educational information is obvious.

2. A new generation of students takes the Internet not just as a social cultural phenomenon of our time, as well as parallel, often leading environment. Any activity in such environment, including an independent educational and cognitive, is taken by a young person with an interest, that increases the motivation for this type of activity. The Internet is becoming an informational environment for training and self-education.
3. Internet environment as an informational and informational and educational environment has a significant potential for self-development of the individual.
4. Thanks to its unique properties (virtuality, turnover of operations, plurality of spaces, etc.), the Internet creates a comfortable environment of life that completes the internal and external space of an individual, and can act as a space of experiment.

From the didactic point of view, the logic of the learning process also changes. The traditional structure of learning process consists of the following steps: "getting information — understanding — memorization — reproduction — application (mostly by model)".

The modern structure is different: "getting information — understanding — application (creative) — analysis — evaluation — creation". It is this logic and structure of the process of educational and cognitive activity that underlies the system-activity and competence approaches and ensures dynamic activity of students.

Having agreed with the researchers [2, 25] we define cognitive activity as an element of the holistic process of learning, which is a purposeful, systematically organized, managed external or independent interaction of a student with the surrounding reality, which results in mastering, on the level of reproduction or creativity, a system of scientific knowledge and ways of activity.

Cognitive activity is carried out throughout the life of a person, in all types of activities and social relationships, in particular, when students perform various subject-practical actions in educational process. However, only in the process of learning the cognition gets a clear form in a special, particular only for person, educational and cognitive activity.

Basic components of cognitive activity:

- content (knowledge, expressed in concepts or images of perception and conceptualisation);
- operational (various actions, operation of skills, techniques);
- resultative (new knowledge, methods of decision making, new social experience, ideas, views, abilities and personal features).

The main types of educational and cognitive activity of students in the Internet-oriented informational and educational environment include: search activity; practical development of new technologies; creating new content; Internet communication for cognitive purposes; learning using Internet resources.

Forms of educational and cognitive activity in the informational and educational environment are determined by the organization and / or self-organization of information and communication interaction and informative and cognitive activity of students. Formation and sustainable development of cognitive abilities of a person throughout his life is an indispensable element of any educational process.

4 Results and discussion

From the perspective of the revised Bloom's taxonomy [1], during the study we systematized the types of educational and cognitive activity of students [17] in the Internet environment in accordance with the categories of cognitive processes (Table 1).

Criteria, levels and other indicators of productivity of educational and cognitive activity in modern conditions are determined by the new paradigm of education of the information society. All the tools that make it possible to evaluate and control educational and cognitive activity get disturbed. The combination of information and communication technologies and means of communication networks form new solutions that can affect the basic processes in the educational system: the formation and development of competencies, fixing achievements, assessing the quality of learning, creating a positive motivation and promoting self-dependence in educational and cognitive activities. On the basis of such technologies, new educational instruments are offered [11].

The effectiveness of educational and cognitive activity of students is determined by the new paradigm of education of the information society. It recognizes all the tools that make it possible to carry out the educational and cognitive activity of the students, its evaluation and control.

Table 1. Types of educational and cognitive activity

Cognitive processes	Educational and cognitive activity of students in the Internet environment
Remember	**Research activity with use of Internet resources:** *identification;* *recognition.*
Comprehend	**Mastering of new technologies:** *mastering communication technologies based on non-verbal forms of communication;* *feedback on the results of the activity.*
Apply	**Practical use Internet resources:** *work with different sources of information;* *independent study of new material;* *training and testing process learning.*
Analyze	**Development of critical thinking:** *self-control and self-correction;* *formation of skills of classification.*
Evaluate	**Internet communication for cognitive purposes:** *feedback in the process of peer assessment;* *ranking;* *verification; reviewing.*
Design	**Creating of new content:** *publication;* *formation of a portfolio;* *production of a new solution;* *implementation of a new process.*

- *Translation of reference experience or practice* — transfer of verbal knowledge (or self-studying), the transfer of non-verbal knowledge through communication with the carrier, the transfer of non-verbal knowledge through training skills. The tools include online multimedia libraries, multi-user online courses, e-books, YouTube educational channels [6], subject blogs [21], virtual mentors, simulators [14], virtual simulators [13], and robot-mentors.

- *Independent getting of experience* through testing, research / experiment implementation, creative individual or group project. They are implemented in gaming environments, quests, in alternate reality, work-competitions, virtual laboratories [15], discussion scientific communities, social networks, and others.
- *Fixation and assessment of students' learning achievements* — testing, prognosis of educational trajectory based on the profile of achievements [3], end-to-end continuous monitoring (in particular, monitoring behaviour in the game forms within the alternate reality).
- *Tools*: personal competency profile, personal virtual portfolio, creation and stress test of the virtual world or digital model.
- *Encouragement and motivation* of students for educational activities is carried out through: competitive gaming models (gamification), reputational capital management system, preventive outcome management (achievement prognosing systems), gaming adaptive models [24], state monitoring systems (which control the quality of experiences in the educational process).

5 Concluding remarks and future work

The transformation of modern society and education, particularly related to the development of new technologies, especially information and communications and networking. The digital transformation of education covers the creation of a modern computer-based environment that supports learning and self-education, creation of a system of informational and educational and game resources, flexible structure of educational institutions, which allows to fulfil a large number of educational formats and supports the advancement of students with individual educational trajectories, development of mechanisms of education in communities, including the use of electronic networks, formation of unique approaches to formation of key competencies, in particular digital one.

Formation of key competencies for lifelong education, including mathematical competence and competence in science, technology and engineering, is possible on the basis of modern educational technologies using ICT tools, electronic educational resources, electronic social networks, which allow to reduce the training load and, at the same time, to intensify the training the process, in particular, from science and mathematic disciplines, providing educational and cognitive activities with creative, research orientation.

The Internet environment as an informational as well as informational and educational environment has a significant potential for self-development of a personality due to peculiarities such as virtuality, turnover of operations, plurality of spaces, etc. It creates a comfortable environment for cognitive activity and can act as a space for an educational experiment.

The main types of educational and cognitive activity of students in the Internet-oriented informational and educational environment include: search activity; practical development of new technologies; creating new content; Internet communication for cognitive purposes; use of Internet resource for educational purposes.

From the perspective of the revised Bloom's taxonomy, during the study we systematized the types of educational and cognitive activity of students in the Internet environment in accordance with the categories of cognitive processes: remember, comprehend, apply, analyse, evaluate, design.

The revolution in digital content complicates separation of academically meaningful, scientifically grounded, truthful from false and, at times, dangerous. Individual training extends to new features. At the same time, the essence of the educational process and its quality survive little changes. According to the authors, there are approaches to change this state, in particular, learning related to real life; training in projects; free choice of training tools; reflection and a two-way evaluation of the result (for example, parents and teachers, teachers and students). We consider further research in solving the problems of using digital simulations in the educational and cognitive activity of students to be relevant.

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The formation of a successful personality of a pupil in Ukrainian primary school during media education implementation

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Abstract. The article substantiates the relevance of implementing the technology of formation of a successful personality of a primary school age pupil during media education implementation at primary school. A technology model is developed. The necessity of solving problems of success simultaneously with increasing the level of media culture of a pupil, the formation of key competencies for life, preparation of a child for the life's self-realization on the basis of the partnership implementation of schoolchildren, parents and teachers is proved. The need of the embodiment of the pedagogy of heart and the pedagogy of success is shown. The diagnostic toolkit for determining the levels of formation of the successful personality of primary school pupils is specified. The effective forms and methods of the schoolchildren education are substantiated: the creation of electronic books, projects "Rules of Success Achievement", "Stories of Success", watching movies about successful people with special needs, analysis of media products on the topic of success. The ways of educating parents about the problems of children's success are determined. The results of experimental research are analyzed. The necessity of improving the content of textbooks in the context of achieving success, increasing interest to children's periodicals is revealed. The formation of a successful pupil is considered as one of the ways to strengthen the Ukrainian state. The necessity of raising the authority of the teaching profession is proved.

Keywords: successful personality, primary school age pupil, technology, media literacy, media education.

1 Introduction

1.1 The problem setting

In the last decade in the pedagogy of primary education, the problem of success and successfulness has become rather actual. There exist a few reasons for the interest in these issues. Usually, success is associated with financial independence or wealth. It is known that in Ukraine the standard of living of the population is steadily deteriorating. One of the ways to overcome poverty lies in developing children's successful personality features. Such education should begin at primary school. The success of a primary schoolchild serves as a start for achievements in high school and a basis for life-long self-realization in the future. In addition, the interest in the success development is due to the introduction of the Concept of a New Ukrainian School [7], the New State Standard of Primary Education [15], which focus school teachers of the first degree to develop students' initiative and entrepreneurship as key competencies, skills to think critically and creatively, solve problems, organize own activities, which are through skills. The implementation of media education is another important problem of the primary school, the relevance of which in the educational sphere is reflected in the Concept of Media Education Implementation in Ukraine [10]. The formation of a successful pupil by means of the Concept enables to solve tasks on the way to success through the development of media culture, information and digital competence. The analysis of scientific sources proves that media is a powerful instrument of influencing personality, but their role in educating a successful pupil is underestimated. The imperfection or lack of patterns for imitation in the Ukrainian media, in particular, literary texts, can be one of the weighty reasons for the acute need of the society in the intellectual elite, effective managers, who would lead Ukraine to the central positions among the states with a high index of human development.

1.2 Analysis of the publications as to the problem of the research

Scientific researches of the problems of forming a successful personality are carried out in several planes: the formation of a successful personality in primary school; the factors to achieve success; the role of the media in forming a successful personality. The significance of childhood success for life self-realization, ways of preventing a loser complex are highlighted by William Glasser, who wrote in particular: "It is here [in the primary school classroom] that the child most often forms the lifelong concept of himself as a successful or a failing person. That's why the impact of school failure

is so devastating: it attacks and destroys the child's initial identity as a successful person" [5, p. 39].

Scientists Lisa Wagner and Willibald Ruch in [19] have shown the interconnection between character strengths (such as perseverance, self-regulation, prudence, love of learning, hope, gratitude, perspective, teamwork, and social intelligence), positive classroom behavior, school achievements, because "being the nice student" will make the grade in just any subject. "It seems rather that character strengths facilitate achievement-related behavior that then may lead to better school achievements" [19]. Based on the results of this research we can affirm that character strengths directly influence on the achieving success in school. But these qualities should be formed and developed.

Important to our research are the ideas of John MacBeath on the necessity of gaining experience by a pupil to overcome difficulties as a factor of achieving success in the future. In this context, John MacBeath states: "The experience to deal with failure is a hugely telling indicator of school success and success in later life, the seeds of which are planted early. That every failure is a learning opportunity has gained the status of a cliché, but can only become a classroom reality when failure no longer carries high stakes penalties" [13, p. 61].

A thorough analysis of the problem of the six-year-old children's success was conducted by Olena O. Maksymova [14]. The scientist substantiated the pedagogical conditions for the achievement of success by pupils in the first grade in their productive activities in the process of subject-subject interaction and identified the diagnostic tools for the development of success.

On the basis of literature analysis, our own research, we have interpreted the concept of "successful personality of the primary school age pupil". It is a pupil whose *activity results correspond to the specified goals; which he/she and his/her surrounding consider successful, based on modern social norms, customs, values and standards.*

Given the relevance of media education, the researchers investigate the role of the media in forming a successful personality. The reflection of stereotypes about human success in media is the subject of scientific research of Magdalena Kolber [9], Ewa Grzeszczyk [8], Amelia Carr [3] and others. Magdalena Kolber hereby argues that comparing himself with the ideal created in the media leads to negative consequences (the appearance of low self-esteem, such a person does not feel happy) [9, p. 79–80]. The positive role of the media in forming a successful pupil is reflected in the works of Timirkhan B. Alishev [1], Svitlana P. Hryniuk [6], Albert Kh. Gilmutdinov [1], Tetiana Ye. Krystopchuk [11] and others, who, studying

the factors of success of schoolchildren in Finland and Singapore, found that the positive ideas of the experience of these countries is the dissemination in the media of the stories of success in the diligent and disciplined study and work environment, systematic reading of books, periodicals [1, p. 245], [6, p. 2].

1.3 Unresolved aspects of the problem

As the resource base analysis shows, the problem of forming a successful personality of a primary school pupil during media education implementation in the Ukrainian primary school was not the subject of a separate study.

1.4 The purpose

The purpose of the article is to substantiate the technology of forming a successful personality of a primary school age pupil during media education implementation.

1.5 Methods of scientific research

A number of research methods have been used for the achievement of the goal:

- theoretical — functional and structural, interpretive and analytical, contrastive and comparative analysis of literary and informational sources, textbooks for pupils of the first-degree school, through which the researched problem was studied, forms, methods and means of formation of successful pupils were revealed; modeling (for the development of a model of technology for the formation of a successful personality of a primary school age pupil during media education implementation);
- empirical — observation, questionnaire, survey, confirmatory and forming experiment (children of the second and third grades of comprehensive schools No 16 of Ternopil, No 30 of Khmelnytskyi, Mukachevo Educational Complex "Preschool educational institution — secondary school of the I degree — gymnasium" were involved in the experiment) to check the effectiveness of the technology of forming a successful personality of primary school age children.

2 The results of the research

2.1 Media education tools for the formation of a successful personality of primary school age pupils

In primary school, due to the relevance of media education, children now know what media is and which media are. Traditional media used by the pupils of the first-degree schools include visual (fiction, textbooks, newspapers, magazines, pictures, photographs), audio (radio), audiovisual (theater, television programs). Innovative ones include a computer, a tablet, a mobile phone, a gadget, the Internet, etc. But, unfortunately, as evidenced by the analysis of scientific sources, empirical studies, their ability to form a successful pupil is used only partially.

The textbooks for primary school ("Literary Reading", "Ukrainian Language", "Mathematics", "I am in the World", "I Explore the World") were analyzed in terms of the success problems reflected in them. Of all the educational books, only in the textbook by Nadiia M. Bibik "I am in the world" for the 3rd grade various aspects of successful activities are sufficiently thoroughly presented. In particular, the social and value orientation of certain goals (the story "What to be?"), the formation of the qualities of successful person ("Human virtues", "How to succeed") is reflected. After reading these stories, primary school pupils learn that a person is born to leave a trace behind himself/herself — in memory, in the hearts of other people; need to learn to live for people; to achieve success in life one needs to be hard-working, persistent, not postpone what can be done today, and even anger and rudeness prevent you from achieving a desirable [2, p. 26, 29, 33, 70]. Here is an example of the inventor Edison, who was an extremely hard-working man. There was a ninety (!) per cent of work in the sweat of his brow reflected in his inventions. The rest relate to talent, inspiration, intuition, and other coincidences [2, p. 29]. In this textbook, the economic aspects of success (economy, thrift) are reflected [2, p. 74]. However, in general, in educational books for the primary school, the problem of success is reflected rarely, fragmentarily without respect to the principle of continuity. We did not detect the texts where the children were taught the art of defining goals and analyzing their achievements, overcoming obstacles, how to communicate properly, to treat time with cautious, to create their own hero (a pattern of behavior), although such knowledge is essential for the formation of a key competence for life — the ability to study.

The fragments of the materials on success are partially presented in fiction, children's periodicals. It should be noted that there are more than

140 periodicals in Ukraine, among them the children's magazines "Angel's Lessons", "Barvinok", "Piznaiko", "Vodohray", "Zerniatko", "Kolosok", "Little Brainiac", "Sunflower", "Posnayko" (Eng.); cognitive and developing newspapers "Bunny", "The Alphabet of Fairy Tales", etc.) [4, p. 4]. However, according to research by Ruslana Z. Danyliak, 62% of the polled primary school teachers do not use children's periodicals either in their classes or in extra-curricular activities [4, p. 141]. The analysis of children's publications shows that they do not pay attention to success issues.

In periodicals and books, Ukrainian folk art is presented, in particular, the proverbs, sayings, acting on the development of a child completely opposite. On the one hand, they warn against ambitious plans: "Who flies high, falls low", and on the other, they call for persistent work that suits the vocation. In proverbs and sayings, the emphasis falls on the importance of motivation for an activity, "There is no work without eagerness", hard work in the achievement of success: "There is no fruit without labor". It is necessary to focus attention on the harmful influence on the formation of a child of certain proverbs like "My sweet peace, I feel good with you", "Neither move forward, nor leg behind, stay only in the very medium, like a periwinkle in the field". After all, such education aims at staying in the comfort zone, does not allow us to form a national elite, while in Ukraine there is an acute shortage of those people who can lead Ukraine out of the economic and social crisis. There are extremely few stories that would form the winner, the builder of the Ukrainian state.

In Ukraine (and this is proved by researches of Ruslana Z. Danyliak [4], Yuliia B. Semeniako [16], etc.) periodicals, fiction give way in the struggle for a little user to television, a computer, a tablet, a mobile phone. Unfortunately, there are not so many examples of success. In addition, there is no substantiated system of work for the formation of the success of a primary school pupil by media tools.

2.2 Model of the technology of forming a successful personality of a primary school pupil during media education implementation

To determine the level of formation of a successful personality of primary school pupils, to prove the work system in this direction, using media education, a study involving 160 pupils of schools in the cities of Ternopil, Khmelnytskyi, and Mukachevo was conducted. They were asked to answer the questionnaire.

A list of questions and answers to them (children could choose several answers to questions 2, 4, 5) is shown in Table 1.

Table 1. List of questions and answers of the pupils to a questionnaire

Question content	**a)**	**b)**	**c)**	**d)**	**e)**	**f)**	**g)**	**h)**	**i)**
1. Who do you consider as successful person?	earning a lot of money **16**	achieving what was planned **50**	respected by other people **36**	has a lot of different activities **58**	other variants				
2. What features are inherent in successful person?	self-confidence **95**	persisten-ce **92**	diligen-ce **90**	sociabi-lity **23**	other features (write them)				
3. Do you consider yourself successful person?	Yes **137**	No **23**							
4. Who is an example for you to succeed in?	hero of fairy tail or a story (write who) **16**	person you heard about from the TV (write who) **11**	mom, dad **117**	a teacher **13**	there is no exam-ple to succeed **3**	other variants			
5. Where do you get information about success and successful people from?	school text-books **17**	children's magazines and news-papers **6**	fiction **6**	TV programs **51**	radio programs **1**	the Internet **48**	teachers **45**	parents **32**	theatre perfor-mance **6**
6. Choose your sex	Male **82**	Female **78**							

Therefore, it was found that 85.6% of children consider themselves successful (almost the same number consider their parents to be successful, since for 73% of the respondents their parents themselves serve as examples of success), but only a third of the respondents properly understand the concept of "success" (achievement of the planned result), and another third is mistaken in the interpretation of "success", considering that a successful person is one who has many activities, regardless of the result they get. According to the respondents, the leading qualities necessary to succeed are self-confidence, diligence and persistence. Positive aspect may be found in the fact that mom and dad serve as an example in achieving success to their children. But, unfortunately, rarely (for 6.9% of children) it is a teacher. Children receive information about their success mainly from television programs, the Internet and from teachers. This result is not surprising since television and the Internet are the most popular media among pupils. However, in the context of achieving success, the need to improve the content of textbooks, increasing interest in children's periodicals, as well as system work of parents and teachers, aimed at creating media production by children, which would aim them at success.

The analysis of educational and methodological publications, scientific literature, children's media, empirical research has shown the need for modeling *the technology of formation of a successful personality of the primary school age pupil during media education implementation.* It ensures systemic work, the relevance of which is revealed at the stage of the survey of children. In modern science, technology is usually referred to as information and communication and media education technologies. However, it is also advisable to call technology as such a learning process, which has the characteristics of technological feasibility: systemic, diagnostic, algorithmic, reproducible, predictive (the results of an activity match a certain goal), as well as the following structural components: conceptual and target, content, procedural and result-analytical.

To substantiate the diagnostic tools of the investigated technology, which allows us to check whether a high and sufficient level of formation of a successful personality of a primary school pupil is ensured, the work of scientists on diagnostics of competences of primary school pupils have been analyzed, in particular media literacy, as well as the results of empirical research.

In the technology under study, the criteria for the formation of a successful personality of a primary school pupil during media education implementation are determined the value-oriented, cognitive and communicative, activity and creative, evaluative and analytical.

Characteristics of the indicators of the levels (high, sufficient, low) of the formation of a successful personality of primary school pupils during media education implementation in accordance with the justified criteria are reflected in Table 2.

Table 2. Criteria and indicators of the formation of a successful personality of pupils of primary school age

Indicators of the formation of primary school age pupils' progress	**Criteria for the formation of a successful personality**
• Setting the goals (determined, determined without complying with the rules of goal setting, non-determined); • the level of differentiation of moral and ethical values, judgments about the achievement of success (based on the definition of good and evil characters in the media, good and bad deeds): deep evaluative judgments, different degrees of the depth of evaluative judgments, evaluative judgments about the behavior of the characters of the media are largely absent.	Valuable and target
• Level of awareness of the types and functions of the media; • level of awareness of success, stages of successful activity; • level of communication on topics of success in the media (high, sufficient, low ability to polysubject interaction) • the dynamics of educational achievement levels.	Cognitive and communicative
• Activity level of actions (high, medium, low); • the level of creative activity and independence during the creation of media products on the theme of success (the ease of inventing constructive ideas and their independent realization, situationality in the production of creative ideas and implementation with the help of adults and peers, the rarity in the production of constructive ideas under the influence of adults and peers); • the level of realization in the life of innovations from the media about success: overcoming obstacles, performing exercises to increase the success rate (constantly, occasionally, never); • the level of formation of the ability to adhere to the rules of safe behavior when working with a computer; restrict yourself to accessing modern technical devices: tablet, gadgets, mobile phone (high, sufficient, low).	Activity and creative
• Analysis of own level of success (adequate with argumentation, with errors in the argument, overestimated or undervalued without arguments); • setting the prospects for increasing the level of formation of success (expressed skills, partially expressed, absent).	Evaluative and analytical

The pupil of a high level of formation of a successful personality can set goals, establishes the relationship between the success of the heroes

and their values; is aware of the main concepts of success, the stages of successful activity, communicates well on the topic of media success, demonstrates the positive dynamics of educational achievements; models successful heroes, writes small and creative works on his/her own, creates projects and drawings, worries about his/her health, without abusing the length of contacts with the media, uses media innovations to improve the level of success; adequately determining the level of success, determines the prospects of self-development using the ideas of media education.

A pupil of a sufficient level, unlike a representative of a high one, makes insignificant mistakes in goal-setting, establishing the relationship between the success of the heroes and their values; in the interpretation of concepts in the field of success and successful activity, talks about the success of heroes in the media depending on the situation; the level of educational achievements is either unchanged or a slight increase is observed, creates media production on the topic of success with the help of adults and peers, situationally showing creativity, does exercises periodically and adheres to the success tips found in the media, sometimes violates media usage rules; makes errors, defining the level of success, defines the prospects of self-development using the ideas of media education with the help of a teacher.

As for the low-level children, they are not able to set goals, do not track the connection between the hero's values from the media and his success, have elementary knowledge of success and successful activity or lack of this knowledge, the level of academic achievement is either unchanged or decreasing, has no model for imitation, sometimes creates a media product about success with the help of adults without creativity, often violates media usage rules, cannot and does not want to adequately determine its level of success and the prospects of self-development.

The feasibility of some of the indicators can be doubtful for some reasons. For example, why it is so important for a successful person to follow the rules of safe conduct while working with a computer; restrict yourself to accessing modern technical devices: a tablet, gadgets, a mobile phone. However, the very safe, rational use of the media makes it possible to preserve the physical, mental, spiritual health that is necessary to succeed.

To determine during the experimental study the levels of the formation of children's media literacy, a set of diagnostic methods was proposed: observation, questionnaires, surveys, analysis of the products of the child's activity (modeled ideal, project about success). Ultimately, the level of formation of media literacy was determined on the basis of the expert judgment method (the experts were a teacher, a representative from parents,

the pupil, who carried out self-assessment). In this case, the child was able to gain **maximum** 2 points on the level of expression of the motivational and value criteria indicators; 4 points — cognitive and communicative with activity and creative; 2 points — evaluative and analytical (total 12 points). Representatives of the high-level gain from 9 to 12 points; medium — from 5 to 8 points; low — from 1 to 4 points. This corresponds to the traditional three-point scale (3 points — high, 2 — medium, 1 — low) of the formation of competencies.

After conducting the confirmatory experiment, it was found out that 17 (10.6%) children are at high level, 78 children (48.8% — on medium), 65 children (40.6%) — on a low level of formation of a successful personality. It was found that the level of success could be higher due to the development of media competencies and the positive dynamics of educational achievements.

The analysis of the results of the confirmatory experiment, scientific and educational and methodical sources made it possible to develop a model of the technology of formation of a successful personality of a primary school age pupil during media education implementation (Fig. 1).

Its purpose (formation of a successful personality of a primary school age pupil) corresponds to legislative acts, educational concepts, the State standard of primary education. Based on the main principles of these documents, methodological approaches (*systemic, personal, informational*) and principles are determined (*respect for national traditions, the priority of moral and ethical values, aesthetic inspiration*). The model of technology reflects the need for the implementation of the pedagogy of the heart and the pedagogy of success, the main ideas of which are grounded by the Polish scientist Maria Łopatkowa [12], the Ukrainian teacher Vasyl O. Sukhomlynskyi [18], etc. In our study, the implementation of the pedagogy of heart means that every child should feel the love and care of teachers, parents and classmates: a minimum of competition and maximum of trust, and confidence in the success of each child.

The content component of the technology embodied the theoretical and methodological foundations of success, media education tools. The elements of the procedural component are the algorithm of the actions of the participants of the pedagogical interaction (pupil, teachers, parents) acting on the principles of partnership pedagogy; forms of education for children (the creation of electronic books "Rules of Success Achievement", "Stories of Success" that ensure continuity in the formation of success), methods (conversations about media success, exercises, projects "How to determine life goals", "How to overcome obstacles", "How to increase self-

esteem") and forms and methods of working with parents (conversations, pieces of training).

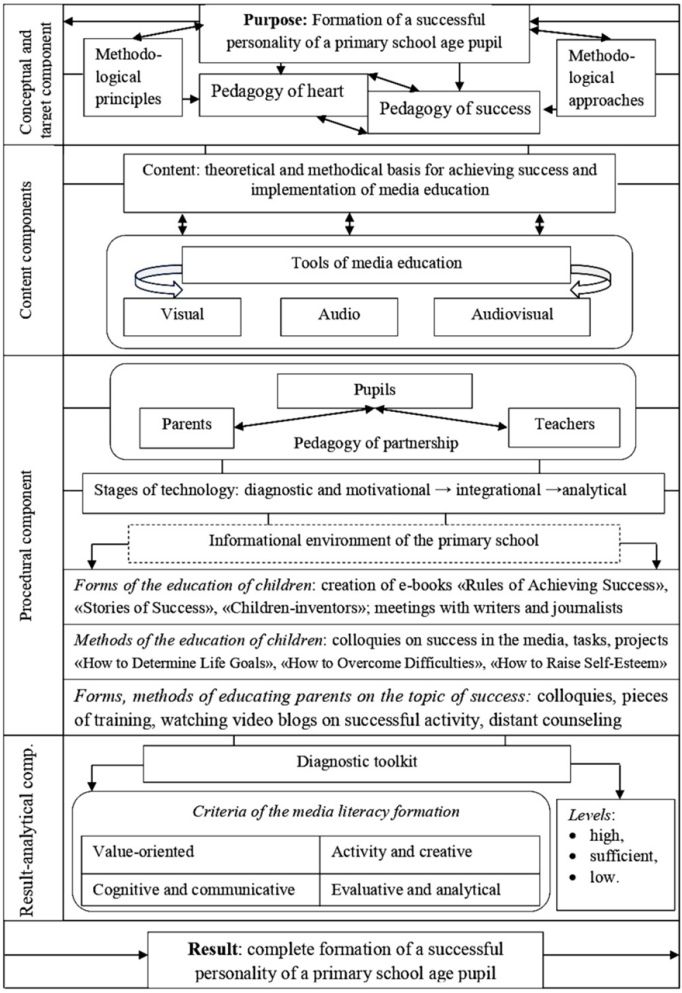

Fig. 1. Technology of formation of successful personality of a primary school age pupil during media education implementation

Diagnostic tools (criteria, level indicators) make it possible to verify the effectiveness of the technology under study.

2.3 Organization and analysis of the results of experimental research

In order to test the effectiveness of the designed technology, a forming experiment was carried out during 2018. Since it is impossible to investigate all the types of activities involving children (someone is successful in one activity, and someone else in another), we have stopped on the leading types: studying, media education activities of the primary school children and their self-improvement activities. Control (81 persons) and experimental (83 persons) groups of the third-grade pupils (three classes in each group) were formed, and the level of formation of their success was diagnosed (the results of the diagnosis are presented in Table 3). Traditional forms and methods of forming success were used in control groups, in experimental, however, the developed technology was introduced.

Table 3. Dynamics of the formation of successful personality levels of primary school age pupils

Levels	**Control group**		**Experimental group**
	Before experiment	**After experiment**	**Before experiment**
High	9 (11 %)	11 (13,6%)	8 (9,6 %)
Sufficient	38 (47%)	40 (49,4%)	39 (47%)
Low	34 (42%)	30 (37%)	36 (43,4%)

The implementation of the technology was preceded by a preliminary work with the teachers of the experimental classes that received a specially designed educational methodological textbook for raising their level of competence in the field of educational technologies, in particular, media education, information and communication, and the organization of successful activities [20]. For teachers, colloquies and counseling were conducted. Students of Ternopil Volodymyr Hnatiuk National Pedagogical University and Khmelnitskyi Humanitarian and Pedagogical Academy were involved in the measurement of the results of the study.

As the technology provides for the formation of a successful personality of primary school pupils, along with the implementation of media education, the formation of key competences for life, in the experimental classes, pupils' knowledge of the media, their types and functions, information search, copyright, safe use of digital media, media communication ethics etc. has deepened.

Differences in the formation of a successful personality between control and experimental groups of children were revealed during the lessons of "Literature Reading", "Ukrainian Language", "I Explore the World". In the process of studying each subject in the experimental classes, attention was focused on the problems of success (for which the corresponding texts were selected). Particular attention was paid to the ability to overcome obstacles and the ways to overcome difficulties were discussed. During the experiment, acute topics were considered, in particular about envy and sincere joy for the success of friends, whether it worth to create an ideal and follow it, etc.

The most effective forms of working with primary school pupils were the creation of electronic books on successful children, watching films about the success of people with special needs, including the Christian preacher, author of the book "Life Without Ends" an American Nick Vujicic, Italian singer who lost his eyesight, Andrea Bocelli, a Ukrainian artist Dasha Bezkosta, who having infantile cerebral palsy, draws pictures using her toes, etc. Effective methods include an analysis of the behavior of heroes of stories, fairy tales; the justification of which features of the character can help to achieve success, creation and discussion of various projects, primarily "How to determine life goals".

In both control and experimental groups, the formation of key competencies among pupils took place in accordance with the Concept of the New Ukrainian School [7], the State Standard of Primary Education [15]. Their formation is undoubtedly an important factor in achieving success. So, during the experiment, we predicted an increase in the formation of a successful personality in both control and experimental groups, which eventually happened.

According to the results of the forming experiment, 18.1% of the respondents of the experimental groups were at a high level; 54.2% — at a sufficient level; 27.7% — at a low level. In control groups, there was an increase in the number of children of the high level of formation of a successful personality by 2.6%, of sufficient — by 2.4%.

The increase in the formation of a successful personality of pupil in experimental groups was due to skillful goal-setting, awareness of the value of media education for life success, the formation of knowledge about success, successful activity, the creation of media production on successful activities — e-books "Rules of Success", "Stories of Success", "Children-inventors"; the analysis of works in which a life ideal is represented; projects, as well as due to children's compliance with the media usage rules. Positive impact on the results of the experiment also had the introduction of the pedagogy

of heart, raising the level of media culture of parents, their awareness of the problems of upbringing a successful child.

Indicators of pupils who were less subject to changes are the dynamics of the levels of academic achievement of pupils; the level of their communicativeness and creativity, the definition of the prospects for self-development.

Another important outcome of our study is the need to increase the authority of a teacher in society in general and in the media in particular. Describing the status of a teacher in Ukrainian society, a well-known scholar, a daughter of a Ukrainian teacher Vasyl O. Sukhomlynskyi, Olha V. Sukhomlynska, stated: "The difficult political situation, the lack of morality of the so-called "political elites", adequate state youth policy, the use of youth in political games, apparent social injustice lead to the growth of nihilism, brutality, crime, anti-patriotic, anti-civilian speeches, to the fact that schoolchildren regard all teachers as losers, and sometimes openly bullying them" [17, p. 12].

Naturally, the attitude towards teacher is more positive in primary school pupils than in high school ones, but the fact that only 8.1% of children consider him/her a role model to succeed (the hero of a story or a fairy tale is an example for 10% of pupils) prompts thinking and making important conclusions about the elevation of the authority of a teacher. Perhaps the reason for the weakness of the state lies in the status of a teacher in the society that he/she cannot become an ideal in achieving success for his pupils.

3 Conclusions and prospects for further research

Formation of a successful personality of a primary school pupil during media education implementation helps to solve several actual tasks: to increase the level of media culture of a pupil, to form key competencies for life, to prepare a child for the life's self-realization, which in the end should contribute to the strengthening of the Ukrainian state in future. The research has proved the effectiveness of the implementation of the technology of formation of a successful personality of a primary school age pupil during media education implementation. In experimental groups, the percentage of children with a high level of successful personality development (from 9.6% to 18.1%) has increased, and the percentage of a low level has decreased (from 43.4% to 27.7%).

Praxeological principles of the formation of the content of primary education are the prospects of further research.

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The state of the art and perspectives of using adaptive cloud-based learning systems in higher education pedagogical institutions (the scope of Ukraine)

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Abstract. The article deals with the problems of using adaptive cloud-based learning systems (ACLS) in the modern high-tech educational environment and expanding access to them as tools of educational and research activity at higher education pedagogical institutions in Ukraine. The conceptual apparatus of cloud-based adaptive learning systems application and design is considered; their main characteristics are revealed; the ways of their pedagogical application are described. The experience of Institute of Information Technologies and Learning Tools of NAES of Ukraine on designing and applying of the cloud-based learning and research environment is outlined. The results of the survey of 31 higher education pedagogical institutions on using ACLS are presented. It is established that in the near future ACLS will become the driving force behind the development of new pedagogy, new strategies for personalizing education, and expanding opportunities for active learning.

Keywords: cloud technology, learning-scientific environment, higher education pedagogical institution, adaptive cloud oriented learning system (ACLS).

1 Introduction

Modernization of teaching and learning in higher education institutions bringing it in line with the current achievements of scientific and technological progress is one of the priority problems of Ukrainian pedagogical research. One of the main conditions for the modernization of education, improving the quality of teaching and research staff training is the use of innovative technologies, in particular, the introduction of adaptive learning systems in educational institutions.

Adaptive learning systems attracted the interest of researchers in the field of ICT in education at almost all stages of development of this industry.

It is always the goal of those who develop and implement computer-centric systems to create tools that would most fully meet educational needs. The cloud computing approach gives the new insights into the field of adaptive learning as artificial intelligence approaches and advanced networks tools merge to create the new trend [1]. The adaptive cloud-based learning systems become the new stage of adaptive systems development that have a great potential and significant prospects for use in educational institutions.

The purpose of the article is to determine the essence of adaptive cloud-based learning systems, the state of the art of their use in educational institutions of Ukraine, outline the prospects for their development and implementation.

2 Review

With the development of cloud computing the possibilities for individualization and adaptability in educational systems have increased significantly. Despite the fact that modern adaptive systems are still in the process of experimental study, they are gradually developing and implemented in educational practice in different countries [13] at different levels of education [11]. These systems are aimed at ensuring the differentiation and personalization of training at a higher level compared with previous generations. The principles of their work concern the dynamic adaptation to individual needs of the subject of the training course, which are conditioned by the abilities, knowledge and skills of the learner. By "tracking" the process of student's knowledge acquiring a system with a high degree of accuracy builds the educational path, sequentially "moving" from one unit to the next until as the planned results are achieved [1].

Problems of designing and implementing adaptive learning systems in Ukraine including cloud-based are at the initial stage of development. So Pavlo I. Fedoruk highlights the methodology of organizing the process of individualized learning using the Web-based adaptive system of distance learning and knowledge control [3]. The peculiarities of the creation of a cloud-based learning and research environment of a higher education institution were considered by Valerii Yu. Bykov and Mariya P. Shyshkina [2]. Serhii M. Pryima analyzed peculiarities of intellectual adaptive learning systems of open adult education in accordance with the recommended didactic-educational strategy and methodology of analysis and empirical data Web Mining as the technology for the use of valuable knowledge [13].

First of all, scholars believe that adaptability is important in distance learning, as the distance learning system should be oriented towards a large

number of users with different levels of knowledge.

So, Pavlo I. Fedoruk [4] considers the problem of personalization of distance learning, which, according to the author, can be achieved using adaptive and intelligent technologies. According to Pavlo I. Fedoruk, in the educational process, more attention should be paid to navigation systems; to make more efficient use of Internet resources, electronic libraries and repositories [5]. The researcher explored the problem of designing intelligent learning systems and noted that such systems should have an intuitive interface, so that the teacher could not only work with already prepared training material, but also independently modify, update and create their own developments. In the framework of the research, Fedoruk argued that through the use of adaptive and intellectual technologies, the educational system receives the opportunity to take into account the student's personal abilities, his prior knowledge, and ability [5]. The researcher discovered that none of the distance learning systems he considered, none of them was adaptive to interact with student groups, that is, they did not take into account the individual characteristics of each student and teacher training.

Elena V. Kasyanova, in 2006, researched adaptive hypermedia systems [9], which, in her opinion, greatly enhance the possibilities of educational systems in general. In addition, according to Kasyanova's research, all adaptive hypermedia systems can be united into one class, the components of which can include hypertext and hypermedia systems. Due to this, for each user, his workplace will be adapted with the individual tools and settings of various aspects of the system itself (without affecting the work of other users).

Theoretical and practical principles of the development and use of adaptive learning systems are actively studied by foreign experts. Peter Brusilovsky and Christoph Peylo conducted a comparative analysis of intellectual and adaptive learning systems, identified the prospects for the development of such systems on the basis of the Internet [1].

The thorough analysis of the concept of an adaptive learning system and its model design is presented in the works of Lou Pugliese [14, 15].

The experience of developing an adaptive open-source online course based on cloud-based Amazon Web Services architecture is presented in the paper [19].

Researchers [21] developed an adaptive learning system with two sources of personalization. Their research is based on two main sources of information about personalization such as behavior in learning and personal learning style.

If to turn to the theory of adaptive systems, then the task is reduced to

the construction of a regulator, which will affect a certain object / subject and in time will ensure (under all conditions) the achievement of the goal. A system consisting of object / subject parameters and the specified controller will be called adaptive [7]. If you return to the research topic, then in this case the cloud-based system will act as the regulator.

In turn, according to the study by Vladimir G. Sragovich [20], the adaptability of the control algorithm means that the goal is provided on the whole class (objects / subjects and functional connections), besides, it remains unknown to the end, which the process itself is being managed. In the presence of a strategy it becomes possible to evaluate the characteristics of the process over which the control takes place. However, Sragovich emphasizes that it is not necessary to evaluate and control the object simultaneously. That is, the adaptive system changes its algorithm (or its structure) automatically, which means achieving the goal in any conditions.

Thus, modern adaptive learning technologies are specialized software or services that adapt to the needs of students. These tools are able to synchronize with the learning process and, based on the technology of machine learning [17, 18], can adapt to the progress of each student and independently adjust the training content in real time.

Any adaptive learning system shapes the model and profile of each user. The user profile stores personal user information such as scientific (training) benefits, training mode and user knowledge. The model is based on a profile research. Jelena Nakic, Andrina Granic and Vlado Glavinic [10] studied the characteristics needed to build a user model for adaptive learning systems. According to the research, as the sources of adaptation, selected individual characteristics of users. The result of the study can be considered a list of 17 characteristics that are considered sources of adaptation (age, gender, cognitive abilities, such as speed of processing, long-term memory, spatial ability and others, metacognitive ability, personality, anxiety, emotional and affective states, cognitive styles, learning styles, experience, background knowledge, motivation, expectations). According to the results, the adaptation of educational systems increases when they are adapted to one or more of the listed characteristics of the user.

The development of cloud computing, the growth of complex implementations in the cloud, has increased the requirements for the internal and interdomain network. However, it should be recognized that network performance is one of the key issues when implementing multi-cloud solutions. This leads to the fact that network management is considered as a major problem; it is an integral part needed to provide integrated security and application performance [6].

This leads to the fact that cloud-based network infrastructure must be extremely flexible and responsive to changes in queries dynamically as a complex workflow is implemented with the use of several cloud-based applications. To achieve this goal, the network must be fully automated, which leads not only to reduce the cost of supplying the new infrastructure, but, most importantly, allows you to independently provide yourself. Self-sufficiency, on the other hand, means that the network becomes service-oriented, provides automated control with adaptive levels of security and control. All this leads to improved user experience when the API interface becomes a flexible programming environment that works concordantly and meets the requirements of the cloud application level. Thus, in the process of debugging operations and managing the general cloud-oriented system discussed in the previous section, network deployment should be included. The main objectives of the network deployment process are to ensure the dynamic behavior of the network, which can be fully consistent with the client's requirements through self-adaptation and increased flexibility [6].

A group of scholars to better adapt to a wide range of uses provided by community of users. Davide Salomoni, Isabel Campos, Luciano Gaido et al. [16] decided to take a different approach from many of the more used PaaS: the solution is based on the concept of an orchestrated complex cluster of services and the ability to automate the actions needed to implement cases of use. This approach was really successful as it enabled the implementation of outdated programs and did not depend on the language on which the program was built.

Given that the practical experience of applying adaptive learning systems, both in Ukraine and in the world in general is rather insignificant consideration of the conceptual foundations of this technology is important in order to avoid ambiguity of interpretation and approaches to understanding its essence. The features and perspectives of the use of adaptive cloud-based systems in higher education pedagogical institutions, in the training of pre-service and in-service teachers, who are the main driving force of the introduction of innovations into general secondary education are not considered enough.

3 Results

3.1 Adaptive learning systems: the essence of the concept

Ability to adapt is one of the critical indicators that determine the human intellect and behaviour. People did not disappear just because they had a special ability to be adapted to everything that was happening in

the surrounding environment. What should be the essence of a system to be adapted to such a complex entity as the person? To do this the model of a person namely a student, a teacher or a learner with a large number of parameters should be provided. The system should be configured in accordance to these parameters, flexibly respond to changes in parameters, with the setting going on automatically, without human intervention, then the system is adaptive to the full extent.

For this configuration the system should be provided with the algorithms for customization, which are usually created with the use of artificial intelligence methods. The flexibility of the system in terms of artificial intelligence can be greatly enhanced by the use of cloud computing approach. The cloud-based system is very flexible by its nature. The necessary computational resources such as memory, processing power, bandwidth network, etc. can be provided and discharged as needed, scaling takes place very quickly. In addition, this system has the ability to be adapted to tasks that can be added or modified as needed. So the adaptation may be provided also by functionality. Thus the cloud-based technologies have additional opportunities for a wider range of adaptation due to the much higher flexibility of their software and hardware and their characteristics.

Thus by *the adaptive cloud-based learning system* the cloud-based system that has the property to be adjusted automatically by its parameters to the different individual characteristics and educational needs of the learning process participants is meant.

In order to implement the computer-procedural functions of this system, a virtualized infrastructure (corporate or hybrid) should be purposefully created.

Among the advantages of the ALS are the following:

- automation of evaluation and forecasting, which greatly enhances the efficiency of these processes;
- the ability to be adapted to each student, regardless of the starting level of knowledge, abilities, peculiarities of psycho-physical development, etc., unlike the traditional system in which the student should be adapted to the general standards;
- adjustment of the degree of complexity of educational content, which contributes to a more efficient, consistent course of study;
- the possibility of constant evaluation, tracking the student's academic progress and adjusting it if necessary;
- the possibility of obtaining data not only about the educational progress of each student but also his individual needs;

- the possibility for the student to carry out self-analysis, track their own educational route, progress in the learning process through the receipt of feedback (feedbacks) from the system in real time;
- the encouragement of students to self-development and the implementation of an individual educational trajectory, regardless of the teacher, with the help of automated feedback loops;
- the possibility of reducing the routine load on teachers, releasing time for professional development, etc.,
- the possibility of continuous improvement of training courses on the basis of in-depth analysis of educational progress, peculiarities of the individual trajectory passing by each student which contributes to the improvement of the quality of educational activity of the institution as a whole.

ALS usually require architecture that integrates key functions of modules (training content), assessment and competencies, which together should provide support for a personified educational environment. As indicated in [14], ALS, at least, should contain the list of methods that provide:

1. The training modules (content) to be completed;
2. Several evaluation systems that track and assess students ' learning outcomes;
3. Methods for coordinating the demonstration of learning content to individual students in a dynamic and personalized way.
4. The analysis of the source base allowing the selection of a number of indicators that determine whether the learning system is adaptive.

So, consider the system of learning to be adaptive if it:

1. Can be adapted to different learning styles (for example, different pace).
2. Contains statistically accurate cognitive models that allow to determine and verify the reliability of the achieved competence level of students.
3. The adaptive sequence can be correctly implemented for the accurate and continuous collection of data in real time for the student's progress and the use of these data for the automatic correction of the educational route.

4. Contains a functions for adaptive evaluation.
5. It can accurately identify corrections and corrective actions through adaptive evaluation (both on the basis of norms and on the basis of criteria).
6. It is possible to synchronously measure critical components of the knowledge (how successful the student has mastered the content) and behavioral (how much time a student was actively involved in the learning process).
7. It can develop complex competencies characteristics that index the learning outcomes.

With regard to the cloud-based approach we also need to consider the cloud-based learning platform providing the ICT infrastructure for the adaptive learning system implementation. The learning platform is considered as the set of the cloud-based tools to support different learning and research activities. Within the unite platform a lot of different tools may be integrated providing more opportunities to realize adaptive learning.

3.1 State of the art of using adaptive learning systems in higher education pedagogical institutions of Ukraine

In order to find out which training support systems are used in educational institutions of Ukraine, and whether there are adaptive systems, we conducted a survey. Interviews were held with the representatives of 16 pedagogical universities and 15 institutes of postgraduate pedagogical education of Ukraine (31 institutions — 31 respondents) competent in the issues of which educational systems are used in the institutions where they work (technical departments, distance learning departments, specialists in issues of informatization of the institution, etc.), in the fall of 2018. It was established that currently none of the institutions surveyed uses ALS. The results of the survey are rendered in Fig. 1–3.

As you can see, the most common is the Moodle Learning Management System (LMS Moodle). Despite the wide range of functionalities and the range of benefits provided by this system, it is, however, not adaptive, as well as the rest of the tools currently used in institutions of pedagogical education in Ukraine.

On the basis of a conducted survey it can be concluded that the cloud-based platforms being the necessary condition to provide ACLS are used only in 16% of institutions.

So, we believe that scientifically and pedagogically grounded introduction of such systems will contribute to the learning environment development that the will become more open, personalized, will enable access to high-quality educational content for all subjects of learning with regard to their individual characteristics.

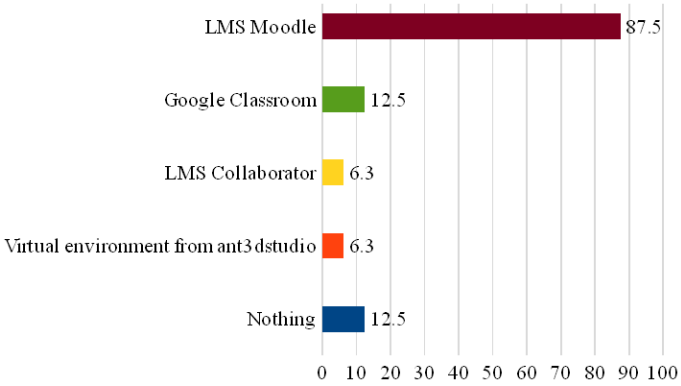

Fig. 1. The systems of training support used in pedagogical universities of Ukraine

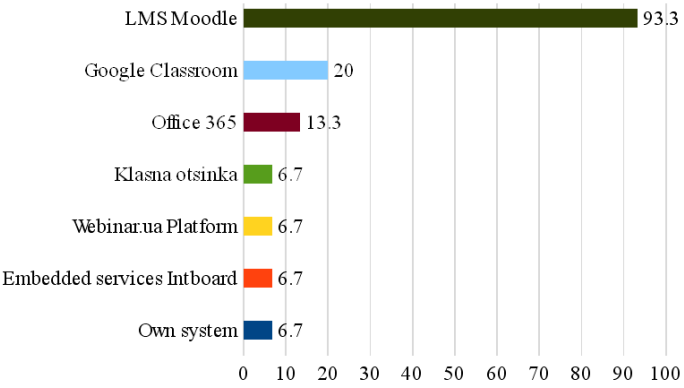

Fig. 2. The systems of training support used in institutions of postgraduate pedagogical education of Ukraine

Note that today the ALS are only at the beginning of active development and progressive implementation. Even in the technologically developed

countries of the world such systems have become widely distributed undergoing experimental testing. According to [8], in the next few years, the ALS will be the driving force behind the development of new pedagogy, new strategies for personalization of education, and the expansion of active learning opportunities.

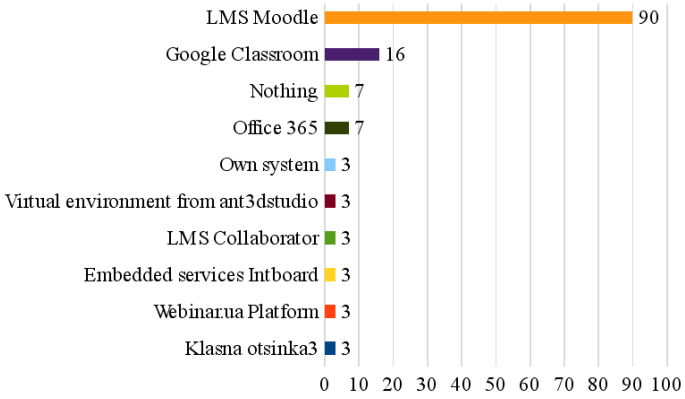

Fig. 3. The systems of training support used in institutions of pedagogical education of Ukraine — pedagogical universities and institutes of postgraduate pedagogical education (consolidated data)

4 Conclusions and discussion

The analysis and assessment of the state of the art of using adaptive cloud-based systems in the domestic educational space has shown that the adaptability is largely not realized; the use of cloud-based services is not complex, conditioned by learning needs and subordinated to pedagogical goals of teachers training.

In 2018 the Institute of Information Technologies and Learning Tools of NAES of Ukraine became one of the partners of V4+ Academic Research Consortium that would address regional issues related to EU ICT research priorities. The focus will be on the networking of the V4+ partners in order to integrate their research expertise, perform partner search and benchmark these issues using the virtual technological platform. The important part of the project is to explore the use of the cloud-based platform to integrate and deploy different types of learning and research services such as educational robots, language technologies and databases [12].

Despite numerous partial studies of specific issues in adaptive learning systems and cloud-based systems, the design and use of adaptive cloud-based systems remains relevant and current. ALS are still developing, gradually gaining momentum in developed countries of the world. The basis of the functioning of such systems is the competence approach, focusing on individual progress.

Because these systems require computation of a very high order, analyzing enormous amounts of data in real time, the scalability of the system can be considered from two points: how to effectively program these systems and how to prepare such an architecture to provide the processing, loading, distribution of these data. In view of this the relevant and perspective point is to study the principles and approaches of designing the ALS on the basis of cloud platforms, as well as developing methods for their use in the professional training of teachers as the main driving force of the introduction of innovation into general secondary education.

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Systematicity of students' independent work in cloud learning environment

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Abstract. The paper deals with the problem of out-of-class students' independent work in information and communication learning environment based on cloud technologies. Results of appropriate survey among students of pedagogical university are discussed. The students answered the questions about systematicity of their learning activity and propositions for its improving. It is determined that the leading problems are needs in more careful instruction according to features of the task completing, insufficient experience in self-management, the lack of internal motivation. Most of all, students recommend to provide the tasks with detail instruction (oral or written) and to pay attention to careful planning the time that is necessary for full completion of the task. It is pointed that such complicated requirements can be satisfied only by complex use of information and communication technologies as well as the automated system of pedagogical diagnostics. Some requirements for management of students' out-of-classroom independent work are formulated as a result of this discussion.

Keywords: students, independent work, cloud environment, systematicity.

1 Introduction

Cloud technologies is a basis of modern distance learning. It provides the students with possibility of study that is free in space and time. Students of full time learning also use the cloud pedagogical information and communication environment for out-of-classes independent work. But learning activities in cloud environment essential differs from traditional work in classroom or homework with short-term tasks. It also differs from learning work on large study projects. New kind of learning activity requires in new studies of pedagogical science in the field of didactical and psychological peculiarities of students' independent work.

Problems of educational activity in cloud environment were analyzed in studies of Liudmyla I. Bilousova [4], Valerii Yu. Bykov [10], Arnold E. Kiv [62], Hennadiy M. Kravtsov [31], Mykhailo S. Lvov [69], Yevhenii O. Modlo [43], Pavlo P. Nechypurenko [47], Maiia V. Popel [38], Serhiy O. Semerikov [72], Aleksander V. Spivakovsky [14], Andrii M. Striuk [39], Illiia O. Teplytskyi [63] and others. The other side of investigations is devoted to the pedagogical theory of students' independent work management. Oleksandr V. Malykhin [36] is an author of one of the recent fundamental research, specifically oriented on the problems of management of students' independent work, he suggests a model of the system of management of the students' independent learning activity in pedagogical university as well as the corresponded pedagogical technology, which has been tested at foreign language learning.

The basis of effective management of students' independent learning activities in higher education institutions is the study of the didactical conditions of management of students' independent work both theoretically and by means of a questionnaire [29, 64, 66]. Thus, according to [64] it is determined that third-year students during independent work had such difficulties as unclear requirements, lack of special literature, the discrepancy tasks with the subject of the course. The results of survey of students on the use of information technologies during independent work [42] are interesting for understanding the technique of students' work. As a result of this survey, students mostly use lecture summaries and electronic resources rather than textbooks or other teaching materials [42] in process of their self-preparation for classes. Survey method was used to determine the problems of self-study of primary school teachers in Luhansk Taras Shevchenko National University [53]. By results of [53], students often identify such difficulties, when performing independent work: not enough books (not enough information on the Internet), objectives or requirements are unclear, lack of time, trouble finding information, too large amount of information that makes it difficult to study. Survey [6], which deals with the problems of management of the students' independent work in the information and communication pedagogical environment, show that students widely use Internet resources during independent work, but they do it spontaneously and do not obtain proper effect on the success of learning. So management of independent work should be provided special means in information and communication environment, aimed at improving the efficiency of the use of Internet resources during independent work of students [6].

The author of [28] took attention for the level of cognitive students'

activity in process of independent work and suggested the appropriate system of tasks for independent work on educational discipline "Method of teaching informatics". This tasks are focused on productive and creative activities of students and anticipate their implementation in the Moodle system. The author underline that the most positive results were achieved by students, who characterized by a high and average level of cognitive activity and a certain experience of independent work in pedagogical information and communication environment [28].

Despite the considerable interest of researchers to pedagogical conditions of students' independent work, the problem of empirical research of relations between factors, which determine the effectiveness of independent learning activities is still not exhausted. In particular, one of the actual problem in management of students' independent work in pedagogical information and communication environment is providing the systematicity of such activity. The lack of direct personal contact between student and teacher as well as the lack of personal connections between students during the task execution and presentation of its results needs innovation approach for motivation and help that traditionally provides learning process.

Objectives of this paper is the analysis of pedagogical conditions of providing the systematic learning activity of students' in pedagogical information and communication environment.

2 Theoretical background

On the basis of the analysis of psychology and pedagogical scientific works, it has been established that independent work of students is a multi-faceted concept and involves various aspects of its research: as a teaching method (Vladislav B. Bondarevskii [7], Volodymyr K. Buriak [9], Ivan I. Kobyliatckii [27], Leonid I. Ruvinskii [59], etc.); as a type of activity (Evgenii K. Bortkevich [8], Mykhailo D. Kasianenko [25], Vitalii A. Kozakov [30], Olena O. Lavrentieva [34], Osvald A. Nilson [48], Ravil A. Nizamov [49], Liubomyr M. Okhrymovych [50], Gennadii P. Semanov [61], Mykola P. Skakun [67], etc.); as a form of organization of the educational process (Boris P. Esipov [16], Ilia I. Iliasov [21], Valentina Ia. Liaudis [35], Aleksandr G. Molibog [44], etc.); as a learning tool (Sergei I. Arkhangelskii [1], Malla G. Garunov [19], Galina N. Kulagina [32], Pavel I. Pidkasistyi [52], Valentin I. Tolkunov [74], etc.). In our study, independent work is considered as an activity of a student, which takes place without the direct involvement of the teacher, but is directed and guided by him.

Studying the problem of management of independent work of students

involves, first of all, the identification of the essence of management, clarification of his role in the student's educational activities. It was defined on the basis of works of Vladimir P. Bespalko [2], Tatiana A. Dmitrenko [12], Larysa V. Filippova [17], Valerii A. Iakunin [23], Lev B. Itelson [24], Aelita K. Markova [37], Raushan K. Mashanova [40], Valerii Ia. Nechaev [46], Liudmila V. Rychkova [60], Kateryna V. Yaresko [13] and others that the essence of management consists in the implementation of the interaction of the student and the teacher, aimed at activating the student's activities in the learning process and at achieving the goal. As a result of this interaction, the socio-cognitive experience of the student changes. Depending on the nature of the teacher's influence on the student's independent work, the types of management are distinguished:

1. according the distribution of roles in the management between the subjects of the educational process — direct management, co-management and self-management;
2. by the presence of feedback — with feedback and without feedback; by the degree of individualization of influence — directed and dispersed; by level of using technical equipment — manual and automated.

From the standpoint of a cybernetic approach, the management is a process that is carried out in the following stages: collecting information and evaluating the situation; setting objectives; decision-making on choosing the appropriate method of solving the problem; realization of the decision; control and evaluation of results; adjustment. Each stage has a specific purpose and task assignments, provides for certain actions of the management entity.

A teacher can provide personal interaction with students to manage their independent work only, when students' independent work is in progress in classroom. The management of out-of-classroom learning activity in traditional study is based on preliminary instructing, didactical tools and student's experience in self-management of own learning activity. Such situation leads to the lack of creative and productive activity in students' out-of-class study, because teachers have problems with management of such activity by traditional means. Only using the innovation pedagogical technologies, based on information and communication learning environment and cloud technologies, gives us possibility to realize on-line management of students' independent work at distance.

The development of information and communication technologies, particular cloud technologies, creates the prerequisites for improving

the efficiency of management of students' independent work. A number of scientific works is devoted to the didactic aspects of the use of ICT in independent work of students (Liudmyla I. Bilousova [6], Andrei P. Ershov [15], Boris S. Gershunsky [20], Liudmyla E. Gryzun [3], Yurii V. Horoshko [22], Aleksandr A. Kuznetcov [33], Yukhym I. Mashbyts [41], Vadim M. Monakhov [45], Nataliia M. Omelchenko [51], Viktor N. Pustovoitov [54], Serhii A. Rakov [55], Yurii S. Ramskyi [26], Vasilii G. Razumovskii [56], Yuliia P. Reva [57], Irena V. Robert [58], Vitalii V. Rubtcov [11], Vladimir F. Sholokhovich [65], Tetiana V. Solodka [68], Iryna V. Synelnyk [71], Nina F. Talyzina [73], Aleksandr Iu. Uvarov [75], Myroslav I. Zhaldak [18], and others). In these studies, attention is paid to the disclosure of new forms of educational and cognitive activity of students with the use of information and communication technologies. The analysis makes it possible to put forward a hypothesis about expediency of computer-oriented management of independent work of students in the process of teaching disciplines of the natural-mathematical cycle.

3 Empirical research

To determine the leading problems, which impede students' independent work, we suggested them some questionnaire with a multiple choice (see Table 1). The target group are students of pedagogical university — future teachers. The size of the sample is 53.

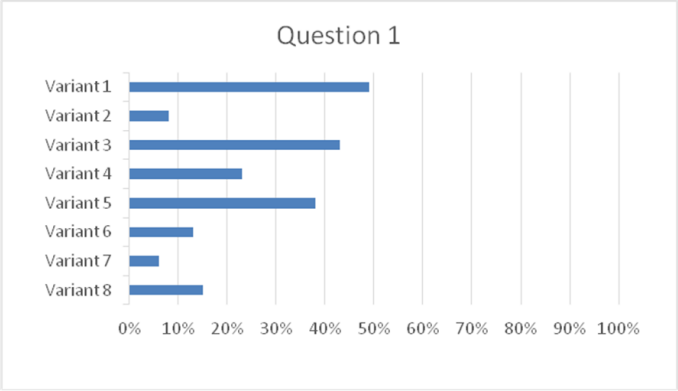

Fig. 1. Percentage of students' choice according to Question 1 (see Table 1)

Table 1. Questionnaire

Question	Variant	
Question 1. Sometimes it is difficult to complete a training task at the appointed time, the reason for this is often the following circumstances:	1	there is no enough understanding of how to complete a task
	2	there are other more important things
	3	there was a mistake in planning time, the task have been left for the last day and time was not enough
	4	bad health, illness
	5	the task is not of interest, it is difficult to force itself to borrow it, even if necessary
	6	fulfilling the task does not affect the achievement of my life goals (does not give the experience that will be needed in life)
	7	the task does not affect my grades at the university (the evaluation system does not take into account the results of this task)
	8	the task is so complicated (labor-intensive) that it is not possible to execute it
Question 2. To improve the systematicity of students' work , I would recommend teachers:	1	not to give for independent work of creative tasks, the order of execution of which is not known in advance
	2	not to give for the independent work of tasks of a reproductive nature, which is not interesting to perform
	3	to provide a detailed written instruction to complete the tasks
	4	to conduct oral consultations and demonstrations in relation to the execution of tasks
	5	to reduce the grading score for the violation of the term of the tasks
	6	to provide multiple reminders about the near deadline of the results presentation, using the means of communication
	7	to calculate the time on the task carefully

The question 1 suggests to the students some hypothetical "opinions" that characterize probable problems, connected with quality and fullness of preliminary instructing, motivation and cognitive interest, students' experience in self-management of independent work. The answers show

(see Fig. 1) that the leading problems are needs in more careful instruction according to features of the task completing, insufficient experience in self-management, the lack of internal motivation. Statistical analysis shows that influence of variants 2, 6, 7, 8, on the systematicity of independent learning activity is significantly less than the above factors (significance level 0.01 according to Pearson's criterion Chi-square). We should take into account the variant 4 also, because of importance of health problems for a student as a person.

The same problems were analyzed by students during answering Question 2 from the other viewpoint (see Table 1 and Fig. 2). Most of all, students recommend to provide the tasks with detail instruction (oral or written) and to pay attention to careful planning the time that is necessary for full completion of the task. Other variants (1, 2, 5, 6) were chosen significantly less (significance level 0.01 according to Pearson's criterion Chi-square).

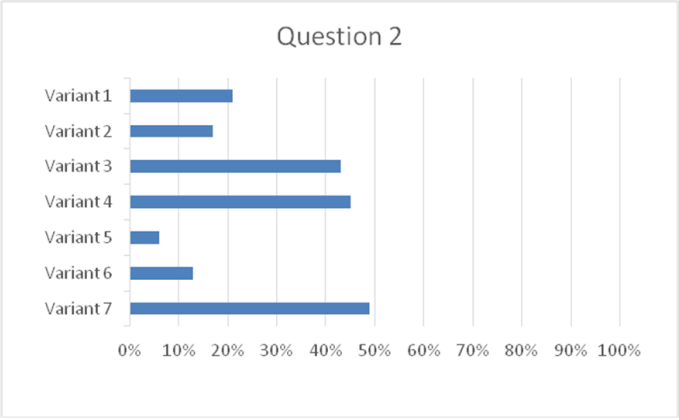

Fig. 2. Percentage of students' choice according to Question 1 (see Table 1)

Such answers of Question2 confirm the answers on Question 1 (Variants 1 and 4), but are in conflict with variant 5 of Question 1. To increase the cognitive interest of the task we should suggest creative tasks for the students, but such tasks are difficult. If the preliminary instructions are very detailed — we'll lost the creative component in the task. So detail instruction should be provided only in needs in time. This instruction should be individual for the student. One teacher cannot serve all students of academic group in such regime, so we need to organize the collective

work of students in information and communication learning environment. We need to use the automated system of pedagogical diagnostics for control every student activity and providing him with context help [5]. There are experimental researches [70] and theoretical studies [10] that stress an attention on accordance between student's learning styles and the used method of teaching, "... the way the material presented in online electronics course" [70]. So the automated pedagogical diagnostic system should be comprehensive enough to determine appropriate student's characteristics.

As a result of this discussion let us to formulate some requirements for management of students' out-of-classroom independent work:

- availability of information and communication learning environment which is useful for students;
- students experience in self-management of own learning activity — this experience is provided by systematic independent work, which step by step transforms from direct management by teacher throw co-management with a teacher to self-management according to objectives, plan, system of learning tools and recommendations from teachers and the automated system of pedagogical diagnostics;
- creative elements in the system of learning tasks;
- students' cooperation and communication in process of independent work that increases motivation, helps to follow the time plan and to overcome problems;
- availability of the automated system of the pedagogical diagnostics that provides a student with help in pedagogical design of his learning activity;
- careful design of the system of learning tasks individually for each student with time planning.

4 Conclusions

1. As a result of survey among students of pedagogical university, the most common problems in systematicity of learning activity during the independent work of the student are the lack of instructions, the lack of cognitive interest, students' mistakes in self-management of own learning activity, teachers' mistakes in time planning for the systems of learning tasks for students' independent work.
2. Some requirements for management of students' independent work for fixing these problems are suggested:

- information and communication learning environment should be available and useful for students;
- students should continuously capture the experience in self-management of own learning activity;
- the system of learning tasks should assume elements for creative students' learning activity;
- students' cooperation and communication in process of independent work should increase motivation, help to follow the time plan and overcome problems;
- the automated system of the pedagogical diagnostics should be worked out to provides a student with help in pedagogical design of his learning activity;
- design of the system of learning tasks should be individual for each student and assume accurate time planning.

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TODOS as digital science-support environment to provide STEM-education

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Abstract. The amount of scientific information has been growing exponentially. It became more complicated to process and systemize this amount of unstructured data. The approach to systematization of scientific information based on the ontological IT platform Transdisciplinary Ontological Dialogs of Object-Oriented Systems (TODOS) has many benefits. It has been proposed to select semantic characteristics of each work for their further introduction into the IT platform TODOS. An ontological graph with a ranking function for previous scientific research and for a system of selection of journals has been worked out. These systems provide high performance of information management of scientific information.

Keywords: TODOS, science environment, educational environment, ontology, taxonomy, STEM-education.

1 Introduction

1.1 The problem of digital science

Nowadays, cooperation and all-world international integration are conducted. Therefore, it leads us to the generation of a huge amount of not-structured information. One of the humanity actions fields which is one of the leaders of information production is science. The situation is being complicated due to the fact that providing science is foresees knowing of the huge amount of already made scientific researches.

Therefore, in science nowadays is a lot of information generated and there is a problem to process it. Considering this, educational approaches are adopting and one the modern approaches which include principles of multidisciplinary and studying to work with a huge amount of knowledge

is STEM-education. The specifics of it is the lack of digital instruments to provide it [2, 3, 20].

1.2 Scientometric databases in post-soviet countries challenge

For post-soviet countries, this situation is even more important due to the fast speed of integration of their science with worldwide which wasn't provided previously.

Nowadays, in the example of Ukraine, the huge challenge is to provide publication in both well-known scientometric databases (such as Scopus or Web of Sciences) and journals recommended by Ministry of Education and Science of Ukraine (scientific professional editions of Ukraine; further — SPE). This makes informational chaos in the field of journal selection to publish the results of scientific work.

1.3 Information processing problem

As was noted before, a huge amount of scientific information is generated nowadays. However, there is no effective was to process them. Sure, systems which can simplify exists, such as Mendeley, but they still do not provide analysis and processing of the information. For example, well-known designs can only provide commenting of the scientific papers which isn't provide any analysis and actually do not provide any systemizing of the information to provide structuration. The interface of commenting in Mendeley is shown in Figure 1.

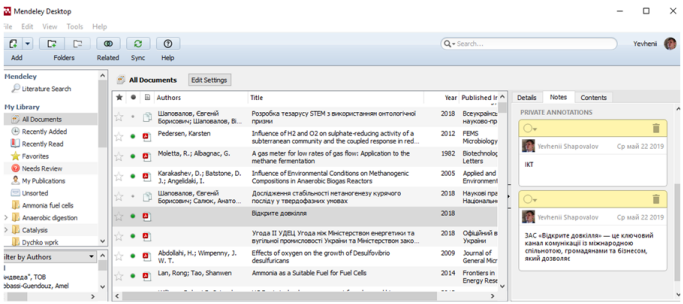


Fig. 1. The interface of commenting in Mendeley

We propose using of Transdisciplinary Ontological Dialogues Object-Oriented Systems (TODOS) [6, 9, 13, 24, 25] to provide systemizing and processing of Big Data with taxonomy creation, filtering, and ranking of information. A key benefit of this system is the context-based method of data

processing and structuring based on semantic relations. Previously, there was provided attempts to use ontology-based approaches in education [1, 7, 8]. However, they were characterized by not attractive for students and teachers' interface and by low interactivity such as the absence of multiagency approaches or wasn't interactive at all. In the case of Ukraine, it is very important to provide education in the national language and IT platform TODOS can implement it.

Therefore, this work aims justification of necessarily of digital science supporting processing and creation of the base of it.

2 Literature review and problem statement

2.1 TODOS as ontology systemizing of information

Using the ontological approach to provide informational systemizing is an important part of the learning process [4, 5]. Such an educational environment based on the ontological approach involves filling adaptive educational services with information resources that reflect the conceptual system of a particular discipline. The methodical provision of the educational-cognitive process consists of the assimilation of the conceptual system, axiomatics, rules, syntactic and morphological foundations of this theory. The set of terms determines the conceptual basis of scientific theories by determining a certain ordering of the concepts of the discipline. Thus, the ontological multiagent in content reflects the conceptual system of a certain disciplinary theory. It takes into account the individual characteristics of each subject of the educational process.

Structures in TODOS are represented by three categories (O, A, R), where O and A are a set of elements called objects and attributes, and R, respectively, is the binary relation between O and A. In particular, if oRa for o O, A, then we assume that "the object possesses the attribute A" or "the object has the attribute O" [7].

The feature of the ontological graph is the high level of structuring and data visualization, the possibility of transition between related edges and search for semantic links between vertices and its elements. The graph provides a transition to scientific data carried out quickly and understandably. In addition, operationality of information can be significantly improved by transforming it to taxonomy under using of ontological approach [6, 21].

TODOS is an innovative complex of programmatic information and methodological knowledge management tools using ontological management approaches to corporate information resources, where people are considered

as the source of the birth of new knowledge for transferring them in the form of their own knowledge through the tool TODOS, which is the only integrated point of access — "the single window" — to the information and applications of the system to provide interactive interaction with users. A key benefit of this system is the context-based method of data processing and structuring based on semantic relations.

The architecture of the formation of transdisciplinary information environments IT-platform based on the multiple procedures of transdisciplinary interaction with network information resources is realized on the basis of semantic control and ontological interface of TODOS [22, 25]. The technical basis of the TODOS is consisted of [24]:

- SYSTEM CONSPECT provides the construction of terminological trees based on the analysis of natural language text. It is a linguistic processor that provides the initial formation of a linguistic case and allows to solve the following practical tasks: improving the quality of processing of linguistic texts by increasing the vocabulary of the system; automatic definition of thematic directions of the document; sorting of documents according to thematic directions.
- SYSTEM CONFOR provides the creation of ontology subject areas, classification, and generation of taxonomies in the form of ontological graphs. The system ensures the creation of subject area ontology, classification, and generation of taxonomies in the form of ontological graphs, which allows solving the following practical tasks: construction of a semantic network of terms of the document; combining semantic network of terms for several documents.
- SYSTEM EDITOR ensures the formation of ontological models through the creation, editing, review and analysis of networks of concepts based on the construction of semantic links between objects of the subject area and the formation of patterns, presented in the form of a set of values of attributes, which describes the initial concepts of subject areas. The isolation of regularities is carried out by the method of inductive formation of concepts based on the pyramidal network.
- ALTERNATIVE SYSTEM ensures the organization of objects-concepts of ontology, on the basis of integrated processing of properties that characterize them. For this, we use weight, ball, and linguistic scales. Each such scale defines the values of the criteria characterizing the properties of the objects of the thematic ontology of the subject

area. In general, the properties-criteria are characterized by different degrees of importance, which when solving the problem of choice are given by some real numbers — weight coefficients. Before solving the problem for each criterion, it is necessary to form its value for each alternative. Thus, the formation of ontologies of the tasks of choice is ensured.

- LINGUISTIC CORPUS and built into its environment SEARCH MACHINE provides marking and indexing of semantic units that define and describe the contexts of objects of thematic ontologies of the subject areas. Contexts of semantic units make up an electronic library with means of associative search of semantically related information arrays, including determining the level of semantic equivalence of texts.

These modules are working together to transform unstructured incoming data to the hierarchy of contexts. Information management system TODOS is shown in Figure 2.

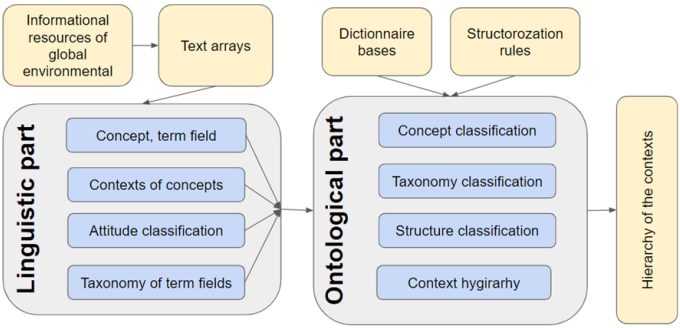


Fig. 2. Information management system TODOS

2.2 Main features of the TODOS: taxonomy, filtering, ranging

Ontologies are based on taxonomy creation. The main feature of the TODOS platform is a simplification of its creation. To create the ontology user do not need to know any programming languages just MS Excel. The example of taxonomy created on TODOS platform is presented in Figure 3.

To provide visualizing of the taxonomy, it's possible using the objective view. This view presents each edge of the ontology as a personal object. The

hierarchy is saved by creating links between those objects. The example of a taxonomy provided by TODOS platform is presented in Figure 4.

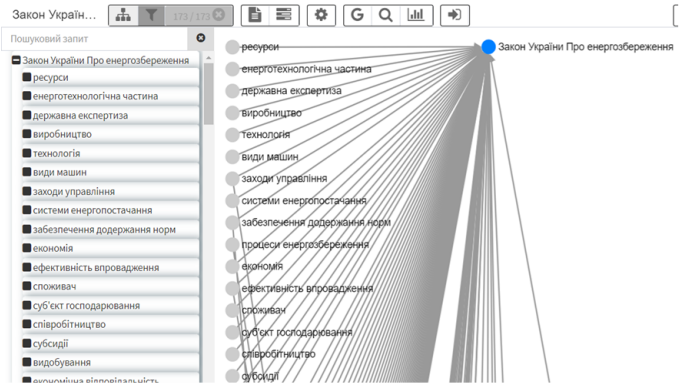


Fig. 3. The example of a taxonomy provided by TODOS platform

Fig. 4. The example of an objective view of the ontology created in TODOS platform

Analysis of information is provided through the identification and separation of semantic information of each edge. As edge, we can use any object kind scientific paper, single microorganism, the technology of water clearing, etc. It depends on the expert-creator idea, but anyway, it provides separation of the semantic data of edges. This can provide further data processing and systemize in way of filtering of ranking. The proposed informational system is characterized by multiagent features and has all the benefits of such a system.

3 Materials and methods

For creating digital educational programs and other educational content, the sheets were loaded to the part of TODOS IT-platform editor4. After that, the generation of the graph edges with its characteristics was carried out.

To store information and provide its sharing, Google sheets were used, with their further conversion into the .xls and .csv MS Excel sheets (see in Figure 5).

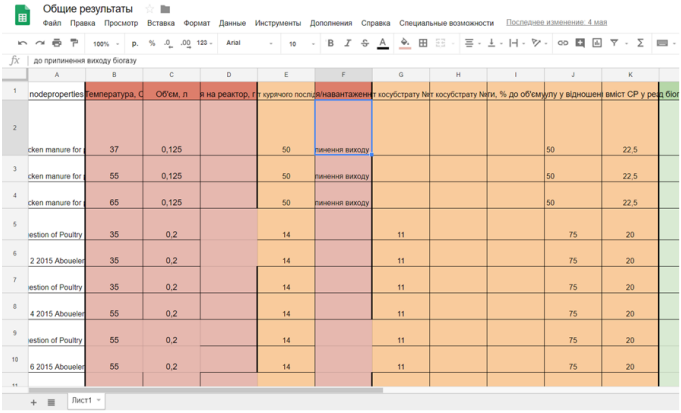


Fig. 5. Google sheet with data

The obtained documents were used to create the ontology structure .xml and to fill the ontology graphs with semantic and numeric information for ranking and filtering. Some of the instruments of the web-oriented educational environment are using intellectual features of TODOS, and to provide it, semantic characteristics were added.

The received documents were used to create an ontology structure (xls) and to fill the ontology graphs of ranking and filtering. To provide it, they were downloaded in editor4, the part of TODOS IT-platform. After that, the graph generation and the inputting of semantic characteristics to each vertex were carried out. Ontological edges were formed using predicate equations [24]:

$$Pr(x_1, \ldots, x_n) = \begin{cases} 1, & \neg Pr(YGrx_i) \wedge Pr(x_1, \ldots, x_n) \\ 0, & Pr(YGrx_i) \end{cases} \quad (1)$$

where $x_i \in X;\ 1 \leq i \leq n$.

The relation between taxonomic categories has the properties of the hyperrelation Gr type — $YGrx$, where Y is the set of all possible sets of concepts of X taxonomic category $\mathbf{T}$, x is one of the concepts of this set and Pr — predicate.

The obtained ontological graphs were opened in the appropriate form, ranking or filtering. To provide filtering, the function of choice has been applied. The function of choice in terms of taxonomic categories is as follows:

$$\forall \mathbf{T}[\emptyset \notin \mathbf{T} \Rightarrow \exists \mathbf{F} : \mathbf{T} \to \cup \mathbf{T}, \forall \mathbf{T} \in \breve{\mathbf{T}}(\mathbf{F}(\mathbf{T})) \in \breve{\mathbf{T}}] \qquad (2)$$

where $\mathbf{F}$ — is a function of the interpretation of a certain ontology; $\mathbf{T}$ — taxonomy.

4 TODOS as the digital science-support environment

All advantages of TODOS can be used to both systemize the science information and to create useful databases (Big Data based) instruments for the scientist.

4.1 Using TODOS to create Big Data databases

SPE and SCOPUS ontology-based selection systems.

We created the online web-oriented ontological graph for both, SPE and SCOPUS journals to provide selection. As graph edge, each journal was chosen. For both, semantic characteristics were separated. For SPE journals they were “Founder”, “Branch of science”, “Date of inclusion/renewal”, “Journal indexing”, “Journal specialization”.

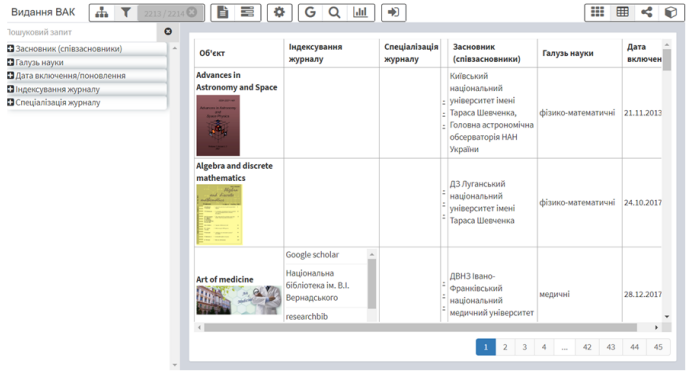


Fig. 6. SPE journal selection instrument

User can use those characteristics to select a journal du to it needs. SPE journal selection instrument is presented in Figure 6.

To create a database on SCOPUS journals “SJR”, “SNIP”, “CiteScore”, “Activity status” (active or not), “All Science Classification Codes (ASJC)”, “Language in the source (three-letter ISO language codes)” and “Publisher’s Country” were separated from each journal and added to edges as semantic data. Scopus journal selection instrument is presented in Figure 7.

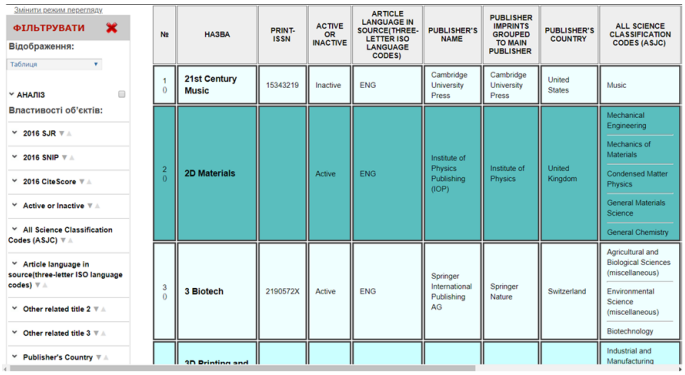


Fig. 7. Scopus journal selection instrument

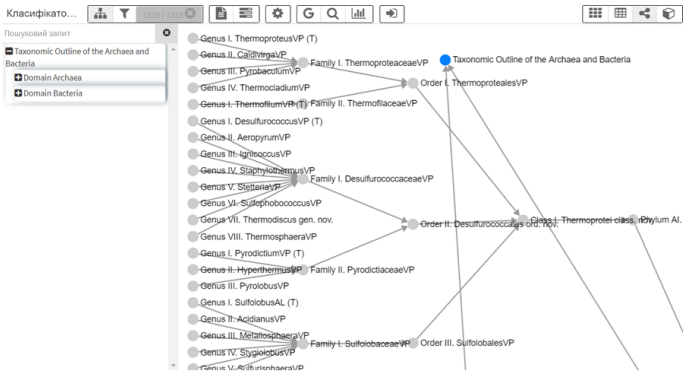


Fig. 8. General view of the ontological taxonomy of microorganisms

Ontology-based catalog of the microorganisms.

Systematization of knowledge in the field of biotechnology may also be complicated by the fact that semantic characteristics cannot always be

quantified, and therefore the ranking system cannot always solve the issue of information management. For such systems, it was suggested to separate the semantic information and apply a filtering function. The semantic characteristics of each microorganism were also proposed and input into the Google Sheets. All semantic characteristics were added in the collective access mode [19].

The resulting ontological graph provides the possibility to use the filtering, and it is possible to find the discovered microorganism or group of microorganisms. General view of the ontological taxonomy of microorganisms is presented in Figure 8 and a general view of the microorganisms selecting system is presented in Figure 9.

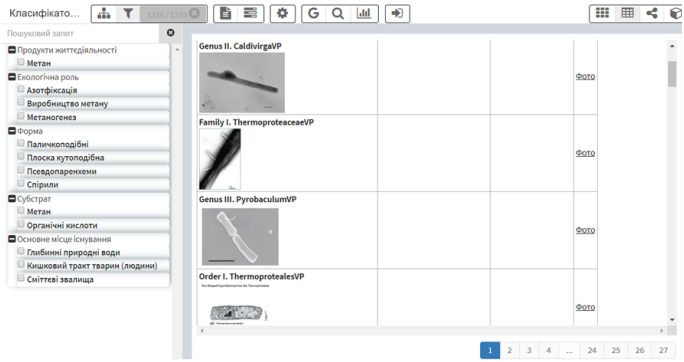


Fig. 9. General view of the microorganisms selecting system

4.2 TODOS to systemize scientific information

To construct a system of ranking of previous studies, we have identified semantic characteristics of the scientific research devoted to biogas production from chicken manure. These semantic characteristics include "Temperature (°C)", "Volume of reactor (l)", "Chicken manure content (%)", "Moisture content (%)", "Active sludge content (%)", "Final solids content (%)", "Biogas production (ml/g VS)", "Methane production (ml/g VS)", "methane content (%)", "Year of the research", "Ammonium nitrogen content (mg/l)", "Final pH", "Initial pH", "Minimal pH" and "Maximum pH" [14, 17, 18, 26]. The characteristics were selected from the studies on dry fermentation of chicken manure and were input to the google sheets.

The data were processed by the methods described in detail in our previous works [3, 16]. As a result, it was possible to use ranging from

previous research results. The general view of the taxonomy is presented in Figure 10. The interface for selecting the importance of indicators is presented in Figure 11, and the interface for ranking the results is presented in Figure 12. The interface for selecting the priorities of numerical information for ranking allows taking into account the priority of modern articles, with the correct marking of important criteria. The considered system allows a quick search of the information by the necessary criterion [19].

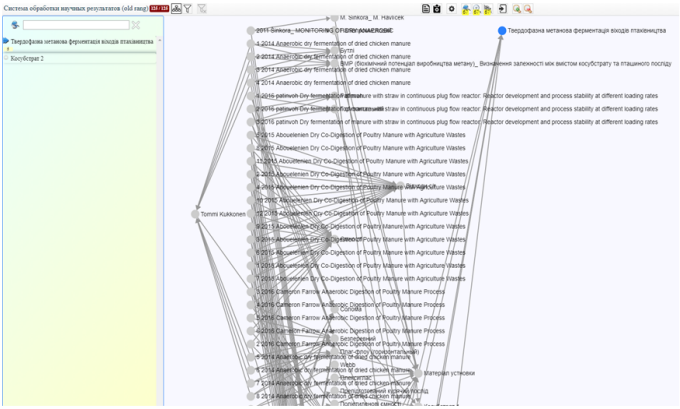


Fig. 10. The general view of the taxonomy

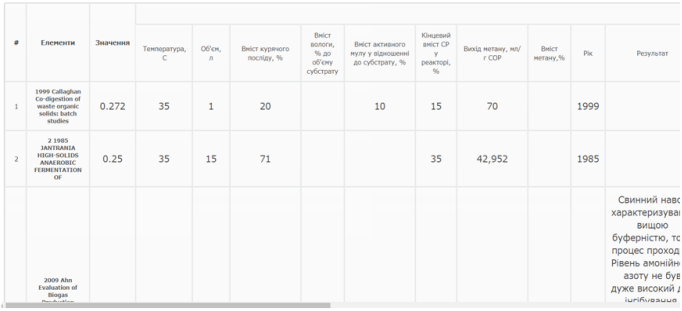
Система обработки научных результатов (old rang)

(Оптимізація)

Опрацювати

Вибір	Ім'я	Ваг. Коеф.	Опт (max/min)	Способи задання вагових коефіцієнтів		
				Бальна шкала (10)	Лінгвістична шкала	Ранкування
☑	Температура, С	0.038	max	5	Середня важливість	1
☑	Об'єм, л	0.038	max	5	Середня важливість	1
☑	Вміст курячого посліду, %	0.038	max	5	Середня важливість	1
☑	Вміст вологи, % до об'єму субстрату	0.038	max	5	Середня важливість	1
☑	Вміст активного мулу у відношенні до субстрату, %	0.038	max	5	Середня важливість	1
☑	Кінцевий вміст СР у реакторі, %	0.038	max	5	Середня важливість	1
☑	Вихід метану, мл/ г СОР	0.038	max	5	Середня важливість	1
☑	Вміст метану,%	0.038	max	5	Середня важливість	1
☑	Рік	0.038	max	5	Середня важливість	1
☑	Результат	0.038	max	5	Середня важливість	1

Fig. 11. The interface for selecting the importance of indicators



#	Елементи	Значення	Температура, С	Об'єм, л	Вміст курячого посліду, %	Вміст вологи, % до об'єму субстрату	Вміст активного мулу у відношенні до субстрату, %	Кінцевий вміст СР у реакторі, %	Вихід метану, мл/г СОР	Вміст метану,%	Рік	Результат
1	1999 Callaghan Co-digestion of waste organic solids: batch studies	0.272	35	1	20		10	15	70		1999	
2	2 1985 JANTRANIA HIGH-SOLIDS ANAEROBIC FERMENTATION OF	0.25	35	15	71			35	42,952		1985	
	2009 Ahn Evaluation of Biogas											Свинний навс характеризуваі вищою буферністю, тс процес проход Рівень амонійн азоту не буе дуже високий д

Fig. 12. The interface for ranking the results

4.3 Transdisciplinary using scientific results in education and science. Single science digital environment to provide STEM-education

As it was proposed previously, the ontology-based system can be used to provide integration and transdisciplinary using internal sources [15, 20]. Databases created by a group of scientists who provides research will be able to share it to the open-source general database. That knowledge can be used by a huge amount of people not just scientist. As it was proposed previously, the ontology-based system can be used to provide integration and transdisciplinarity using internal sources. It means, that multidisciplinary ontology-based educational environment can't be used as the main instrument which provides scientific method of education and can integrate other instruments of STEM-education such as augmented reality or mobile phones involving [10–12, 15, 20, 23]. The proposed system will be very useful for students and young scientists who just start their research work.

5 Conclusions

1. A huge amount of scientific information can be systemized by using TODOS IT-platform.
2. TODOS IT-platform can provide a high level of informational structuring and information processing through the creation of the hierarchy and using TODOS instruments such as ranking and filtering.
3. TODOS can be used to both systemize the science information and to create useful databases (Big Data based) instruments for the scientist.
4. We developed the method of systemizing scientific information which is characterized by a higher level of informational processing.

5. TODOS integrate the scientific processed data in a single scientific informational field which involves scientists and students to provide transdisciplinary researches.
6. The proposed system can be used not just for a huge amount of people not just scientist and provides integration of internal and external sources to provide research approach in STEM-education.

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Use of Web 2.0 technology tool — educational blog — in the system of foreign language teaching

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Abstract. This paper discusses the use of a Web 2.0 technology tool — educational blog — in the system of teaching foreign languages for enhancement of teaching effectiveness and optimization of students' performance. The authors describe the content, characteristics and didactic properties of an educational blog as an alternative or auxiliary educational environment, define its methodological objectives and list a number of advantages of this approach versus conventional teaching model. The effectiveness of the above-mentioned Web 2.0 technology tool was confirmed by the experiment which showed that an educational blog integrated in a foreign language teaching system contributed to optimization of the process of teaching and learning, development of foreign language communicative competence of students and thereby allowed them to acquire not only communicative but also technological skills.

Keywords: tools, Web 2.0 technology, optimization, training, foreign language, educational blog, communicative competence, communicative and technological skills, educational blogosphere.

1 Introduction

Nowadays, optimization of foreign language teaching and learning approaches is a relevant objective not only in the field of education, but also in other areas of modern human activities. Today, every person willing to

master a foreign language always faces the task to accomplish the language learning within a short period of time and with minimal effort. Searching for the optimal way to solve this problem, the authors came to an idea that expedient and effective learning of a foreign language can be achieved in the environment that contributes to accelerated assimilation of language and speech units and overcoming of language barriers.

Development of effective tools for teaching foreign languages has been an objective of the education system over the past decades. However, each year this problem obtains new features due to the wide involvement of new ICT into our lives [7, 21]. In our opinion, to solve this problem such learning tools can be used, which, on one hand, require minimal effort in terms of their implementation but, on the other hand, require the most complex and time-consuming preparation for optimization of foreign language teaching and learning. Currently, the leading methodologies of foreign language teaching and learning implicate use of Internet with its rich resources including websites, e-mail and electronic encyclopaedias, telecommunication projects, Web 2.0 technologies, e.g. video conferences, podcasts (for example, Elementary Podcast from the British Council and 6 Minute English from the BBC), chat sessions, forums, blogs, and more [6, 17].

Our study showed that Web 2.0 technologies, in particular educational blogs provide the most complete solution to optimization of educational activities in the field of teaching foreign languages. We are convinced that integration of Web 2.0 technology tools in the educational process provides an effective teaching approach due to didactic properties of such tools, including ease of use and accessibility, efficiency of the information space organization, interactivity and multimedia interface, reliability and security, and will contribute to optimization of the system of teaching and learning a foreign language.

2 Description of an educational blog as a Web 2.0 technology tool

Scientific substantiation of the theory of learning through an educational blog is implied by the studies published by Lisa Kim Bach [2], Joel Bloch [3], Rebecca Blood [4], Aaron Patric Campbell [5], Charles Lowe [14], Will Richardson [19], Terra Williams [14], and others. In turn, Maksim N. Evstigneev [22], Anna V. Filatova [8], Dmitrii A. Ivanchenko [9], Liliia K. Raitckaia [18], Pavel V. Sysoev [22], Svetlana V. Titova [23], and others established the modern theoretical basis for integration of blog technologies in the process of teaching foreign languages.

In this paper, we will focus on using an educational blog as a tool for optimization of the foreign language teaching process. The blog is one of the Web 2.0 technology services which creates conditions for improving all types of student's foreign language speech activities.

Web 2.0 technologies present an attractive educational tool due to, first of all, their availability, simplicity and possibility of independent and unsupervised work of students providing thereby more free time in the classroom. At present, an educational blog is used in teaching foreign languages with the aim to solve a whole range of methodological objectives, including: building and improving the listening comprehension skills (speech recognition), pronunciation, expanding and enriching a vocabulary, developing speaking and writing skills (Lisa Kim Bach [2], John Barger [20], Joel Bloch [3], Maksim N. Evstigneev [22], Liliia K. Raitckaia [18], Pavel V. Sysoev [22], Geoff Isaacs [15]).

Creating a blog as a part of the educational process, can solve such **tasks** as *forming informational, communicative, and sociocultural competencies of students, expanding information space of the educational process, organizing extracurricular work on the subject, publishing creative works, forming the bases for correct cultural and safe behaviour in the network, improving communicative and technological skills* [11].

The modern classification of educational blogs is widely described in methodological literature. A blog can be created for free on one of the blogging platforms, such as Blogger, LiveJournal or Tumblr, using ready-to-use layouts and templates. Blogs are usually dedicated to a certain topic and include entries on various subjects.

First of all, we should define the term "blog". A blog (or web log) is an online journal or diary on a website, the main content of which is regularly updated with adding posts, images or multimedia. Blog pages can contain links to Internet resources and integrated external applications such as flash videos, news feeds, simulators, tests, gadgets, mini-applications, etc. Gadgets (widgets) are mini-applications created by software developers as support tools. There is a quite broad range of gadgets in the Internet, from which you can choose those that could be useful both for teachers (moderators) and students. Among those related to learning a foreign language are, for example, "Translator", "Holiday Calendar", "Aphorism of the Day", "Useful Links", Pinterest, Fluent U, Cramberry, BX language acquisition, Barabook, Urban Dictionary, Fluent U, Conversation Exchange, MosaLingua, etc. Characteristic features of blogs include short posts with time-sensitive content, sorted in reverse chronological order (the last entry on the top).

The main and the most significant difference between a blog and a website is its interactivity. In a blog, students can communicate with each other and with the teacher in the extracurricular time via external applications integrated on a gadget page through a chat or video conference. Communication can be further performed through publication of comments, which, in fact, resembles forums. Blog readers (students and teacher's colleagues) can write comments to each message posted by the blog moderator on blog pages. In addition, the moderator can provide online tutorial or give advices, organize a joint online work on a project or study. We should further note that a blog differs from a classic website primarily by the ease of its creation, since the user does not require any knowledge of HTML-layout, design, or network marketing skills needed for a website promotion. It is very easy to make changes to a blog, even though a smartphone, as well as to add new modules due to an "open source" philosophy. According to Steve Lee and Melis Berry, the occurrence of web 2.0 technologies allowed to shift the focus from the technology and media to communication and cooperation, which by itself is the goal of education [13].

3 Integration of an educational blog as a Web 2.0 technology tool in a foreign language teaching system

Since today an educational blog, as was noted above, presents an innovative teaching/learning resource, at the stage of learning a foreign language (local language of the country of study) we conducted a teaching experiment in groups of foreign students at technical higher education institutions (http://rusdiliukraina.blogspot.com). The experiment demonstrated effectiveness of this approach as an optimal way of teaching electronic communication to foreign students, as a new form of their self-actualization. In view of the fact that a blog also provides tools of synchronous and asynchronous communication [16], such technological environment of learning also contributes to overcoming the communicative barrier that a foreign student faces in interpersonal communication. Exemplary screenshots of educational blogs are provided in Figure 1.

Integration of this educational environment into the process of foreign language teaching includes a number of advantages, as was shown by the results of our teaching experiments. Introduction of educational blogs in the educational process also contributes to optimization of this process, enhancement of foreign student's motivation and development of cognitive activities, formation of skills of independent/unsupervised work and creative

Fig. 1. Exemplary screenshots of educational blogs

thinking [1]. Optimization of foreign language teaching and learning is achieved through the use of special functions of an educational blog which allow not only to realize the general didactic principles, including *visual aids, accessibility, systematicity and consistency, developmental and educational character of education*, but also the special functions of teaching: *social, communicative, informative and administrative.*

The teacher who also performs the blog moderator functions, works with students remotely, posting on the page a number of tasks for independent and group work, tests for self-examination.

In the course of the teaching experiment, it was observed that one of the main advantages of using an educational blog in foreign language teaching is the possibility to place a set of educational documents for the student in a separate section of the blog. Such documents include the curriculum on the subject, individual and grade-based educational programs, system of grades, teacher's consultation schedule, homework assignments, supplementary materials for specific classes, recommended sources for independent student's learning (reading and listening, for example, podcasts and feature stories), links to information, reference and educational online resources, links to online tests on the topics studies within the scope of an independent student's work (for example, after finishing some topics on Grammar, students have the opportunity to check their knowledge by passing an online test).

An important role in a blog-based learning belongs to the use of google-forms based on which questionnaires or tests can be created, to reinforce the material studied. Students can answer the proposed questions both offline and online. Comments of group members in this format help the teacher to quickly respond by making changes, corrections and adjustments to the educational material. Publication of questionnaires and on-line tests allows to track the learning success of each individual student and the entire group within a scope of the topic studied.

A significant part of a blog is allocated to additional, supplementary materials designed to enhance lesson materials. Thus, for example, within the scope of the teaching experiment, use of educational films and cartoons, audio files, and video clips caused a lively and active discussion in the group of students.

It was observed that the educational blog contributed to the formation of student's skills of independent work, enhanced student activity, increased motivation, activated self-control during the learning process, student's motivation to independently find the necessary information. Accordingly, the level of student's interest correlates with the amount of time spent

on homework, projects, etc. Thus, improvement in the quality of tasks performed was observed, since the student was not limited by the timeframe of the lesson.

In our opinion, an educational blog helps to expand the educational space, as during the lesson there was not enough time to pay attention to each student and answer all students' questions, while the "blog lesson" allows students to work in a free mode, without any strict time limits, and to learn material at own pace.

In addition, an educational blog provides an opportunity to reorganize extracurricular activities of the educational process participants. Various slide-shows, summaries and discussions of conference talks, thematic evenings and concerts, presentations, reports about events happened in a student group or during classes, writing essays, exchange of useful links — all this improves the skills of working with information and communication technologies, promotes the development of communicative and technological skills and broadens student's mind.

The teacher works with students offline, giving them freedom in performing their tasks, but at the same time directing, controlling and correcting the process of their foreign language learning which undoubtedly contributes to intensification of the educational process.

In addition, blogging leads to optimization of organization of students' independent work [10, 12], because blog sections contain necessary for students information in the form of links, texts, finished educational materials, databases, based on which students can accomplish both independent and individual work.

Our study showed that blog-based learning provided students with the opportunity to manage their learning activities, publish their own thoughts and demonstrate understanding of educational material. It also broadened the tasks to be performed beyond the educational process and the "teacher-student" relationships, allowing everyone to rate and comment on their activities. Blogs also provide students with an opportunity for individualization, increase their interest in the learning process, as novel technologies belong to motivating factors in the learning process. In our study, such motivation was not only the result of technological opportunities, but was also related to the fact that students could write about what was important for them personally.

Thus, after organizing and preparing the teaching experiment supported by dedicated pedagogical technologies, we conducted a survey of the level of foreign language communicative competence of foreign students at a number of technical higher education institutions. The data obtained during

this experiment were analysed statistically using Pearson's chi-squared test and Fisher's exact test. Table 1 and Figure 2 show improvements in the learning success in the experimental group vs. control.

Table 1. Changes in the level foreign language communicative competence of foreign students in the experimental and control groups (% of the total)

Levels	**Control group (106 participants)**				**Experimental group (105 participants)**			
	Stage of the experiment							
	Ascertaining		**Control**		**Ascertaining**		**Control**	
	n	**%**	***n***	**%**	***n***	**%**	***n***	**%**
High	14	13.2	18	17.0	12	11.4	25	23.8
Satisfactory	38	35.8	44	41.5	38	36.2	52	49.5
Low	54	51.0	44	41.5	55	52.4	28	26.7

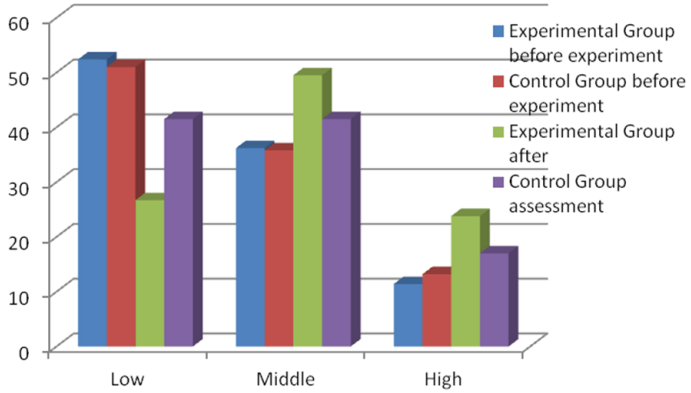

Fig. 2. Comparative histogram of changes in the level of foreign language communicative competence of foreign students at technical higher education institutions in the experimental and control groups

The results obtained show significant changes achieved in the experimental group compared with the background level. The experimental group achieved a high level of foreign-language communication and technological skills and developed professionally significant personal qualities. In the control group, which learned foreign language according to the standard scheme, the level of foreign language communicative

competence increased by only 4.28%, compared to 14% in the experimental group.

These results suggest that an educational blog creates an alternative, auxiliary learning environment providing beneficial effects for student success.

4 Conclusions

In conclusion, we must emphasize that the above mentioned Web 2.0 technology tool — an educational blog — proved to be effective in optimizing foreign language teaching, in view of its multiple features and advantages, such as:

- hierarchical structure of the blog providing comfort and availability of work in the blog environment;
- function of translation of information in foreign language posted in sections of the blog, which allows students to view information in their native language;
- widgets and gadgets placed on the blog pages (various external applications — blog chat, calendar of events, etc.), links to information and reference Internet resources (online dictionaries, Google translator), links to training Internet resources (Webquests, optional distance education courses, podcasts, etc.) helping foreign students to navigate while working on a blog;
- creation of a micro-social environment contributing to the establishment of a trustful, accommodating relationships between the teacher — moderator of the blog — and students from different national groups and of different temperaments;
- opportunity to conduct consultations in different communication modes (both online and/or offline);
- co-authoring of the blog enhancing the level of motivation of students with this form of education;
- opportunity to use forms, methods and techniques of cooperative learning during the learning process, as well as integrate tests into the relevant sections of the blog by the moderator;
- technical possibility to place the most optimal for the modern educational process form of presentation of the educational content ("three in one": text, audio/video, graphics), etc.

Therefore, didactic properties of Web 2.0 technology tools, in particular the educational blog, contribute to organization of innovative management of educational activities of students, allowing to create a new, alternative, auxiliary educational environment taking into account individual capabilities and characteristics of each participant in the educational process. In our opinion, integration of open educational blogs in the process of education, should lead to the creation of a unique learning blogosphere, in which all participants of the educational process will be able to obtain necessary information, communicate, jointly create a database, exchange ideas, improve communication and technological skills.

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Information and technology case as an indicator of information competence level of the translator

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Abstract. The article deals with the innovative approach to the organization of the information training of translators. The proposed approach will ensure not only the formation of information competence of future translators, but also the formation of an individual information and technology case of the translator. The components of an individual information and technology case are determined. They may include electronic terminology databases, translation memory databases for use in automated translation systems, databases of electronic links to terminological resources network, databases of electronic links to corpora of parallel texts. The using information and technology case of the translator as one of the diagnostic tools for evaluating the information competence level of the translator is proposed. It was found that the creating information and technology case is effective in developing information literacy and improving information technology skills.

Keywords: innovative approach, information technology, information and technology case, information competence of future translators.

1 Introduction

The realities of the information society lead to radical changes in the conditions and nature of professional activities of specialists in all spheres of life. Special transformations relate to professions that have traditionally been not closely linked with the use of information technology, in particular, professional translation activities. Appropriate reorientation is also needed in higher education institutions that train translators. Given the rapid development of information technologies that affect, in particular, scientific

and technical translation, and based on a competent approach to the training future professionals, it is important to focus on the development of information competence of translators. The development of this competence will enhance the competitiveness of current students in the market of translation services. In view of this, the search and implementation of innovative approaches to information training of translators in the process of their study is relevant.

2 Related work

The specification of an optimal translator's competencies complex that meets modern requirements and takes into account the technology of translation activities was investigated by domestic and foreign scientists, in particular, Oleksandr S. Bondarenko [4], Christiane Nord [8], Alla S. Olkhovska [9], Dennis Scheller-Boltz [11], and others. All researchers agree that, along with language knowledge, the knowledge of modern translation tools based on specialized information technologies is equally important.

In particular, Dennis Scheller-Boltz notes that in the CIS countries today there is no understanding of the integral complex of competencies of the professional translators, or it is only partial and has not sufficiently developed yet. So far, many translators believe that language competence is a dominant in the translation process. Without denying that knowledge of a foreign language is one of the main components of the translator's competencies complex, the scientist states that nonetheless, many other competencies, in particular informational, should be formed for the successful translation [11].

The Research group PACTE (Process in Acquisition of Translation Competence and Evaluation — Amparo Hurtado Albir (director), Allison Beeby, Mònica Rodríguez Fernández, Olivia Fox, Inna Kozlova, Anna Kuznik, Wilhelm Neunzig, Patricia Rodríguez-Inés, Lupe Romero Ramos), on the basis of the Autonomous University of Barcelona (Universitat Autònoma de Barcelona), has developed a model of competence of the translator, emphasizing the need to take into account the knowledge of various components due to the translation process. According to scientists, the competence of the translator consists of five subcompetencies, namely:

- language competence, that involves fluent knowledge of two languages,
- extra-language competence, that covers different types of background knowledge,
- translation competence, that means the ability to translate in working languages,

- strategic competence, related to knowledge and decision making on the choice of translation strategy,
- instrumental competence, related to modern information tools of translator based on information technologies [10].

In order to develop information and technological skills, Christiane Nord offers the structure of a training program for technical translators, according to which the course "Practice and theory of specialized translation" should be studied during the last two semesters and involve studying both traditional and electronic translation tools [8].

However, despite the available work of scientists, an effective system of formation of the information competence of the translators has not been developed yet.

The purpose of the article is to consider innovative approaches to the information training of the future translators at different stages of mastering information technologies and to determine their content and tasks in relation to the formation of an individual information and technological case of the translator.

3 Research methodology

The methodology of the study covered a number of methods that provided for the study of individual aspects of the problem, namely:

- method of analysis and synthesis in the study of scientific literature and methodological documentation to determine the degree of problem investigation;
- comparative analysis of international standards for the training translators, standards for their professional activities to distinguish the main components of the informational competence of future translators;
- empirical methods — questionnaires, interviews, interviews to determine the attitude of future translators to the issue of information competence.

4 Research results

The problem of forming the informational competence of future translators during their studies at the university is considered in the context of concepts developed by scientists. They are based on numerous theoretical

and empirical studies on the implementation into the educational process of various forms of educational work, methods and means of training that in aggregate contribute to the achievement of students by such level of knowledge of information technology, which is necessary for successful professional activities.

It is worth noting that the researchers expressed the idea of a close relationship of information competence and ways of interaction of a person with information, which is determined by a set of three main components: information technology, conditions of use of information and features, due to special circumstances. This understanding has been reflected in a distinct complex of concepts that summarize the main characteristics of the information competence:

- information technology conception — using information technology for information retrieval and communication;
- information sources conception — finding information;
- information process conception — executing a process;
- information control conception — controlling information;
- knowledge construction conception — building up a personal knowledge base in a new area of interest;
- knowledge extension conception — working with knowledge and personal perspectives adopted in such a way that novel insights are gained;
- wisdom conception — using information wisely for the benefit of others [5].

Variable components, which depend on the particular circumstances of use of the information, are as follows:

- information technology for access to relevant information;
- information sources (including organizational structures and information specialists);
- information process for problem solving and decision making;
- information management to get more information;
- critical analysis of ideas and knowledge expansion;
- intuition to develop new ideas;
- personal values and moral perceptions regarding the use of information.

Taking into account the aforementioned, the successful mastering of the modern translator's tools by the future specialist depends on his awareness of the growing prospect of no alternative to the use of information technology in translation. In order to determine the degree of awareness of the role of information technology in translation activities at the present stage and the importance of their study during the training period, a questionnaire was conducted among future translators. 68 students of the specialty "Translation" of the National University of Life and Environmental Sciences of Ukraine attended it. As a result, it was found, that 87% of students noted the need to study information technology in translation. In addition, 26% of respondents even expressed the need for an in-depth study of modern translator tools based on information technology. This testifies to the urgency of finding new approaches to the organization of the educational process in order to improve the information training of translators.

Among the innovations that can contribute to improving the effectiveness of informational competence formation in future translators, the following should be noted:

- orientation of professional training of translators to the requirements of European and international standards for the formation of information competence as a factor in ensuring their competitiveness in labor markets;
- direction of the content of courses of professional and practical training for forming the components of information competence;
- implementation into the curriculum of a special course, which will ensure the formation of the components of information competence in applying modern information technology in professional activities;
- internships in translation agencies using modern tools based on information technology involving students to the main stages of translation projects [2].

The enhancement of the synergetic effect in applying these innovations in mastering modern information technologies by future translators can be achieved by introducing such a system of their training that would involve the formation of their information competence. It includes the acquisition of abilities through the implementation of a complex of translation tasks with simultaneous filling throughout the period of training of an individual information and technology case of the translator. Under the information and technology case of a translator, we understand the complex of student

outcomes, which reflects his ability to use information technology in translation and for which he must focus his efforts during studying.

The conceptual idea of such an approach is that the student develops, at the initial stage of training, under the guidance of a tutor, his own working plan for the period of study, which includes a phased implementation of a series of tasks aimed at:

- in-depth mastery of the terminology of several specialized branches;
- search for available terminology resources databases, including those selected for in-depth study;
- development of own terminology databases in formats that can be used when working with automated translation systems;
- formation of bases of aligned parallel texts and translation memories databases in specialized formats based on the results of their own translation activities and using materials that are freely available;
- translation of branch materials using desktop and cloud automated translation systems;
- expansion of its own information space by participating in network professional communities (forums, blogs, webinars, conferences);
- research on the efficiency of the use of information technology in translation.

Successful implementation of this process can be achieved by clearly defining the results that a student must achieve; stages of achieving these results; the components of the information competence of the translator, the formation of which ensures the execution of the specified set of tasks. It is worth noting that it is necessary to adhere to the definition of the structure of the stages of such activity, their correlation with the classical division of the educational process for periods, and most importantly with the levels of knowledge by future translators of information technology [2].

Considering in this context the process of forming a coherent structure of the informational competence of the future translators, it is worth noting that its content should be consistent with the standards of leading foreign countries that regulate the quality and order of providing translation services. The most common of these standards are International ISO 17100:2015 "Translation Services — Requirements for translation services" [7] and American ASTM F2575–14 "Standard Guide for Quality Assurance in Translation" [3]. These standards define a common list of competencies of the translator, which generally coincide in name and content, and in particular, the structure of information competence.

An important aspect in shaping the structure of the information competence of the translator is taking into account the elements of information competence identified in the European Master's program (European Master's in Translation) [6].

Summarizing the requirements of these documents and the experience of training translators, we consider it appropriate to form the information competence of the translator in the list of components that cover the most significant aspects of their information training, namely the complex of such components:

- information retrieval component;
- information and technology component;
- informational and technical component;
- informational and analytical component;
- information and editorial component;
- informational and thematic component;
- information and legal component [12].

By concentrating on filling the information and technology case of a translator by each student, it is necessary to determine its components in a quantitative and qualitative dimension, because of which it will be possible to assess the level of formation.

Given that such levels can be used as indicators of the formation of an information competence of a translator, each level should have a separate set of constituents with defined quantitative indicators, or these components can be repeated at different levels but with other numerical limits. In addition, each higher level must contain at least one component that was not available at the previous level and is characterized by a higher complexity of its implementation. The number of levels for the expediency of determining the completeness of the information and technology case of the translator should be defined as four, which corresponds to the levels of formation of the information competence of the translator: low (reproductive), medium (technologized); sufficient (constructive), high (productive) [12].

Considering the above, the information and technology case of a translator may include several indicator. The list and the quantity may vary, and depending on the level of their implementation, it will be possible to determine the level of formation of the student's information competence. In particular, such components may include:

- database of software products for performing various translation tasks, taking into account information about the type and value of the license;
- databases of electronic links to network terminology resources;
- electronic terminology databases of branch terminology;
- databases of aligned parallel texts;
- translation memory databases for use in automated translation systems;
- database of texts translated using CAT systems;
- databases of electronic links to corpora of parallel texts;
- database of network professional communities, registration and participation;
- scientific articles covering various aspects of the use of information technologies in translation;
- certificates of internship in agencies and organizations, including international ones, using information technology in translation;
- certificates of the level of knowledge of specialized software in translation (companies, their dealers, certification centers, etc.).

The practical realization of the components of this complex must certainly be provided for the instrumental support, which in this case is realized by means of specialized software. Since it is about using this software by students during training, it is worth noting that the use of professional proprietary software has certain limitations associated with its cost. In this regard, students should be oriented, preferably, to studying and using for these purposes software with a free license, or cloud services with available periods of free access or access for a minimum fee. This option of using specialized software by students is realistic, as a significant number of companies offer services on the use of cloud-based automated translation systems, which implement the functions of creating terminology bases, aligning parallel texts, creating databases for translation, etc. The presence of such functions will allow realizing the overwhelming part of the set of components of the information and technology case of the translator. Such systems are MemSource, Wordfast Anywhere, XTM Cloud, MateCat, MemoQ, smartCAT. There is also a significant number of desktop software products with open source licensed, that have similar features.

As noted, one of the components of the information and technology case is the electronic terminology database of the branch terminology. The ability to implement such a component lies at the heart of many technological processes associated both with translation and with terminology management. In particular, it should be noted that, depending on the needs, such databases could be made in different structures, in different formats and by different software tools [1].

The simplest and most widespread form of structuring terminological entries and forming terminology databases on this basis is the tabular form that is usually implemented by means of the MS Excel table processor and the saving results in the format of XLSX. Applying this option allow to structure the terminology entries in the columns by language, and within the line, there is a concentration of entries, which relate to one term. The advantages of such structuring terminological data and using the appropriate format are:

- wide access to relevant software products in the structure of many desktop and network office packages (Office 2019; Office 365; Google Sheets, etc.), with the help of which it is possible to structure data in tabular form and save results in XLSX format;
- previous experience with the use of tabular editors and processors for structuring data in tabular form;
- universality of the XLSX format for saving terminology databases, since almost all network automated translation systems and part of desktop systems can work with them directly in this format or with certain transformations to their own format.

The slight differences in the preparation of terminology databases in the XLSX format for various automated translation systems lie predominantly in the area of application of the corresponding language coding systems in accordance with the standards ISO 639–1 and ISO 3166–1 alpha-2 (Figures 1, 2). Although in some cases, it is necessary to take into account possible changes in the structure of the base.

Taking into account the peculiarities of the preparation of this component of the information and technology case of the translator, its formation with different quantitative indicators should be part of the case formed at the initial and subsequent levels.

The higher level of the formation of the case, and, accordingly, the information competence, must meet the developed terminology database in specialized formats, which can be connected to the common automated translation systems. In particular, SDLTB terminology databases for

SDL Trados (Figure 3) can be included. Despite the fact that SDL MultiTerm specialized terminological management system is required to create and fill it, it is possible to achieve qualitatively new indicators of their informativeness and technology, in particular by filling descriptive fields, using filtering functions, etc. In this context, it is necessary to focus separately on the possibility of filling the information-technological case by forming and saving terminology bases directly in the environment of the CAT systems. Since almost all cloud-based CAT systems contain tools for filling them in various ways, in particular, importing terms from files, adding terms using the appropriate forms and functions (Figure 4), adding terms directly in the translation process, etc. Such options can be implemented during the period of work with the information technology case using the available tools.

	A	B	C
1	**en_US**	**en_US**	**uk_UA**
2	multishare plow	multifurrow plow	багатокорпусний плуг
3	corn cutter	corn mower	жатка кукурудзяна
4	sweer-fork feed	shaker feeder	живильник вібраційний
5	grass drill	grass seeder	трав'яна сівалка
6	hi-arch tractor	high-clearance tractor	висококліренсний трактор
7	caterpillar tractor	crawler tractor	гусеничний трактор
8	wheel tractor	wheel-type tractor	колісний трактор
9	power take-off shaft	pto shaft	вал відбору потужності

Fig. 1. Structure of the branch terminology database in XLSX format with the possibility of using it in cloud-based CAT systems XTM Cloud, MemSource, Wordfast Anywhere

	A	B	C
1	**English**	**English**	**Ukrainian**
2	corn harvester	maize harvester	кукурудзобиральна машина
3	corn sorting machine	maize sorting machine	кукурудзоочищувальна машина
4	hulling machine	hulling separator	лущильна машина
5	packaging machine	packager	пакувальна машина
6	compress machine	press machine	пресувальна машина
7	drum-type washer	rotary washer	барабанна мийка
8	apron washer	belt washer	конвеєрна мийка
9	agitator	mixer	мішалка

Fig. 2. Structure of the branch terminology database in the format of XLSX with the possibility of its further conversion and use in the SDL Trados

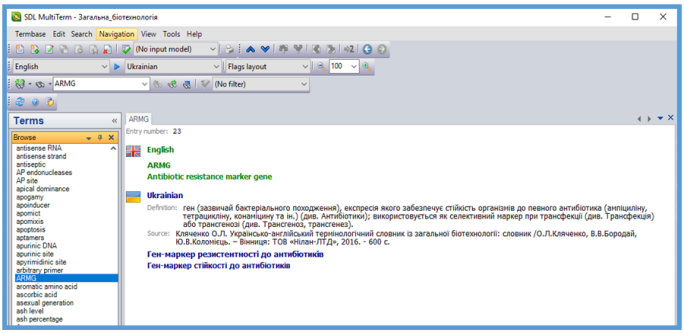


Fig. 3. Structure of the window and tools of the SDL MultiTerm system for working with the terminology database in .sdltb format

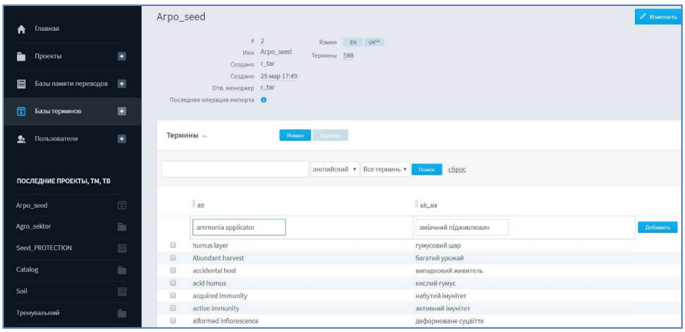


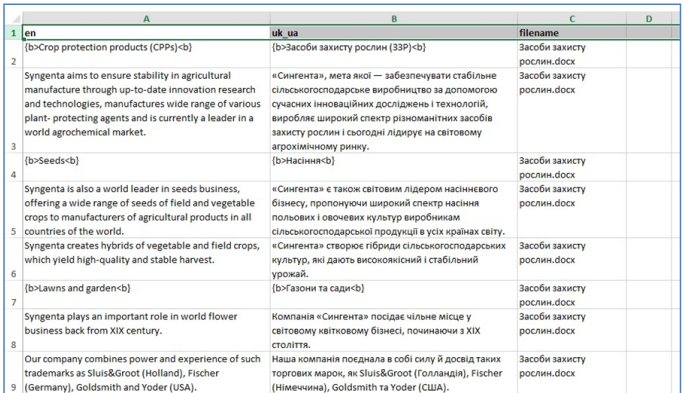
Fig. 4. Structure of the window and tools of the cloud-based CAT system MemSource for working with the terminology database

A special place in the structure of the components of the information and technology case of the translator take the translation memory, since it is based on the work of the main modern tools in translation, namely, automated translation systems. A future translator can reach a certain level of filling his own translation memory databases during studying by performing appropriate operations and using specialized tools. In particular, the most accessible in this aspect may be actions aimed at the use of predefined databases of aligned parallel texts in appropriate formats for filling such databases, or saving the results of translations by using automated translation systems. That is, the implementation of this component of the information technology case is closely related to two

other components, namely, the formation of a database of aligned parallel texts and the development of a translation memory database using CAT systems.

Alignment of parallel texts can be done both with the use of desktop systems and with the toolkit that is in the structure of cloud-based CAT systems. In particular, a powerful tool for aligning parallel texts is the WinAlign program, which is part of the structure of the SDL Trados system, but it relates to proprietary software. To this end, the software Okapi Olifant Translation Memory Editor, which has a free license for use, can be successfully used and, accordingly, is available for use in the studying process and in self-study work. These software products can save the alignment results of parallel texts in a specialized TMX format that can be directly used as a translation memory database in some CAT systems, and it serves for such systems as SDL Trados as the main resource for importing into a database stored in SDLTM format.

As noted, alternatives to desktop systems may be appropriate tools for cloud-based systems. The process of aligning parallel texts in cloud-based CAT systems occurs mainly in automatic mode, with subsequent loading of files in the format XLSX to a personal computer (Figure 5).



	A	B	C	D
1	en	uk_ua	filename	
2	{b>Crop protection products (CPPs)<b}	{b>Засоби захисту рослин (ЗЗР)<b}	Засоби захисту рослин.docx	
3	Syngenta aims to ensure stability in agricultural manufacture through up-to-date innovation research and technologies, manufactures wide range of various plant- protecting agents and is currently a leader in a world agrochemical market.	«Сингента», мета якої — забезпечувати стабільне сільськогосподарське виробництво за допомогою сучасних інноваційних досліджень і технологій, виробляє широкий спектр різноманітних засобів захисту рослин і сьогодні лідирує на світовому агрохімічному ринку.	Засоби захисту рослин.docx	
4	{b>Seeds<b}	{b>Насіння<b}	Засоби захисту рослин.docx	
5	Syngenta is also a world leader in seeds business, offering a wide range of seeds of field and vegetable crops to manufacturers of agricultural products in all countries of the world.	«Сингента» є також світовим лідером насіннєвого бізнесу, пропонуючи широкий спектр насіння польових і овочевих культур виробникам сільськогосподарської продукції в усіх країнах світу.	Засоби захисту рослин.docx	
6	Syngenta creates hybrids of vegetable and field crops, which yield high-quality and stable harvest.	«Сингента» створює гібриди сільськогосподарських культур, які дають високоякісний і стабільний урожай.	Засоби захисту рослин.docx	
7	{b>Lawns and garden<b}	{b>Газони та сади<b}	Засоби захисту рослин.docx	
8	Syngenta plays an important role in world flower business back from XIX century.	Компанія «Сингента» посідає чільне місце у світовому квітковому бізнесі, починаючи з XIX століття.	Засоби захисту рослин.docx	
9	Our company combines power and experience of such trademarks as Sluis&Groot (Holland), Fischer (Germany), Goldsmith and Yoder (USA).	Наша компанія поєднала в собі силу й досвід таких торгових марок, як Sluis&Groot (Голландія), Fischer (Німеччина), Goldsmith та Yoder (США).	Засоби захисту рослин.docx	
10	For more than 140 years, we apply innovation technologies and leading selection methods to help professional florists achieve highest results in growing flowers.	Уже понад 140 років ми застосовуємо інноваційні технології і провідні методи селекції для досягнення професійними квітникарями найкращих результатів у вирощуванні квіткової продукції.	Засоби захисту рослин.docx	

Fig. 5. Fragment of aligned parallel texts base by cloud-based CAT system MemSource in the format of XLSX

Formation of other identified components of the information and technology case of a translator is no less important than those discussed in

more detail above and is an important indicator of students' knowledge of the information technologies used in translation process.

Table 1. The correlation of the results of the formation of an information and technology case of a translator with the level of information competence

The formation level of information and technology case	**Components of information and technology case**	**Quantitative indicators of the components of the information technology case**	**The level of the information competence**
1	**2**	**3**	**4**
I	Database with a list of software products for performing various translation tasks	Up to 5 products	low (reproductive)
	Database of electronic links to network terminology resources	Up to 5 links	
	Electronic terminology databases in XLSX format	Up to 500 terms	
II	Database with a list of software products for performing various translation tasks	At least 10 products	medium (technologized)
	Electronic terminology databases in XLSX format	At least 2000 terms	
	Databases of aligned parallel texts	Up to 1000 segments	
	Database of electronic links to corpora of parallel texts	Up to 5 links	
	Database of network professional communities, registration and participation	Up to 5 links	
III	Electronic terminology databases in formats XLSX, SDLTB	At least 5000 terms	sufficient (constructive)
	Databases of aligned parallel texts	More than 5000 segments	
	Translation memory bases for use in automated translation systems	More than 7000 segments	
	Base of texts translated using CAT systems	More than 50,000 characters	
	Database of network professional communities, registration and participation	Up to 5 links and participation in 1 of them	
	Scientific publications	Up to 2 publications	
	Certificates of internship in agencies and organizations	Not less than 1	

Continuation of Table 1

1	2	3	4
IV	Electronic terminology databases in formats XLSX, SDLTB	At least 7000 terms	high (productive)
	Translation memory bases for use in automated translation systems	More than 15,000 segments	
	Base of texts translated using CAT systems	More than 50,000 characters	
	Database of network professional communities, registration and participation	Up to 7 links and participation in 2 of them	
	Certificates of the level of skills of the use of specialized software in translation	Not less than 1	
	Certificates of internship in agencies and organizations	Not less than 2	
	Scientific publications	More than 2 publications	

The results of systematization of the aforementioned aspects of the formation of the components of the information and technology case of the translator in quantitative and qualitative dimensions, which are correlated with the levels of formation of information competence, are given in Table 1.

The structuring of data summarized in the data table concerning the qualitative and quantitative indicators of the information and technology case of the translator can be used as one of the diagnostic tools for determining the levels of formation of the information competence of the translator, which was carried out during the experimental study.

The overall sample consisted of 96 students. They were assigned to experimental group and control group so that each group comprised 48 students. The analysis carried out at the end of the experiment based on control diagnosis showed significant changes in the experimental group (Table 2).

In particular, the number of students in the experimental group, which had a low level of information competence formation at the beginning of the experiment, decreased from 69.6% to 15.2%. At the same time, positive dynamics is observed also at the average level, where the growth was 13.0%. The effectiveness of the study of information technology, typical of translation process, to increase the level of information competence of future translators is that 34.8% of students have reached a sufficient level and 6.5% the high level, although at the beginning of the experiment there were no students at all such levels of information competence.

Table 2. Dynamics of formation levels of information competence

Levels	Control group		Experimental group	
	at the beginning of the experiment, %	**at the end of the experiment, %**	**at the beginning of the experiment, %**	**at the end of the experiment, %**
low (reproductive)	68.1	59.6	69.6	15.2
medium (technologized)	31.9	38.3	30.4	43.5
sufficient (constructive)	0.0	2.1	0.0	34.8
high (productive)	0.0	0.0	0.0	6.5

5 Conclusions and future work

Based on the study, an approach has been proposed that can contribute to the achievement of high efficiency in the formation of an integral structure of information competence of translators. This approach is based on the orientation of the student on the creation of an information and technology case of the translator. It is determined that the indicator of the level of formation of information competence is the completeness of a certain set of components of such a case. The translator's information technology case includes a set of components that reflect a list of the most important information, terminological and technological resources that can contribute to the successful implementation of translation projects in educational and professional activities.

Thus, it is possible to create the prerequisites for successful start of professional activity of future translators, determining and evaluating the completeness and level of formation of the translator's information and technology case during the implementation of an individual plan by each student. It is due to the availability of important developments in information resources and knowledge of information technologies with a confirmed level of formation of information competence.

Findings of the present study have revealed the need to undertake further research works in many related areas. Further scientific studies may be related to the development of methodological aspects of the formation of the components of the information and technology case of the translator.

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Modern techniques of organizing computer support for future teachers' independent work in German language

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Abstract. The purpose of the study is to elucidate the theoretical and methodological aspects of computer support organization for independent work in a foreign (German) language for future teachers of different subjects.

The subject of the study is a methodological technique of organizing effective computer support for future teachers to work independently in a foreign (German) language.

Objectives of the study: to state the goals of studying foreign languages in its broad and narrow sense, the requirements for the results of future teachers' training in different subjects; to explore ways of organizing computer support for future teachers' independent work; to determine the list and purpose of the basic and auxiliary structural elements of a typical e-learning Moodle course in a foreign language; to provide methodological recommendations for the organization of future teachers' independent work in the content of a separate training module of the Moodle course "Foreign (German) Language".

The article summarizes the experience of organizing computer support for future teachers' independent work and the substantive and methodological features of its implementation into the process of experimental introduction of the Moodle course "Foreign (German) Language" into the educational process carried out on the basis of Kryvyi Rih State Pedagogical University.

Keywords: computerization of independent work, future teachers, methodology of teaching a foreign language, Moodle.

1 Introduction

The purpose of studying a foreign language in its broad sense (by future experts in any field) is mastering the language means for the implementation of the basic functions of the language, namely:

1. instrumental (language used to obtain things);
2. regulatory (to regulate the behavior of others);
3. interactive (to interact with other people);
4. personal (to express personal feelings and meanings);
5. heuristic (for learning and discovery);
6. imaginative (to create a world of imagination);
7. representative (for transmitting information) [14].

According to the educational programs for the preparation of future teachers of various subjects at Kryvyi Rih State Pedagogical University (KSPU), the purpose of studying the discipline "Foreign language" (as a normative one from the cycle of general preparation) is to acquire such competencies as:

- fluent reading and understanding of authentic ("true", official) texts of both general and professional orientation;
- recognition of basic grammatical constructions and their use in oral and written speech;
- defining of the topic covered in the text, the selection of the main opinion, the choice of basic facts; drawing up a plan;
- answers to questions about the main content, the ability to find and analyze the required content;
- communication on general and professional topics [29].

The main task of studying a foreign language for future teachers is the development of vocational competence in the field of professional communication, which includes the accumulation of geographical, historical, economic, cultural and political knowledge; expanding the universal cultural outlook, bringing them into the values and socio-cultural features inherent in different levels of civilization; forming one's own views, ability to hold discussions, ground one's own opinion, etc.

Considering the results of Valerii Yu. Bykov [5], Andrii M. Hurzhii [13], Tamara I. Koval [20], Mikhail P. Lapchik [23], Alla F. Manako [24], Nataliia V. Morze [28], Maiia V. Popel [25], Serhiy O. Semerikov [36], Mariya P. Shyshkina [34], Kateryna I. Slovak [33], Oleh M. Spirin [37], Aleksander V. Spivakovsky [8], Andrii M. Striuk [18], Illia O. Teplytskyi [35], Nataliia P. Volkova [31], Yuliia V. Yechkalo [38], Myroslav I. Zhaldak [45] and other national as well as foreign scientists, there can be argued that the

effectiveness of the fundamental training of future teachers in general (and in a foreign language in particular) can be implemented through the organization of a modern educational process using information and communication technologies (ICT). The pedagogically balanced and appropriate involvement of ICT software and Internet services will enable the students (future teachers) to become independent in their work. After all, the potential of independent work (in the classical as well as in the modern sense) allows you to realize the educational, developmental and educational functions of the educational process, promotes the development of students' intellectual and creative abilities, their cognitive activity and creative thinking, language and speech skills as well as to define their humanitarian position [42].

The organization of future teachers' independent work in a foreign language involving innovative ICT software and Internet services is especially relevant for:

- full-time students who receive education according to an individual plan (the proportion of independent work is more than 40% of the total number of academic hours in the discipline);
- students of part-time (distance) form of study (the proportion of independent work — at least 80%);
- students with special educational needs, etc.

2 Ways of organizing computer support for future teachers' independent work

Computer support for the educational process, including the independent work of students (future teachers), in any academic discipline, including a foreign (German) language, can be implemented in various ways with the involvement of current technologies of open education (education for everyone and education everywhere).

The first method is based on the presentation of an electronic educational and methodical complex in the discipline (or its individual components) in the repository of the educational establishment or on the webpages of educational and methodical materials of the department [7, 15–17].

Under these conditions, students' independent work usually involves working with electronic versions of officially published printed educational materials (textbooks, tutorials, etc.), which today require re-issue to supplement them with an interactive computer-oriented component.

The second method is based on the presentation of the components of the e-learning complex in the discipline, including materials for students'

self-study, on the corporate Google teacher's or department disk. (Note: On July 1, 2019, the volume of corporate account disks for non-profit educational institutions is not limited.)

One of the advantages of this method over the above mentioned is that cloud repositories can store resources in different formats (including multimedia), and not just text documents.

Another advantage is that, even when presenting practical tasks in the format of text documents — *.doc/*.docx or *.odt — (prototypes of electronic workbooks), students have the opportunity to download copies of such documents in order to store and open them for editing in a personal learning environment [21, 22] created with Google Drive and Docs services.

In addition, the owner of the e-learning complex in the discipline (teacher) independently determines the degree of openness of its components, because it has the ability to set up shared access to a folder with the complete complex or individual components of the complex for:

- a specific group of users whose e-mail is indicated in the corresponding window;
- users of corporate (educational) domain who will have a link to the resource;
- users of corporate (educational) domain in the absence of the link to the resource, and based on the results of its successful search;
- users of the Internet community by the link provided;
- Internet community users by search results.

The third way of organizing computer support for students' independent work is based on the presentation of relevant educational and methodological materials in the form of electronic training courses created and implemented in the educational process using systems or services of learning management, the most common of which (in the system of national education) is *Google Classroom* [2, 15] and *Moodle* [39].

Google Classroom is a portal solution that enables you to create an integrated e-environment based on a variety of cloud services and tools; a service that connects Google Docs, Google Drive, and Gmail, helps you create and streamline tasks, rate, comment, and organize effects — outside of real-time communication with students [10, 26].

Moodle (an acronym for Modular Object-Oriented Dynamic Learning Environment) is a learning platform designed by Martin Dougiamas, aimed at bringing educators, administrators and pupils (students) together into one reliable, secure and integrated system for creating a personalized learning

environment; a free, open, extensible learning management system that implements the philosophy of "pedagogy of social constructivism" (Ernst von Glasersfeld [9], Seymour Papert [30], Jean Piaget [32], Illia O. Teplytskyi [40], Lev S. Vygotskii [43]) and is focused primarily on organizing interaction between the teacher and students, although suitable for the organization of traditional distance courses as well as the support of full-time study; written in PHP using a SQL database (MySQL, PostgreSQL or Microsoft SQL Server) complies with SCORM; has been translated into dozens of languages, including Ukrainian, and is used in over 190 countries [27].

Opportunities for lecturers (teachers) in the Moodle environment: providing tools for developing author distance courses; placement of teaching materials (lecture texts, practical / laboratory and self-study assignments; supplementary materials (books, manuals, manuals, methodological developments) in .doc, .odt, .html, .pdf formats, and video, audio and presentation materials in different formats and through additional plugins; possibility of adding various elements of the course; rapid modification of educational materials; possibility of using different types of tests for creating test tasks; automatic formation of tests; automation of the process of knowledge testing; student completion of coursework and student test reports, adding a variety of plugins to the course (using a variety of third-party distance learning software).

Opportunities for university (secondary school) students in the Moodle environment: availability of learning materials (lecture texts, assignments for practical / laboratory and self-study papers; additional materials (books, guides, manuals, methodology recommendations) and tools for communication and testing 24/7; availability for group work (wiki, forum, chat, seminar, webinar); viewing your own results of the distance course, including the results of all attempts to pass the test; communication with the teacher through personal messages, forum , chat; downloading files from completed tasks, using event reminders up to date, etc. [1]

The Moodle system is not a specialized language learning tool, but its additional modules, including Read Aloud [12, 20], provide the ability to form and develop lexical, grammatical and phonetic competences in the process of different types of speech activity (reading, listening, writing and dialog speech), to evaluate pupils (students) on the fluency of reading and the correct pronunciation of foreign words in the texts reading process (Words Correct Per Minute) and more.

Taking into account the results of studies carried by Klaus Brandl [3], Michael D. Bush [4], Gary A. Cziko [6], Robert Godwin-Jones [11], Justin Hunt [12], Claudia Warth-Sontheimer [44], the achievements of enthusiastic

teachers who have been conducting experimental implementation of e-courses since 2006 the KSPU educational process, and recent trends in the KSPU educational policy [19], for the organization of independent work of students (future teachers) in learning German, the technique of design and implementation of the e-learning Moodle-course "Foreign (German) Language" was chosen. The typical course structure, the specific content and elements of the methods of its implementation are described below.

3 Basic and auxiliary structural elements of a typical e-learning Moodle course in a foreign language

In the structure of a typical e-learning Moodle course in a foreign language, certain basic and auxiliary elements can be distinguished.

The basic structural elements of a typical e-learning Moodle-course in a foreign language are:

- "Folder", "File", and "URL (web link)" resources (to submit / refer to the regulatory documentation of the discipline (work program and / or extracts from it, electronic versions of printed didactic resources, descriptive recommendations, etc.); for submitting / accessing thematic texts and authentic texts for additional reading or performing individual research tasks; for accessing Google documents with a systematic list of sources (printed and electronic) recommended for further mastering), audio and / or video, for the treatment helped to inter-installed software and Internet services to support the study of foreign languages to refer to the forms of input (intermediate and / or final) survey, etc.);
- "Glossary" activity (for submission of thematic dictionaries);
- "Tasks" activity (for performing oral or written exercises with recording of their performance in the Moodle journal);
- "Test" activity (to organize and support ongoing and / or final testing with automatic processing of its results and entering estimates for their performance in the Moodle journal).

Additional structural elements of a typical e-learning Moodle course in a foreign language are:

- "Page-type" resource (for submitting a systematic list of sources (print and electronic; open educational resources), audio and/or video materials recommended for additional mastering; in support of foreign language learning);

- "SCORM package" activity (for example, to access interactive exercises created with LearningApps and to record their performance in the Moodle journal);
- "Forum" activity (for written asynchronous communication with the teacher and / or other students of the course, with the possibility of entering the resulting grades in the Moodle journal);
- "Chat" activity (for written synchronous communication with the teacher and/or other course participants with the possibility of entering the resulting grades in the Moodle journal).

Demonstration of examples of the following elements application on the example of the content module "Ukraine. Education and Culture" is presented in the next section.

4 Typical content of the module "Ukraine. Education and Culture" in the e-learning Moodle-course "Foreign (German) Language" and guidelines for organizing students' independent work

At this stage of the study, the e-learning Moodle course "Foreign (German) Language" is at the design stage (involving content regulation techniques [22]) simultaneously with the experimental introduction into the KSPU educational process.

Thus, the basis of the module "Ukraine. Education and Culture" of the educational Moodle course "Foreign (German) Language" (Fig. 1) contains the materials of the traditional (academic) textbook in German "Ukraine" [41].

Theoretical materials of the module (thematic educational texts) are presented in the form of elements-resources of the file type (pdf-format, currently without audio-supplement).

Each thematic text has a corresponding glossary page with new vocabulary, which, if necessary, can be supplemented by course' participants with both text and audio components (Fig. 2).

To effectively master the new vocabulary, LearningApps interactive exercises with audio content were designed and loaded into the course in the form of "SCORM package" activity elements (Fig. 1, 3).

To effectively learn the spelling of the new vocabulary, the design of test tasks (Fig. 4) was performed, which could be used by the trainees in the training mode (without evaluation and unlimited number of attempts).

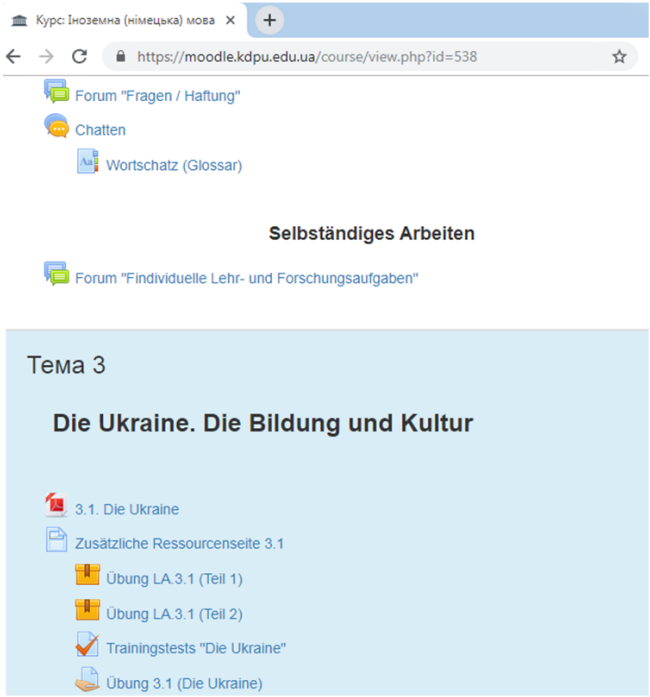

Fig. 1. Moodle course page "Foreign (German) Language"

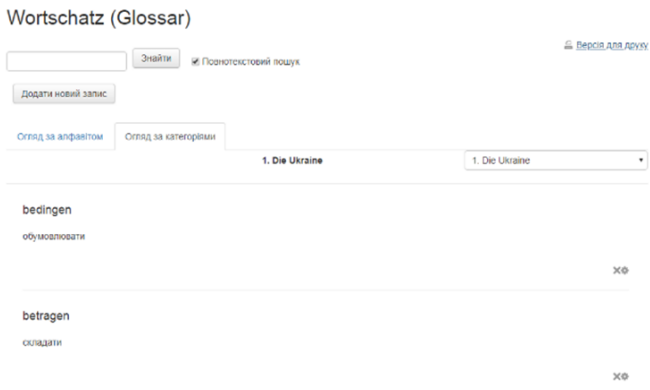

Fig. 2. Glossary page with vocabulary for the topic "Die Ukraine"

Fig. 3. Interactive LearningApps page

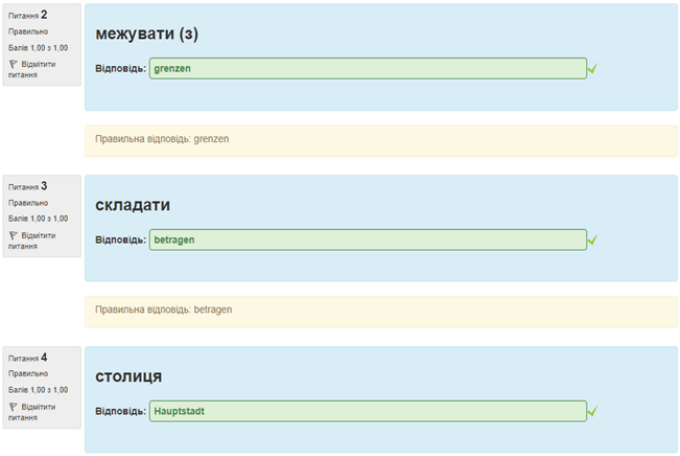

Fig. 4. Training test page

Other tasks for the written practical performance are presented in the form of a Google text document (Fig. 5).

Students copy the document to their personal learning environment, set up document sharing for the teacher, and after self-completion, wait for the teacher's assessment in the Moodle Register.

During the written practical tasks, students may, if necessary, refer to the pages with additional course resources (content module / topic, Fig. 6), a text chat room or a Question / Answer forum (Fig. 1).

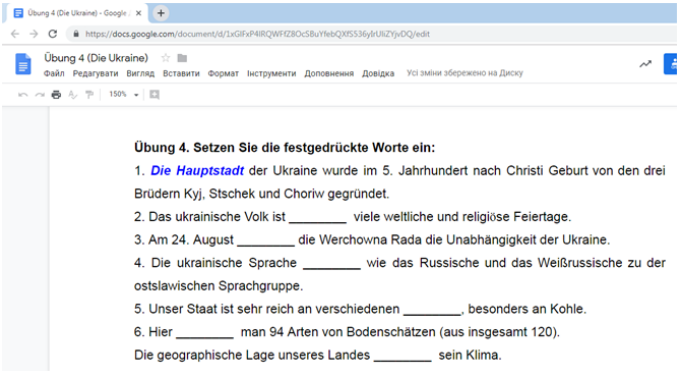

Fig. 5. The page with the task for written practical implementation

Fig. 6. Page with links to additional resources

A key type of extra-curricular independent work in Foreign Language is performing Individual Science-and-Research Assignments (ISRA).

The purpose of ISRA in Foreign Language (in this case German) is to study part of the program material individually, namely: individual work with profession-oriented authentic texts, systematization, deepening, generalization, consolidation and practical application of the acquired subject knowledge and development of components of the key competence — readiness for lifelong learning.

Individual work with professionally directed authentic texts involves the following activities:

- reading of the original text (introductory, in-depth reading, scanning/skimming);
- translation (oral and written, special and artistic, synchronous and sequential, abstract, etc.);

- performing pre-text and post-text lexical-grammatical exercises, exercises for developing the mechanism of probable forecasting and creative imagination;
- referring to special reference literature in foreign language;
- processing of materials of professional load, which is based on the terminology of a certain specialty, etc.

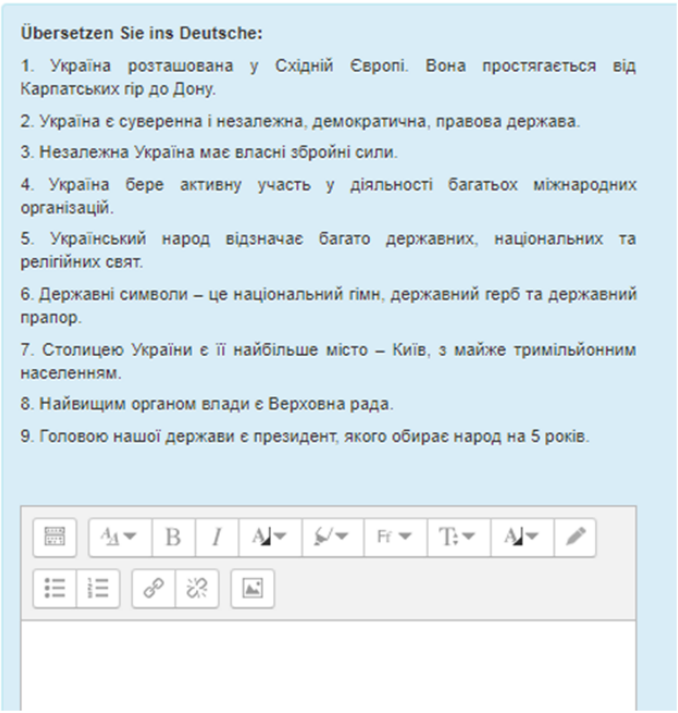

Fig. 7. Page with final test tasks

When evaluating individual work with authentic literature, the following should be considered:

- the degree of consistency of statements with a given theme, text;
- completeness of perception and reflection of the theme, situation;
- ability to use and find the necessary information in dictionaries and additional literature in the specialty;
- the level and characteristics of improvisation in the formulation;

- correctness and variety of use of linguistic means;
- ability to analyze individual places in the text, organize and comment on the received information;
- the level of awareness of linguistic features in the artistic translation of authentic text;
- creative and extraordinary approach to working with texts on a specialty, etc.

The LMS Moodle E-Learning Course offers students a link to a folder of authenticated texts (Fig. 1) and a Moodle page containing a list of open educational resources in foreign languages. For current control over their performance, personal (student) topics of the "ISRA" forum were created (Fig. 1).

To perform the final control, a test was designed with test tasks of different kinds (Fig. 7) — closed and open, with and without multimedia content, as well as one task of "Essay" type.

Students have one attempt to complete the final test tasks, the results of which are automatically recorded in the course's Moodle-journal.

5 Conclusions

1. The pedagogically balanced and appropriate involvement of ICT software and Internet services, including training management systems and services, gives the opportunity to innovatively activate the independent work of future teachers — both full-time and part-time (distance) students.
2. Standard (universal, general) and specialized LMS Moodle tools provide powerful potential for the formation and development of future teachers' high-level lexical, grammatical and phonetic competences in various forms of educational process organization, including independent work.
3. The defined structure, content and methodology of working with the elements of the Moodle course "Foreign (German) Language" require further introduction into the educational process and implementation of monitoring expertise to obtain scientifically sound and grounded conclusions on their effectiveness.

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The overview of software for computer simulations in profile physics learning

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Abstract. The paper deals with the possibilities of using specialized (virtual labs and simulators, software for natural process simulation) and general (programming languages and libraries, spreadsheets, CAS) software in school researches.

Such software as virtual labs, software for natural process simulation, programming languages and libraries in school researches can be used to simulate phenomena that cannot be learned in a school lab (for example, for modeling a radioactive decay or for demonstrating the states of relativistic mechanics). Also, virtual labs in school practice are usually used in those cases where students cannot perform an experiment in real labs. For example, it is convenient for distance learning.

The using of programming languages and libraries in physics learning research requires both students' physics research competencies and programming competencies. That is why using this software in physics classes can hardly be recommended. However, programming languages and libraries can become a powerful tool for the formation and development of research competencies of physics students in extracurricular learning activities.

The implementation of the spreadheets and the CAS in school physics researches is the easiest and has its benefits.

Keywords: profile physics learning, physics research, CAS, spreadsheets, virtual labs, virtual simulators, programming languages and libraries, software for natural process simulation.

1 Introduction

Valerii I. Seldiaev [11] classifies the possibilities of using a computer in physics labs. He emphasizes that there are many experiments that cannot be performed without computer (studying the kinematic characteristics of motion caused by the gravity, the conditions of spark discharge occurrence etc.). Furthermore, Seldiaev defines the main methods of ICT using in educational studies:

a. using the computational experiment in conjunction with the lab experiment;
b. using the computational experiment only;
c. using ICT tools in the set of measuring equipment.

Donald R. Hamann states that the most traditional methods of ICT using in physics researches are automation of computing and physics processes modeling ("numerical analysis" or "imitation" [5, p. 240]).

Richard Phillips Feynman proposed to generalize "step by step" calculations in the form of a table to determine the orbits of the planets [4, p. 170–171]. He proposed to use the tables of squares, cubes, and inverse quantities to simplify mathematical calculations. Feynman emphasized that even in this case, the implementation of such calculations manually requires a lot of time. That is why it can be useful to solve such tasks with the use of a computer as a tool of computing automation [4, p. 173].

2 Discussion and results

Charles W. Misner examined the possibilities of using spreadsheets in physics researches. Using spreadsheets provides the ability to automate the data processing [12], mathematical and logical actions; provides the opportunity of numerical solving of equations, of submitting data in the form of charts. The most common modern spreadsheets are Microsoft Excel Online, LibreOffice Calc Online, KSpread, Kingsoft Spreadsheets, Google Sheets [13], Gnumeric.

According to Misner, the main advantage of spreadsheets is their possibility to combine text and numeric data. It makes the execution of similar "routine" actions (such as reports writing) easier [8, p. 396]. Moreover, the researcher notes that the range of physics problems that can be solved via spreadsheets is much wider (these tasks are also more complex) than the range of problems for which the spreadsheets were created. First of all, spreadsheets in physics are used for calculations and

building additional charts and diagrams. Misner described main features of spreadsheets using for calculations in physics: "a high ratio of design time to run time and the need for small amount of data" [8, p. 395].

The spreadsheets in profile physics learning can be used in studies that require the processing of homogeneous data arrays and their generalization in charts. The examples of such studies are the research of the process of discharging the capacitor and determining its capacity, determining the temperature coefficient of metal resistance, studying the efficiency of the electric source, studying the correlation between the resistance of semiconductors and temperature, studying the volt-ampere characteristics of the semiconductor diode (Figure 1). It is also advisable to use spreadsheets to process the results of series of identical experiments [16], which is relevant for the most of school workshops.

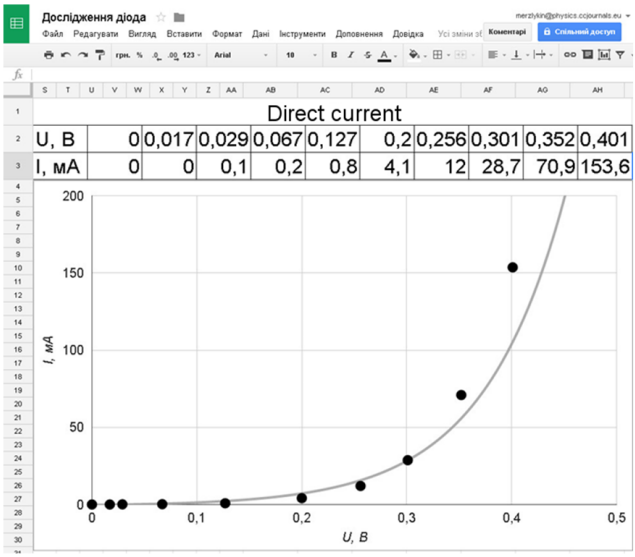


Fig. 1. Example of Using Google Spreadsheets for the Studying of Semiconductor Diode

Donald R. Hamann emphasizes the significant potential of problem-oriented programming languages, such as MACSYMA and ALTRAN. Nowadays the common name of such software is the computer algebra systems (CAS). The main purpose of this software is the performance of mathematical operations and transformations of algebraic expressions given in a symbolic form. Moreover, most of modern CAS provide the

ability to numerical problem solving, to work with matrices, to process the data arrays. The most of modern CAS also support the ability to display data in a graphical form. The most common modern CAS are CoCalc [7], MATLAB Online, MapleCloud, Mathcad, Scilab on Cloud [9], Maxima Online, Wolfram Mathematica Online, Yacas Online.

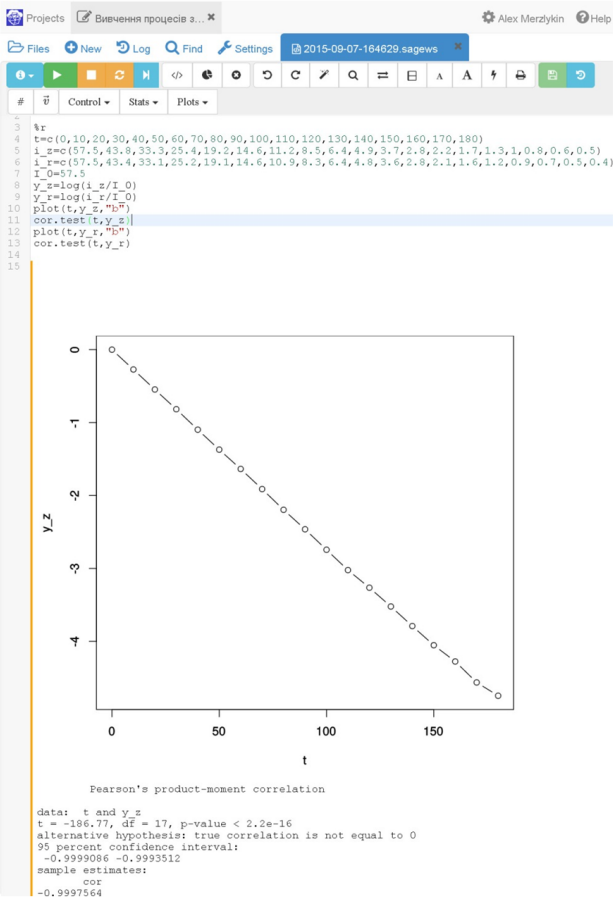


Fig. 2. Using CoCalc in studying the processes of charge and discharge the capacitor

At school CAS can be used to solve the same problems as spreadsheets. However, their use for researches, which require the work with a large amount of mathematical abstractions (such as vectors) is the most effective.

The examples of such researches are the study of body balance under the action of several forces in, finding the center of mass of the flat body. Moreover, CAS can be used for statistical data processing (Figure 2).

Donald R. Hamann considers contemporary (Fortran, C, ALGOL, Pascal) and prospective programming languages and libraries separately [5, p. 248–251]. We will use the term "programming languages" for definition of the complex of programming languages as is (character system for writing algorithms) and its translator (compiler or interpreter). A programming language translator, along with a text editor, debugger, profiler, file and object management, set of specialized libraries for a given programming language, etc. can be combined into an integrated programming environment.

In this definition, the programming languages and libraries together are the tool of implementing any algorithm as a computer program. The ways of data presenting can be diverse (text, charts, video, audio, multimedia, database, etc.). That is why programming languages can be considered as the universal tool at all stages of physical research [14].

It should be noted that the using of programming languages and libraries in physics learning research requires both students' physics research competencies and programming competencies. That is why using this software in physics classes can hardly be recommended. However, programming languages and libraries can become a powerful tool for the formation and development of research competencies of physics students in extracurricular learning activities.

Figure 3 shows the user interface of the computer program for demonstrating Faraday's law in a cloud-based GlowScript environment created with use of Python programming language and Visual Library [15].

Virtual labs are a narrow class of software that is designed to simulate the process of natural research [10]. Using virtual labs involves working with virtualized objects of a real physical laboratory. Virtual labs may involve the creation of the user's experiments or researches, pre-designed by the authors of the virtual lab or by the teacher. The purpose of students' work at the virtual lab is to process an experiment using the appropriate set of virtualized devices and performing measurements.

The virtual lab designed by Gregory Bothun, Sean Russell and Amy Hulse is the part of Oregon's Physical Education Resources package and is a collection of Java applets available on the University's website. Research in the virtual lab, according to the authors, is intended to give students an access to the data that simulates a real physical experiment. According to Gregory Bothun, it was previously planned to use a virtual lab for students

of non-science specialties (their Physics course does not involve lab works). Later it turned out that the Java applets were downloaded thousands times per month and became popular at physics classes in high schools. Every research in the virtual lab consists of two parts: in one of them students work with computer models of devices, and the other one reflects the lesson plan. The virtual lab includes both studies which can be and cannot be provided in the conditions of the physics lab (Figure 4).

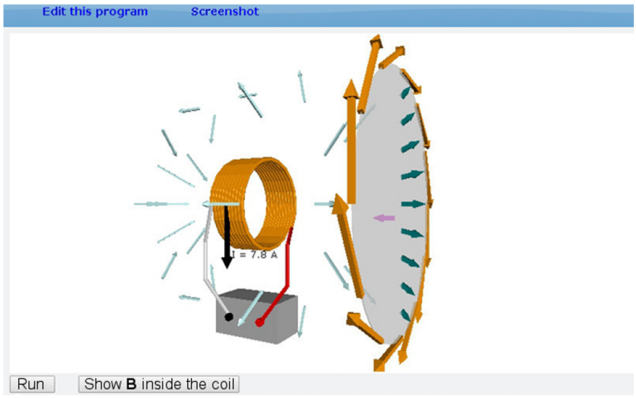


Fig. 3. User interface of computer program for demonstrating the Faraday's law

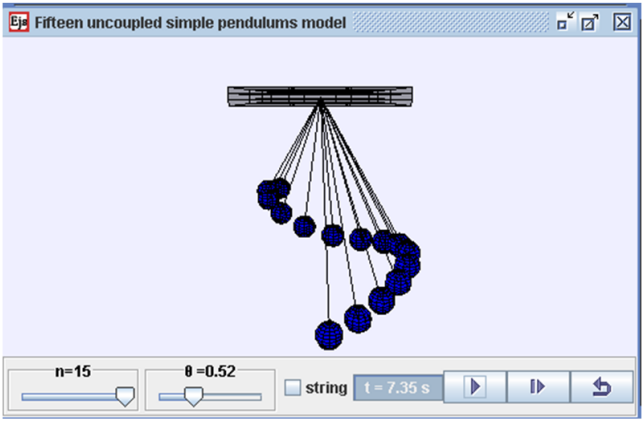


Fig. 4. Wave pendulum simulated by Easy Java / Javascript Simulations (EjsS) of the Open Source Physics Project

You can use improperly most of the equipment in this virtual lab. In this case, the equipment will "virtually" fail, and the sound message will notify user [1]. It provides the ability to use the part of the described virtual lab as a virtual simulator for the use of physical equipment.

Virtual simulators are the software that is similar to virtual laboratories. The main difference between these two classes of software is their purpose. Using virtual simulators mainly involves working with virtualized devices as is, but not with the "scheme" of the whole experiment. Virtual simulators can be used for students' familiarization with the devices used in research. Often the virtual lab and the virtual simulator are the same software. Thus, virtual simulators simulate physics equipment, while virtual labs simulate physics research.

Virtual simulators in a school physics research should be used at the preparatory research stage to provide to students the opportunity to familiarize themselves with the equipment which is used in the research (Figure 5). This is especially useful for students who have to work with devices they have never used before.

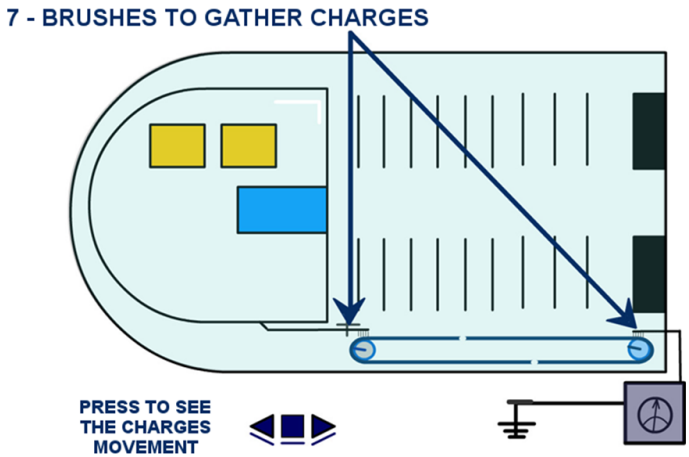


Fig. 5. Introduction to electrostatic ion accelerator on the site of the Institute of High Technologies of Kyiv Taras Shevchenko National University

The using computer simulations can extend the content of school curriculum because any natural phenomenon can be modeled using a computer. Donald R. Hamann states that there are three factors of the successful application of numerical modeling: "analytical simplification based

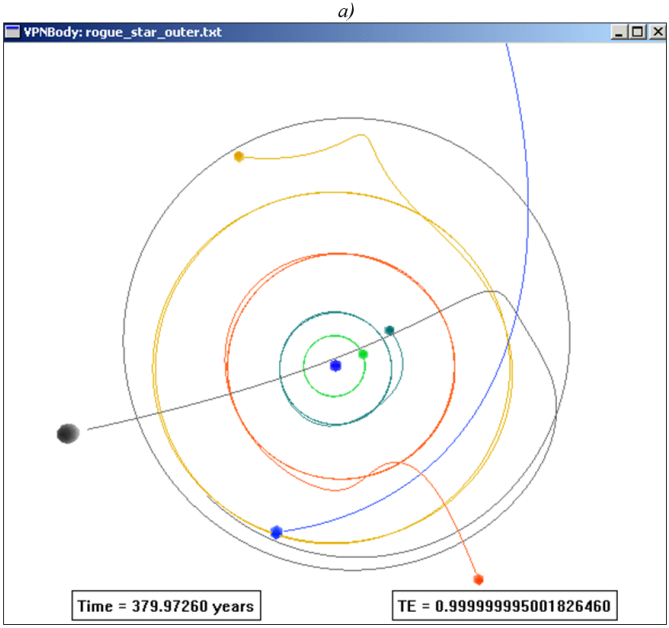
on well-known physical theory, good algorithm and successful graphical representation of results" [5, p. 247]. The article [6] presents a number of models, which using in the educational process, according to the authors, is more effective than the real demonstration of physical phenomena.

```
TIME_STEP 90 DAYS # крок моделювання
MAX_TIME 600 YEARS # повний час моделювання
METHOD Candy_Rozmus_Opt # метод інтегрування

OBJECT_DATA # опис об'єкту "блукаюча зірка"
  Name Rogue_Star
  Free
  MASS 1.50 SOLAR_MASSES
  COLOR 1 0.85 0
  Orbit_color 1 0.85 0.0
  POSITION -125 200 0 AU
  VELOCITY 0.325 0.0 0 AU/Yr
END_OBJECT_DATA

# опис інших об'єктів Сонячної системи (Сонця, планет)
```

a)



b)

Fig. 6. The fragment of description the computer model of the process of the wandering star invading in the Solar system using VPNBody (a) and the results of simulation (b)

Software for natural process simulation is similar to virtual labs. In virtual labs, students use ready-made models of natural phenomena, while in

software for natural process simulation, they have to create these models by themselves. It requires a higher level of abstraction, deeper understanding of the processes and mathematical modeling skills. Developing computer models with this software takes a lot of time, so it is advisable to organize such activities within the framework of a research project. At the same time, complete virtualization of lab work using this software goes beyond the scope of physics learning.

Methods for describing models, which use the software for natural process simulation, can vary from a textual description (Figure 6) to the direct execution by means of a graphical interface [17].

Marek Pawel Checinski proposes to use the FireFly (PC-Gamess) for calculating the properties of molecular structures and MacMolPlt for visualization the results of these calculations [2]. The author examines the basic features of both tools and makes recommendations on how they can be used. Francisco Esquembre points out that computer simulation tools have all the benefits of learning modeling and, in addition, help students to clarify the Physics concepts. The author also notes that the level of abstraction of the modeling tools can vary from the "pure programming" to the construction of high-level blocks. The choice of modeling tools is determined by the task. So Esquembre recommends using Modellus for simple models and Easy Java Simulations for more complex tasks [3, p. 17].

Table 1. Classification of adjacent software by controllability of code and data

Software	**Controllability of code**	**Controllability of data**
Programming languages and libraries	The code is created by the user with the use of library objects; algorithms are created or used from the library	The data structures are determined by the user or by the author of the library; the data is entered by the user
Software for natural process simulation	The code can be created by the user according to the proposed interface or the ready-made program modules can be used	The data structures are determined by the software engineer; the data is entered by the user
Virtual labs	The code is created by the software engineer	The data structures are determined by the software engineer; the data is entered by the user
Virtual simulators	The code is created by the software engineer	The data and its structure are determined by the software engineer

Consequently, software natural process simulation in relation to virtual laboratories is not a broader but a different class of the software that has its own specific purposes and ways of using. One of the possible approaches to the delimitation of this software is the classification given in Table 1.

3 Conclusions

Such software as virtual labs, software for natural process simulation, programming languages and libraries in school researches can be used to simulate phenomena which cannot be learned in a school lab (for example, for modeling a radioactive decay or for demonstrating the states of relativistic mechanics). Moreover, virtual labs in school practice are usually used in those cases when students cannot perform an experiment in real labs. For example, it is convenient for distance learning. However, a comparison of the results of the study obtained in the natural research with the results obtained by means of the virtual lab can be useful. It can also be useful to compare the results of different models of the same phenomenon. Such comparisons can help students to understand the limits of the application of physics laws, to understand the correspondence principle and the possibility of the existence of several adequate mathematical interpretations of the same phenomenon.

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The use of cloud technologies when studying geography by higher school students

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Abstract. The article is devoted to the topical issue of the cloud technologies implementation in educational process in general and when studying geography, in particular. The authors offer a selection of online services which can contribute to the effective acquisition of geographical knowledge in higher school. The publication describes such cloud technologies as Gapminder, DESA, Datawrapper.de, Time.Graphics, HP Reveal, MOZAIK education, Settera Online, Click-that-hood, Canva, Paint Instant. It is also made some theoretical generalization of their economic, technical, technological, didactic advantages and disadvantages. Visual examples of application are provided in the article. The authors make notice that in the long run the technologies under study should become a valuable educational tool of creation virtual information and education environments connected into common national, and then global, educational space.

Keywords: cloud technologies, future teachers, educational institutions, augmented reality technologies.

1 Introduction

1.1 The problem statement

The essential characteristic of nowadays society is the existence of the universal information space based on global computer networks and information technologies. So it has become vital for an educated person to be highly competent in working with large masses of information. This determines the need for the integrated use of Internet information opportunities in education.

The modern educational policy strives to train a highly skilled professional who can be mobile and flexible professionally in the

information society, can easily navigate in the global information space, and, what is more important, be capable of effective self-education throughout the life time. Everything mentioned above is the key to the success in the fast-moving world [3].

The training of future teachers in general and teachers of geography, in particular, is no exception. The higher educational institutions try to fulfill the social demand to train competitive pedagogical staff linking it with the further search for ways to improve the quality of education and the level of competence. One of the ways to do these is to implement cloud technologies in the educational process.

Cloud technologies are the fundamentally new services that allow you to remotely use the tools of data processing and storage, provide Internet users with access to computer resources of the server and use software as an online service [42].

1.2 Theoretical background

In the scientific literature there are widely represented the general scientific aspects of the problem under study, as well as those relating to specific teaching methods. In particular, scientists examine the essence of the concept, types of educational clouds, forms and necessary components of cloud technologies (Svetlana H. Lytvynova [14, 15]); theoretical foundations, possibilities and methods of using cloud technologies in the educational process are studied by Oksana S. Makovoz [16], Oksana M. Markova [17], Yevhenii O. Modlo [23], Vadym S. Nazarenko [26], Pavlo P. Nechypurenko [22], Tetiana S. Perederii [16], Maryna V. Rassovytska [30], Serhii O. Semerikov [18, 33], Vladimir N. Soloviev [35], Andrii M. Striuk [30, 33], Mariya P. Shyshkina [32], Illia O. Teplytskyi [34] researches the benefits and prospects of using cloud technologies in the educational process of a modern school.

The use of cloud technologies in computer science classes is studied by Anna I. Gazeikina [10], Olha V. Korotun [13], Oksana M. Markova [19], Susana N. Seytveliyeva [36], Viktoriia G. Shevchenko [37], Mariia V. Stupina [40]; in maths classes by Georgii A. Aleksanian [1], Maiia V. Popel [29], Tatiana A. Vakalyuk [42]; in history classes by Olena V. Burlaka [7], in languages classes by Irina A. Belysheva [3], Olena V. Pakhomova [28], Lucie Renard [31], Nataliia V. Skrynnik [38]; in physics classes by Maksym V. Khomutenko [12], Oleksandr V. Merzlykin [20]; for the formation of self-educational competence of future specialists (Tetiana V. Voloshyna [43]) and etc.

The use of cloud technologies during the study of geography is mostly

represented in the works of foreign scientists, in particular Anna Badia i Perpinyà, Montserrat Pallarès Barberà and Joan Carles Llurdés i Coit [2]; Richard G. Boehm and Cheryl A. Frazier [8], Andrew J. Milson [21], Jacqui Murray [25], Tiani Page and Beverly J. Christian [27], Michael Zimmer [44].

The analysis of works on methods of geography teaching suggests that the most commonly used in secondary schools are general-purpose cloud technologies such as Google Apps, LearningApps.org, scribing technologies, blogs, online puzzle-maker generators, ribbons, tests, etc. They help develop geography knowledge and provide educational communication while studying.

Higher schools often use GIS technologies (Google Earth, Google Maps, DataGraf, Microsoft Map, Map Info, ArcGIS) that allow students to work with cartographic material [24].

At the same time, it should be noted that both approaches may be considered one-sided, since only complex systematic use of cloud technologies (both general purpose and GIS technologies), provided that the pedagogically balanced combination of traditional and innovative technologies of classroom, distance and mobile learning will contribute to effective achievement of didactic goals and thorough study of geography. Moreover, the scientists and teachers fail to notice the advantages of those cloud technologies that help work with accounting and statistical data that are widely included in study of economic and social geography. The cloud technologies mentioned above aid to memorize the large amount of geographical nomenclature and the creation of not only maps, but also dynamic charts, logical reference schemes, etc. In this article, we consider the selection of such cloud technologies that can be helpful not only for students of geography major, but also for everyone who deal with geography study in higher school.

1.3 The objective of the article

The purpose of the proposed publication is to characterize the content of some cloud technologies that should be used in geography students training in higher school.

2 Presenting the main material

The first cloud technology to be considered is *Gapminder*. We cannot deny the leading role of maps while geography studying, but we want to draw attention to the resource Gapminder. It is developed by the Gapminder Swedish fund, with Hans Rosling as a co-founder, that

collaborates with educators all around the world. Using the Trendalyzer software Gapminder visualizes statistics in the form of interactive charts. This cloud environment enables a student to analyze databases provided by the following organizations: World Bank, FAO, International Labor Organization, World Health Organization, UNAIDS, IARC, etc. The statistics can be optionally illustrated from 1800 to 2018 at the global, regional or local (individual country) levels. With the help of the time tape (as well as maps, ratings, sex-age pyramids, presentations, videos), one can trace the nature of the dynamics of demographic phenomena and processes, carry out a comparative analysis of various quantitative or qualitative demographic indicators (population, child mortality, urbanization, welfare of the countries, education of the population, poverty and many others), Fig. 1.

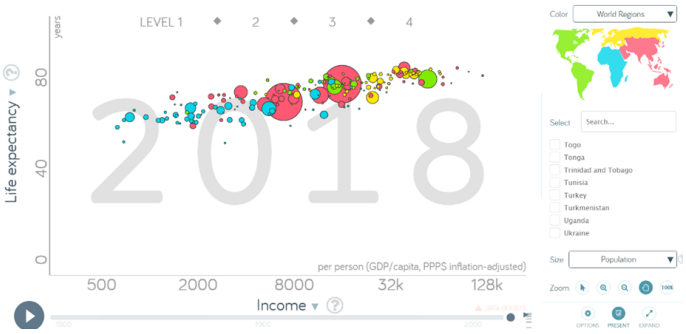

Fig. 1. Interactive graph "The population of the world", built in Gapminder

Carmine Gallo rightly calls well-known statistician Hans Gösta Rosling a star among the TEDers, since his presentation at the TED conference in 2006 was unrivaled and "became an online "viral sensation" [9]. We are convinced that the introduction into accounting and statistical data while studying economic and social geography (especially the geography of the population) is bound to be started with Gapminder and fragments of the video collection "Do not panic. The truth about population" by Hans Rosling. Being presented by the distinguished TEDer, "grey" statistics which students do not really enjoy turns into a clear and distinct language of convincing facts that create a coherent demographic picture of the world.

The second cloud technology under consideration is DESA Technology (Department of Economic and Social Affairs) / Population division, United Nations). This resource makes it possible to build and analyze randomly

demographic profiles and probabilistic forecasts that reflect key demographic indicators from 1950 to 2017 for countries or different world regions, Fig. 2.

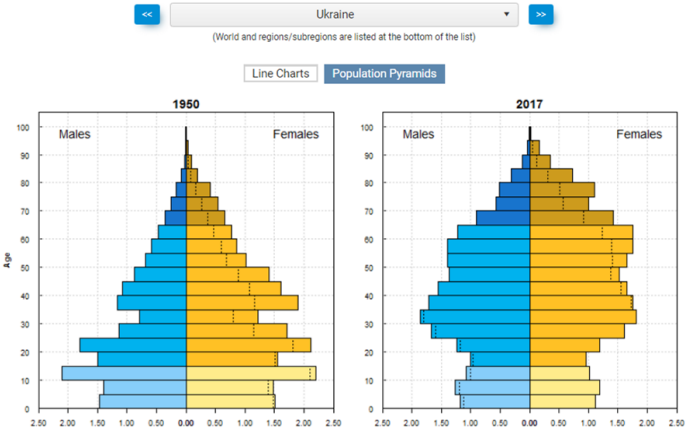

Fig. 2. Gender-age pyramids of the population of Ukraine, DESA

The third cloud technology is *Datawrapper.de*. This service contains an online designer and can create an interactive table or map in four steps: download, data validation, visualization and publication.

The benefits of this cloud technology are: the simplicity and speed of a final product creation; the access to the finished charts and maps folder and a wide set of templates; the import data from Excel, CSV, PDF; the export data (PNG, PDF), and the possibility to integrate data into the environment of any site; the facility to create a new personal account, etc. However, full-customized version with custom maps, print-export and CMS integration is possible only on subscription terms. Nevertheless, the technology successfully handles with the simple geographic tasks that require data visualization.

The next resource is *Time.Graphics*. This cloud technology was developed by Yevgeny Mustafin in 2017. It is aimed to visualize the chronology of events in the form of a timeline by adding photos, audio and video materials. The resource can be used while studying any discipline (history, biology, literature, foreign language). When studying geography, it is helpful to illustrate the stages of formation of the world, region, or country political map, the process of getting country independence, the periodization of the era of Great geographical discoveries, the history of the economy branches development, etc.

The main advantages of this technology are: the timeline speed making, the intuitive interface, the wide range of backgrounds and the colors of the presentation formats of the tape, the different tools to import data (Google ArtProject applications, Google Docs, Google Maps, Google Drive, Google Sheets, Google Slides, YouTube, etc.) and export the final product.

One more cloud technology worth mentioning is *HP Reveal* (*Aurasma*). It is a cloud-based augmented technology [41] created in Cambridge in 2011. This platform is free of charge and easy to use. The key point of HP Reveal technology is the uploading of an aura that is a visual trigger with overlaid multimedia content. By using a camera on a smartphone or tablet, the technology recognizes real images and displays overlaid animation, video, 3D model, or webpage (Fig. 3).

Fig. 3. Aura "Panama Canal", created by HP Reveal

The main advantage of this technology is the expanded didactic capacity of any printed publications, school textbooks, manuals, etc., achieved by visualizing its educational content. The main obstacle in its implementation may be as that a personal mobile device be equipped with the Aurasma App (HP Reveal), to a certain extent restricting the access to aura. Aurasma can be used while studying many higher school disciplines, but let us dwell on geography studies.

All the concepts that students master while studying geography can be divided into concrete and abstract ones with their own specifics. Thus, for the disclosure of specific concepts (river, mountain, enterprise, etc.), the inductive method is traditionally used, and for the comprehension of abstract concepts (climate, weather, historical and geographical region, specialization or concentration of production) is more often applied deductive one. Since concrete concepts are often available for direct perception, students encounter less difficulty with them than with abstract concepts. So 3D models, videos and interactive images are ultimate teaching tools, because the vivid outlook on some geographical phenomena or process

contributes better to the conscious comprehension of abstract complicated concepts.

The next *MOZAIK education*. This is a service software of the Hungarian company specializing in educational interactive software for almost three decades. The resource is available in 30 languages and has both free and paid content.

Taking into accounts the specifics of geography studies, a media library that is a cloud storage and contains digital lessons, 3D scenes, videos, images, audio, task letters, tools and games offered for primary, secondary and higher schools can be of great value and importance.

The advantages of the considered service include: the high resolution of the video and 3D models (Fig. 4), which demonstrate components of the geographical phenomenon or process, their integral representation in the form of a video animation; review normal, anaglyph or stereoscopic modes; scaling the user interface of a 3D player; tools to work with the legend, separate layers of the image, additional information and facilities to make virtual trips.

Fig. 4. Ferrous metallurgy, 3D scene MOZAIK education

In addition, the "Tools and Games" category includes three-dimensional maps and tasks, interactive maps, three-dimensional images of the Earth, a collection of aerial photographs, a constructor for quick and easy creation of diagrams using built-in templates, interactive test editor, etc.

However, free viewing of 3D content is limited to 5 units per week.

Premium mozaWeb subscription is needed for full access to the library contents, search and playback of 3D models, videos, audio materials or images. The subscription enables further e-learning and working with interactive tutorials.

The next point in cloud technology collection is *Settera Online*. This popular service is adapted in 32 world languages and is intended for studying the geographical nomenclature. Swedish programmer Marianna Wartoft developed Settera Online in 1998. The service exists both in the computer version and in the form of mobile applications for iOS, Android and iPad.

This cloud application can replace the traditional method of learning numerous geographical names into an interactive one [4]. Before now, a student showed geographical positions and locations on the map in the classroom to demonstrate his knowledge. Now students have to find the geographical position of the country or capital, recognize its outline in a limited time, and then send the answer to a teacher for a check. If the answer is error-free and done on time, the map will paint white, assuming one error — yellow, and two errors — red. So, in order to cope with the task in the set time, students have to perform the task online at least ten times. The number of practicing promotes better memorization of the geographical names eventually.

The advantages of such method of nomenclature study are obvious. They are: an individual pace of a task performance; objectivity of assessment; developed mapping skills; rational use of classroom time.

Click-that-hood is a cloud technology for studying and verifying the names of units of administrative and territorial division of countries (states, regions, provinces, lands, prefectures, voivodships, etc.), a technique similar to that of Settera Online.

A very popular present day form of data visualization is the infographic, which does not take much time to view and provides the reception of large volumes of information in an accessible and comprehensible form. The leading Ukrainian resource that supplies accounting and statistical data in the form of infographic directories is *BusinessViews* [39]. Unfortunately, the authors cannot propose a free cloud-based technology that provides geographic knowledge in the same way as BusinessViews does. However, the Canva cloud technology can serve as an alternative.

Canva is a graphical design software that visualizes information in the form of a presentation, a graphic, a map, a booklet, a postcard, etc. The benefits of this service are free registration or access through Google and Facebook; user-friendly interface; wide selection of ready-made templates and filters; access to a folder of photos, illustrations, fonts, styles, etc.

In this article we do not characterize special cartographic editors that can be used for studying geography, since a separate publication will be dedicated to the consideration of this issue. However, some of the cloud technologies mentioned above help create maps, including Gapminder, Datawrapper.de, Canva. Google *Instant Paint* Image Editor has also a potential for creating geographic mappings. The method of work in the environment of this service is similar to Paint. Although it is not possible to create proper geographic maps, however, charts or logical reference schemes reviling geographic knowledge of a student can be quite informative (Fig. 5).

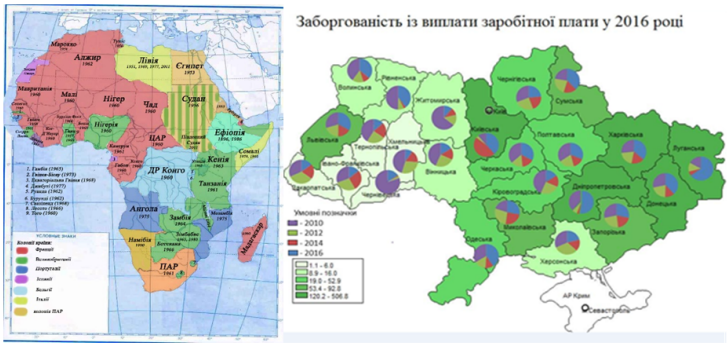

Fig. 5. Cards created in Paint Instant

Unfortunately, the format of one article does not allow to consider all available cloud technologies that can be used for studying geography. However, the implementation of the services described by the authors can significantly expand the methodical arsenal of teachers and higher students and make the educational process more efficient.

Today, it is impossible to format a student coherent geographic picture of the world in a higher school only by traditional didactic means. Geography is a science to be studied when traveling and instantly perceiving the object of study [5, 6]. That is why cloud technologies make it possible to visualize geography learning in a virtual environment and even substantially increase the perception of geographic processes not available in direct observation. What previously seemed to be difficult, and sometimes inconceivable, is quite possible at the moment (for example, to look at the volcano's burning stove or blast furnace, to observe the formation of the Earth or the work of a nuclear power plant, etc.). What is more, the generation of students who cannot live without gadgets, should learn how to use them rationally rather than be deprived of them.

The analysis of the cloud technologies observed above and their implementation in educational purposes internationally proves their long-term benefits due to the number of advantages. We fall into line with Anna I. Gazeikina and Alevtina S. Kuvina [10], and we consider their pluses can be summarized in the following groups:

- economic benefits (free of charge or privileged access to the majority of services; less number of auditorium and equipment required for training; reduction of the number of personnel required for maintenance);
- technical benefits (minimum hardware requirements on condition of access to the Internet, lack of technical support for the work of the platform and configuration);
- technological benefits (high quality and intuitive interface of the majority of cloud technologies; personal data protection and delimitation of common information access; rapid integration of created products into the educational process; no attachment of the service user to the territorial location);
- didactic benefits (a wide range of online tools and services that can be implemented with a different didactic purpose and at different stages of the classroom; the variety of interactions; simplification of information creation, accumulation and exchange; the expansion of out of classroom training opportunities; the increase in the academic performance and students' internal motivation, etc.).

However, the implementation of cloud technologies in the educational process has also some disadvantages. They can be the following: limited access to the services or subscription requirement; limited functions of online software in comparison with the local one; the absence of Ukrainian cloud service providers; high quality requirements for enforced path; the dependence of non-stop operation and important data storage on the service provider; possible errors and leakage of information with user increase; lack of legislative framework for the use of cloud technologies; low level of computerization of Ukrainian institutions of higher education; insufficient development of theoretical and methodological principles of cloud technologies implementation in the educational process; the unwillingness of some teachers to combine traditional and innovative educational technologies, as the implementation of the latter requires additional efforts; underestimation of the importance of cloud technologies in the professional development of teachers and students [4, 10, 16, 26].

We want to emphasize that cloud technologies should gradually become a thorough didactic means, enabling educational institutions to create their own virtual information and education environments, with the prospect of integrating into a common national, and then global, information space.

3 Conclusion

1. Nowadays decision-making is often based on the information of various Internet sources [11], so an educated person is required to be highly competent in dealing with large amounts of information. Due to the relevance of this problem for the IT society, one cannot overestimate the didactic prospects of cloud technologies, as they contribute to: efficiency of handling with the students' real life problem situations, which can be sorted out with digital devices and gadgets [26]; mastering the skills to find, systematize, analyze a large amount of necessary information; the reasonable use of cloud technologies, the skills to assess the benefits and risks of cloud technologies for self-development, environment or society.
2. We see the prospects of further scientific research in the study of the practical cloud technologies implementation while the geography study in higher school.

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Cloud ArcGIS Online as an innovative tool for developing geoinformation competence with future geography teachers

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Abstract. The article dwells upon the scientifically relevant problem of using cloud-based GIS-technologies when training future geography teachers (based on ArcGIS Online application). The authors outline the basic principles for implementing ArcGIS Online in the educational process (interdisciplinary integration, the sequence of individualization in training, communicability, distance education and regional studies), and provide an example of an interactive map created with the help of the specified cloud GIS, since this kind of map is the most popular a form of research by geography students. In the article it is noted that integration of ArcGIS Online into the educational process allows the teacher to follow a clear pedagogical strategy, taking into account possible variants of its use (demonstration, direct mastering of GIS in a computer class and independent work in an individual mode). Considering cloud GIS as a new stage in the development of geoinformational education, the authors emphasize their key benefits (round-the-clock access, work with GIS package in the cloud, the ability to use other maps as well as the creation of their own maps and web-applications) and disadvantages (monetization of services, underestimation of the GIS role in the curriculum of the higher school, the lack of Ukrainian content, etc.).

Keywords: ArcGIS Online, cloud technologies, geoinformation competence, future geography teachers.

1 Introduction

1.1 Scientific relevance of the research

Nowadays, for most educators, it is clear that GIS-based training should take its decent place in the educational process as well as methods of

learning about the world (in all time and space scales); as a method of solving actual natural or social problems and as a way of presenting spatial disproportions in the processes and phenomena development. However, as it is stated in the report of the National Research Council of Great Britain (NRC), for the successful implementation of GIS into training, five interrelated conditions are to be ensured, including: financial support, technical support, methodological assistance, GIS introduction into the curriculum and support of community [17]. Note that the provision of these conditions during the study of geography has a number of difficulties that must be overcome by the teacher.

In the context of the above mentioned, it is worth noting the large-scale work being done by ESRI on interactive teaching of educators in the field of GIS-education of various levels and profiling. In particular, a great deal of attention is paid to the introduction of educational materials based on the ArcGIS Online cloud system. In some countries in Europe and the world, cloud-based GIS is already being actively used in the educational process, starting with secondary school education.

1.2 Recent research and publications analysis

The analysis of scientific literature on the problem we are investigating convincingly testifies that many works of domestic and foreign authors are devoted to the use of cloud technologies in geoinformational education. Thus, studies by Olga V. Bondarenko [5], Jack Dangermond [6], Iryna M. Khudiakova [8, 9], Svitlana V. Mantulenko [3], Oksana M. Markova [10], Oleksandr V. Merzlykin [12], Vladimir S. Morkun [15], Pavlo P. Nechypurenko [16], Serhiy O. Semerikov [13], Kateryna I. Slovak [14], Andrii M. Striuk [11], Tetiana V. Zaitseva [19], Vladimir I. Zaselskiy [4] etc., have proved that today, in order to improve the learning process, powerful technologies such as cloud computing are needed that, by supporting traditional forms of education, they are a new stage in the development of education and an economically viable, effective and flexible way to meet the needs of those who are being trained to acquire new knowledge.

In the writings of Dmytro S. Zanko [18], Oleksandr V. Barladin [2], Witold Lenart [17] etc. practical tips and examples on using cloud GIS in higher education institutions while teaching a range of professional-cycle subjects (cartographers, informants, etc.) are provided. However, until now, there is no clarity as to how to integrate cloud technologies into the daily teaching of future geography educators.

1.3 Article objective

The aim of the proposed study is the theoretical substantiation of the principles and methods of using cloud GIS, in particular ArcGIS Online, for the formation of geoinformation competence in future geography teachers' training.

2 Presenting main material

Geographic information systems in geographic education began their way from the late 1970s to the university level and interest in them grew in an avalanche. So, the number of geographic curriculum programs that the American and Canadian universities launched in 1984 equaled about 10. By the end of 1990, their number exceeded 2000, and the use of the field has expanded at the expense of history, computer science, biology, mathematics and other sciences [7].

Pioneers in the use of GIS during the higher learning of geography have become the Harvard University Computer Graphics Laboratory (the USA) and the Department of Experimental Cartography at the Royal College of Arts (the UK). In these institutions, new computer algorithms and programs designed to handle spatial information were developed through attempts and experiments. Thanks to this, active students and teachers have gained the first experience of integration of GIS technologies into the educational process, which has become actively distributed among other world institutions of higher education.

In particular, in 1995 a joint project of hundreds of American universities "Ecological and Spatial Technologies" (EAST) was launched, which used the strategy and technology of problem learning to stimulate the intellectual development of students based on GIS. Since then, GIS technology has begun to develop so smoothly that educational opportunities simply did not have time for them. GIS software products began to generate profits and were quickly bought off.

In the mid-1990s, it became clear that there were not enough specialists able to carry basic geoinformational knowledge to future teachers. This was due to the development of the "Project for the training of GIS NCGIA" by the National Science Foundation of the United States. This project was based on the premise that the educational materials being developed would be widely distributed among educators teaching GIS. The core of the course, about 1000 pages, has been acquired by many educational institutions in the world (over 5 years more than 70 countries had about 1300 copies of the study course). The project is translated into many languages of the

world. Until the 1990s, according to the international survey, more than 450 universities in the USA, Europe and Australia were registered providing the opportunity for GIS education [1]. As a result, partnership agreement between schools and higher education institutions contributed greatly to solving the problems of primary GIS education.

The active and comprehensive introduction of GIS to the school system around the world already began at the beginning of the twenty-first century. Analyzing the current use of geographic information systems in schools around the world, it should be noted that the US historical leadership in the development of GIS education was in the undoubted leadership of the use of GIS in secondary schools in the country. Undoubtedly, ESRI's policy has been the main factor in this, which has made GIS education of its highest priority in schools, colleges and universities [7].

In this article, we would like to draw the attention of the educational community to the potential of ArcGIS Online Clouds offered by ESRI.

ArcGIS Online is a complete geographic information system hosted on a cloud-based server with a broad functionality. With ArcGIS Online, you can create web-maps, use ready-made resources, publish mapping services, spatial analysis, distribute data, and access cards from any device. At the same time, ArcGIS Online can be used as a platform for building your own geographically-bound applications. Through the built-in map viewer, galleries of base maps and space images are provided free of charge, and their range, detail and relevance are constantly expanding [1, 2].

If you add to this the benefits of cloud technologies, such as access to personal information from any computer, reliable cloud storage, a significant reduction in the cost of purchasing licensed software, as well as the technology of distributed data processing in which the computer resources and capacity are provided to the user as an Internet service, then it becomes clear that ArcGIS Online is a great tool for working with geospatial data at different stages of future geography teachers' training.

It should be borne in mind that the criterion for motivating the use of GIS-technologies is their influence on the students mastering the material in different conditions. In this regard, in each case, the purpose of the GIS application and its functional definition must be clearly specified. It is expedient, the use of this technology can only be considered reasonably motivating if pedagogical efficiency cannot be achieved using other, more accessible means of study.

Let us determine the basic principles of using ArcGIS Online in an educational process:

1. *Interdisciplinary integration.* Today, maps, tables, graphs and charts —

all these kinds of representations of information generated by GIS are widely used in disciplines related to geography: chemistry, history, computer science, biology, mathematics, etc. It allows students to integrate knowledge from these disciplines. Integration occurs through work with electronic maps and databases, the topics of which are related to the discipline, and the tool is GIS.

For example, the use of students' knowledge in mathematical statistics helps to identify causal relationships between different natural components of the geographical environment. Knowledge in chemistry is essential to highlight issues of the migration of chemical elements during environmental research. The use of knowledge in biology reveals the interrelations between elements of natural landscapes. ArcGIS Online allows one to combine these diverse data into a single geospatial model. The use of GIS is especially encouraged by the development of computer literacy for future geography teachers: file management, database work in the cloud, satellite positioning systems, remote sensing data, etc.

2. *The principle of consistency* ensures the gradual and promising learning of cloud GIS technologies; in other words, the assimilation of knowledge takes place from simple to complex. The educator should not speed up the process of familiarizing and mastering ArcGIS Online by students. Only competently organized, step-by-step and metered training is the key to a successful work with this service.

So, at the initial stage, students should familiarize themselves with the cloud-based GIS interface, log into the system and create a user's personal page. At the next stage of training, future educators will get acquainted with online map creation, work with layers and attributes, which will eventually lead to the stage of registration and editing of thematic maps and organization of the general access to the elements.

As a result, students must independently create cartographic web-based applications. The development of cartographic web-applications for learning purposes is based on the use of ready-made templates in the cloud, which are a convenient way of publishing web-maps and combine location with web-based applications, as well as provide multimedia and interactive features.

3. *Individualization of training.* Work in the cloud refers to personality-oriented technologies that help the teacher to individualize the process of learning, to organize an individual educational process for each student. This significantly transforms the activities of the subjects of the educational process — the teacher and students. They have to

engage in fundamentally new activities in connection with the change of educational activities and the specific restructuring of its content.

Individualization of training with GIS involves the differentiation of the teaching material, the system of tasks of varying complexity and volume. It is advisable to highlight the main and varied study materials. It is expedient to actively use GIS-projects, with their division into separate small tasks, stages. In addition, each subsequent task becomes feasible for the student, providing the previous one has been accomplished [7].

4. *The principle of communicability.* Observance of this principle involves such class orientation, when the purpose of learning (mastering GIS-technologies) and the means of achieving the goal (spatial and temporal analysis in the study of natural, socio-economic, man-made processes, objects and phenomena) are closely interrelated. First of all, this involves activating the students' creative activity: the widespread use of collective forms of work, problem situations, creative tasks, etc. Cloud technology is still more likely to be conducive in the organization of joint activities and interaction of subjects of the educational process, the ability of future educators to take into account different opinions and strive for the coordination of different positions.

Each student, at the time of registration in the service ArcGIS Online, gets their own design site, where they store their own attributes and data, maps and other useful information.

5. *Principle of distance learning.* By implementing cloud-based GIS technologies in training, students are not required to have a physical presence at the place of their education. This technology allows students to use educational materials of any kind, as well as perform work with teachers or a group. ArcGIS Online allows teachers and students to share their research results through the use of supported GIS data and services, thus creating an information space that other users can access.

Obtained thematic maps can be published on the Internet as content pages or as web-based applications using built-in mapping templates for electronic maps. Among these templates, attention is drawn to the ones with synchronized windows, which allow you to view various subject-specific data in terms of a single territory.

6. *The local area study principle* is realized in the practical orientation and research competence of GIS-technologies. On the one hand, it determines a comprehensive study of this or that local area, and on

the other hand, the use of ethnographic material in teaching. Both of these tasks are interrelated: the first solution opens the way to the second.

The regional orientation of cloud GIS can be engaged in a wide range of geographic research areas: mapping and plans of its terrain, analyzing the meteorological situation, studying the spatial distribution of biological species, socio-ecological research. The material required for conducting research using GIS can be obtained by applying literary, cartographic and statistical methods, as well as by method of direct observations during the local area studies, travels and excursions.

An interactive map is the main form of research for future geography teachers through the help of cloud-based ArcGIS Online. The main functions of this online service provide a simple and accessible form of geospatial information visualization in the form of interactive maps (Figure 1), as well as their publication on the Internet.

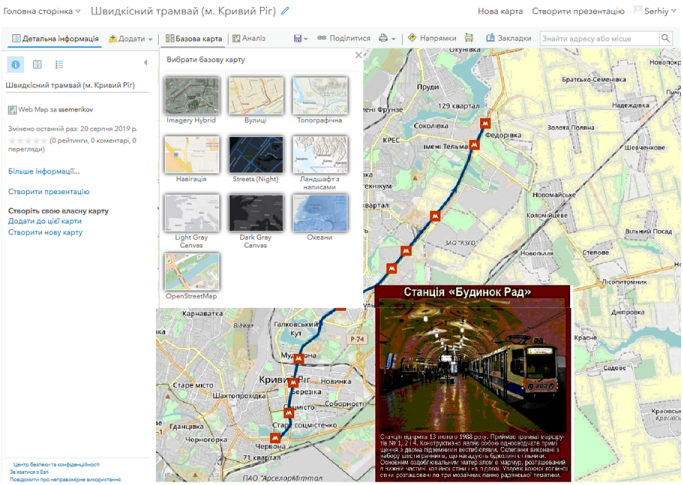

Fig. 1. The view of the interactive map “High-speed tram at Kryviy Rih”, designed by means of using ArcGIS Online cloud

The use of innovative teaching aids requires the teacher to master new forms and methods of activity. The integration of such high-tech information media as cloud GIS into the educational process should be based on a clear pedagogical strategy:

1. Cloud GIS, as interactive learning tools, allows teachers to manage the flow of information, focusing on the most interesting or more

complex moments of the material being studied, allowing them to model geographic phenomena and processes, demonstrating them dynamically. Consequently, they facilitate the understanding of the essence of these phenomena and processes.

2. In the learning process, the teacher should not act as a software expert. ArcGIS Online is a rather complex cloud service, and in this connection it is impossible to know all its features. Therefore, the teacher should constantly be engaged in self-education.
3. The teacher should not be afraid to change pedagogical approaches to learning using cloud GIS. He must be in the creative search for new ideas, be prepared to make adjustments to the teaching methodology taking into account both the dynamics of the level of students' general knowledge as well as their level of preparation in geoinformation.
4. Re-perform is the key to the success of GIS education. If the required function is not provided for some reason, it is actually useful, because it forces the student to go through this path over and over again, fixing the algorithm of the task in their brain.
5. An important task for a teacher when using ArcGIS Online is to create a competitive learning environment among future educators as it significantly enhances their motivation. It is important that, in selecting forms and methods for organizing a competitive learning environment, the teacher takes into account the personal characteristics of the students.
6. When using cloud-based GIS in the training of geography teachers, the teacher should share his or her experience among the colleagues, both during direct consultation and in specialized seminars, conferences, webinars, online forums, electronic and print magazines, etc. On the one hand, it will allow them to distribute the results of their own work, and on the other hand — take into account the progress of other teachers, avoiding unnecessary mistakes in their own activities.

Like traditional maps, ArcGIS Online is a three-way learning tool: a means of visibility, an object of study, and a source of knowledge. Accordingly, the following options for using GIS in the educational process are available:

1. *Work in the demonstration mode.* Cloud GIS have a unique ability to create a visual spatial image of various objects, processes and phenomena, and the teacher should be able to use it. ArcGIS Online has a huge number of basic maps that the teacher can use in his or her

work. The gallery contains a variety of topographical, demographic, socio-economic maps and satellite images of the world. In addition, these maps can be used as a basis for creating your own maps.

The layer-by-layer form of information organization, the ability to complement cartographic information by various schemes and charts, demonstration of dynamic processes, 3-D models and much more, allow the teacher to form a new way in the students' geographic concepts during the study of new material.

2. *Work in a computer class.* The conduct of practical classes or research should be regarded as the most effective work with cloud computing ArcGIS Online in the computer class. The following activities are available in terms of content and proposed methods of organization:

- frontal work, carried out by the whole group, when all students perform the same task;
- group work, for which students are divided into small groups (3–5 people);
- pair work, when two are studying a question;
- individual work, carried out by the student himself or herself.

3. *Work in an individual mode.* The individual work of future geography teachers with cloud GIS is possible mainly in the form of distance learning organization of the educational process, which is aimed at the development of the students' personality, their autonomy, creativity. The most effective form of training in this case should be recognized as a project activity.

The project method is to create conditions for independent mastering of cloud-based GIS-technologies by geography students during the realization of specific projects. They participate in this process starting from the project idea itself up to its practical implementation. As a result, students, with the help of a teacher, learn to search, summarize and analyze information independently, enter it into a cloud database, build their own map sets.

The themes of projects should be determined by the sphere of interests of future teachers and depend on the level of their individual training. So, in the first stages, it may be some task that demonstrates the relationship between cartographic and attribute information. These are various information GIS projects, where information about different historical, social and natural objects of the studied territory is displayed. In the future, the teacher should focus on projects that use the analytical functions of GIS (over-lined operations, buffering, zoning, etc.).

The main advantages of cloud GIS as an educational tool are:

- round-the-clock access to personal information from any computer connected to the Internet;
- no need to install a GIS package on your computer;
- access to spatial resources (various maps from physical and geographic to socio-economic and political, satellite images, historical maps, interactive maps, etc.) prepared and published by other users;
- personal data storage in the cloud: map packs, layers, tabular (attribute) data, etc.;
- the possibility of creating interactive maps, as well as creating web-based applications based on pre-made templates without the use of programming tools;
- ease of cooperation integration between the users within an educational organization.

At the same time, it is necessary to describe the problems associated with the widespread use of ArcGIS Online in geography teacher training:

- monetization of the resource: the full-fledged use of the resource is possible only on a paid basis, and not all educational institutions of higher education can afford it;
- a small number of class hours in the curriculum of future geography educators, dedicated to the study of GIS-technologies and their full-fledged mastery;
- absence of the possibility of joint editing of web-maps in an on-line mode;
- absence of Ukrainian-language content for the resource.

3 Conclusion

1. To summarizing, it should be noted that cloud GIS is a new stage in the development of geoinformational education. Thanks to them, work with GIS is more efficient and affordable. Cloud ArcGIS Online has proven to be a fairly simple, well-developed and user-friendly educational resource.
2. The prospects for further research are seen in the formation of training and methodological base for integrating the elements of cloud GIS into various training courses for future geography teachers.

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Distance learning courses in developing future music teachers' instrumental performance competence

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Abstract. The scientific and methodological background of creation and development of the distance learning courses for the future music teachers is substantiated. The components and structure of future music teachers' instrumental performance competence are defined; the content of the course is revealed. The materials are based on the authors' teaching experience within the distance learning course "Basic Musical Instrument (Piano)". The main blocks of the distance course design and development are considered among them to be theoretical, practical, individual work, and control blocks. The specificity of distance learning methods in the future music teachers' instrumental and performance training is substantiated and three main methods are distinguished. The method of involving information and communication technologies, including multimedia; project method, and features of knowledge and skills controlling are elaborated. The results of implementation and experimental research of using distance learning courses for developing future music teachers' instrumental performance competence are described. The influence of different methods use on students' success is explored.

Keywords: distance learning course, instrumental performance competence, method, ICT, project, test.

1 Introduction

One of the characteristic features of contemporary artistic education is its updating in accordance with the requirements of the information space, which is now actively formed within the university information and communication educational environment. A typical phenomenon of artistic education is developing and active implementing of electronic

educational resources, using the information and multimedia sources, electronic textbooks and manuals, educational and methodical software tools, etc. Gradually, the distance learning tools are also involved in artistic education, and distance learning courses are being developed so that future music teachers can study historical and theoretical, and methodological artistic disciplines. The search for new forms and methods of teaching different types of art, effective in the context of distance education, is relevant for contemporary artistic pedagogy.

2 Literature review and problem statement

Informatization of the artistic component of the future music teachers' professional training has become an integral part of the educational process, as it is proved by numerous scientific and pedagogical studies of domestic and foreign scholars (Jacques Arveiller [1], Richard Ashley [14], Natalia V. Belousova [2], Nataliia D. Bieliavina [3], Olena A. Chaikovska [4], Rocio Chao-Fernandez [5], Irina B. Gorbunova [6], Ihor A. Haidenko [7], Andreas Kameris [24], Aleksandr V. Kharuto [9], Igor M. Krasilnikov [11], Aleksei V. Krasnoskulov [12], Nadiia V. Novikova [15], John Michael Ortner [16], Sergei P. Polozov [17], Oleksandr M. Rybnikov [19], Jonathan Savage [21], Galina R. Taraeva [22], Larysa I. Varnavska [23], Irina V. Zabolotskaia [25] and others). Scientists emphasize the importance of using ICT in music education for its transformation into a highly artistic and high-tech process. New software tools, which flexibly combine pedagogical tools of traditional music education and the possibilities of ICT, are actively developed and allow using of the musical computer as a professional tool for a future specialist.

The beginning of the 21st century has been marked by the development and widespread use of computer programs and multimedia for music education: Theano Koutsoupidou develops practical tips for using online distance learning tools in teaching music [10]. Nathan B. Kruse, Steven C. Harlos, Russell M. Callahan and Michelle L. Herring present their experience in Skype music lessons in the academy [13]. J. Savage, the author of several projects on the music education of children by ICT tools, develops new approaches to implementing the computer technologies, taking into account the curriculum, the educational goal, and effective management of the educational process [20, 21]. Rocio Chao-Fernandez, Sara Román-García and Aurelio Chao-Fernandez offer different strategies for learning music by the use of ICT in the context of the music education methodology at secondary school [5].

The design, development, implementation of distance learning courses in the field of artistic education, and their support with electronic educational resources are left out in the researches of the modern scholars. It is known that there are some distance learning courses on music and art in the educational environments of the faculties of culture and arts in Ukraine ("History of Music", "Fundamentals of Musical Composition in Choreography", "Relevant Issues of Contemporary Musical Performance", "Modern Ukrainian Music" are offered to students of the National Academy of Managerial Staff of Culture and Arts; distance learning courses "Polyphony", "Vocal", "Methods of Music Education" and some others are introduced into the future music teachers' professional training at the National Pedagogical Dragomanov University). However, the scientific understanding of using the distance learning elements or creating distance learning courses for the disciplines of the artistic educational industry has only just begun to develop in Ukraine. Liudmyla H. Havrilova presents her experience of introducing distance learning courses into the future primary school teachers' artistic training on the example of the distance learning courses "History of musical art of Ukraine" and "Multimedia technologies in artistic education". The author analyses the peculiarities of creating electronic educational resources, multimedia textbooks and manuals on the history of musical art and their systematic involvement in the e-training of future music teachers [8].

3 The aim and objectives of the study

The main purpose of the article is to consider the experience of designing and applying distance courses while the students' professional instrumental and performance skills are being developed, and to analyse the specific of distance learning methods in the future music teachers' instrumental and performance training as well.

The research described in the article was conducted in the context of the implementation of the research theme of the Primary Education Theory and Practice Department of the Donbas State Pedagogical University "Professionalism of the Teacher: Theoretical and Methodological Aspects" (the state registration number 0115U003313), where the use of distance courses is considered as one of the conditions of increasing the efficiency of the vocational training process for students, and, in particular, future music teachers.

At the preparatory stage of the study, we developed the distance course "Basic Musical Instrument (Piano)" and at the main stage of

the study its approbation was carried out in the course of future music teachers' vocational training at the Faculty of Primary, Technological and Professional Education of the Donbas State Pedagogical University and the Art Faculty named after A. Avdievskyi of National Pedagogical Dragomanov University. 52 bachelor students of the specialty 013 Primary education (specialization "Music") participated in the experiment. In order to solve the problems of the research, a set of methods was used: theoretical (analysis of scientific and methodological sources on the problems of using distance courses in the vocational performance training of future music teachers, systematization and generalization of the information collected) and empirical (conversations, questionnaires, pedagogical experiment).

4 Results of the study

4.1 Review of the distance course "Basic Musical Instrument (Piano)"

The educational discipline "Basic Musical Instrument (Piano)" provides the students with individual classes and with the possibility of adjustment and adaptation in accordance with abilities and preliminary musical training. The course is aimed at the further development of pre-acquired instrumental and performance skills and the students' preparation for the use of the musical instrument at the musical art lessons and in the extra-curriculum activities at secondary educational institutions. The distance course "Basic Musical Instrument (Piano)" like the discipline complements naturally the system of future music teachers' professional performance training, implementing the principles of blended learning and contains the following blocks: 1) theoretical; 2) practical; 3) independent work; 4) control.

Among the main tasks of the course "Basic Musical Instrument (Piano)" we distinguish the following:

1. Forming the interest in pedagogical activity and independent work in instrumental and performance training of the future specialists.
2. Creating a professional basis for further independent work of the future music teachers by means of playing a musical instrument.
3. Optimizing of music teacher vocational training in the integrated unity of musical and performance and pedagogical components.
4. Accumulating the musical repertoire for various forms of educational and extracurricular activities in school and cultural and educational institutions.

5. Developing the readiness to solve the problems of selecting and interpreting didactic and expedient samples of national and foreign musical art, taking into account age-related abilities of schoolchildren.
6. Acquiring students' aesthetic tastes and value orientations.
7. Forming the individual performing style of the future musical art teachers.

The expected result of studying the discipline and working in the distance course "Basic Musical Instrument (Piano)" is to develop students' professional instrumental performance competence, which involves fluent playing the musical instrument (piano) and the ability to use it in educational, concert, and performance activities; to acquire the skills of reading music from a sheet, transposition, music selection by ear; to master the methods of teaching musical instruments playing; to develop the ability to organize instrumental music for students at musical lessons and in extracurricular activities. In the structure of the future music teachers' instrumental performance competence, traditionally, we distinguish cognitive, operational, and motivational components.

The content of the course "Basic Musical Instrument (Piano)" is organized in 5 modules, which combine 10 themes:

Module 1. Formation of piano and technical skills, professional accompaniment skills

Theme 1. Development of professional musical skills. Complication of technical tasks for the development of a pianist apparatus. Work on music of great form: a variety of techniques in sound production, dramaturgy of contrasting images.

Theme 2. Mastering the necessary skills for concertmaster's work. Professional accompanying skills, familiarity with the textual features of the classical romance, the specifics of reading from the sheet of solo, ensemble works and works of school repertoire.

Module 2. Piano technique development

Theme 3. Intonational, dynamic, timbral, and rhythmic function of articulation. Analysis of the characteristic features of the musical composition from the school programme, the definition of the necessary requirements for intonation (articulation, timbre, etc.) and rhythmic difficulties.

Theme 4. Generalization of application formulas. The mastery of the technical perfection of the musical programme by working on certain types of techniques that require systematic rehearsal work. Analysis of the application and the detection of patterns.

Module 3. The structure of polyphonic technique

Theme 5. Polyphonic multidimensionality as a property of piano texture. Formation of cantil, flexibility, and naturality of intonation skills. Development of polyphonic hearing: the ability to hear the individual expression of each voice. Rehearsal work on intonation of polyphonic texture.

Theme 6. Development of polyphonic hearing. Concept of polyphony for school repertoire. Improving the skills of performing the song for your own support. Harmonize the melody using improvisation elements.

Module 4. Development of piano performance skills

Theme 7. Development of performance skills in the work of polyphonic works of great shape. Continuation of mastering the skills of polyphonic thinking, polyphonic control, its interaction with performances techniques, various types of polyphonic techniques. Ability to master the drama of the musical image in the works of a great form. Formation of large-scale musical thinking.

Theme 8. Development of stylistic and genre interpreting skills. Ability to use knowledge about the form, character, and dynamics of the piano works development. Understanding the meaning of the timbral colour, realizing the artistic design of each of the works of the program.

Module 5. Competence in the field of musical and pedagogical performance

Theme 9. The mastering of musical works from the school repertoire. Knowledge of the reproduction specifics of piano works of different eras, styles, and genres, taking into account the peculiarities of the students' perception.

Theme 10. Realization of pedagogical and executive plan while performing plays for listening. Ability to combine the melodic line and accompaniment, mastering the skills of joint playing music. Ability to perform musical works for listening perfectly, technically, and artistically.

The course "Basic Musical Instrument (Piano)" is preceded by the information block containing general information about the course, a forum for communication with the students, and a glossary for the course providing basic concepts and their interpretation. There are the tasks for creative projects, recommendations for the conclusion of an e-portfolio, tentative repertoire and a list of recommended literature available for downloading (Fig. 1).

The theoretical block of the course aims at forming and developing the cognitive component of the future music teachers' instrumental and performance competence and contains the text materials of lectures

accompanied with multimedia presentations, charts, tables, as well as multimedia content (audio, video fragments, photo materials, reproductions of works of fine arts etc.). The lecture material is presented in a short form and supplemented with the musical compositions for listening (Fig. 2).

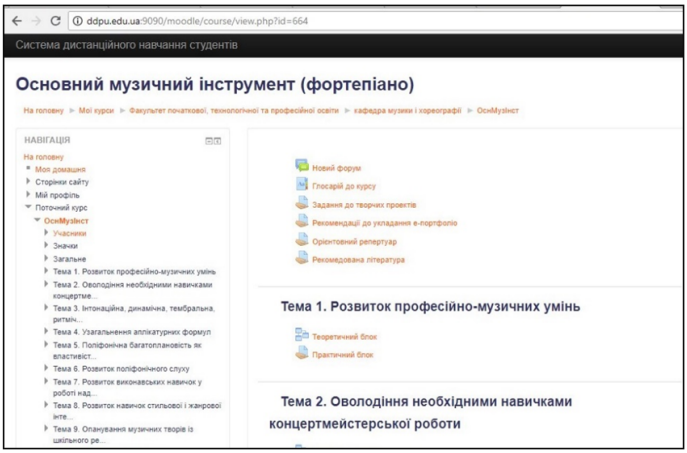

Fig. 1. The information block of the distance learning course "Basic Musical Instrument (Piano)"

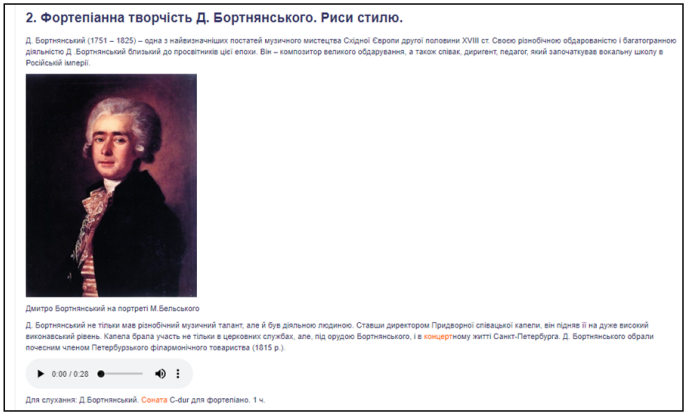

Fig. 2. The fragment of the lecture in the distance learning course "Basic Musical Instrument (Piano)"

Practical block of the distance learning course "Basic Musical Instrument (Piano)" aims at forming the operational component of the students' instrumental and performance competence and contributes to forming and developing skills and abilities of listening to music, fluent playing the musical instrument, skills of reading music from the sheet, transposition, selection of music on rumour, performance of musical and analytical activity, developing creative musical thinking.

The block of independent work, which contains tasks that require a comprehensive solution through the use of Internet resources, work with multimedia content, its processing, both individually and in group activities, is aimed primarily at the formation of the motivational and value component of the future music teachers' instrumental and performance competence.

The control of musical knowledge and instrumental skills, acquired while mastering the "Basic Musical Instrument (Piano)" distance learning course, takes place in the form of a test (MOODLE's learning environment provides an opportunity to check the knowledge of the theoretical material effectively, as well as mastering the musical compositions of Ukrainian composers by hearing through test tasks of different type, developed in the module "Test") with instant receipt of test results.

4.2 Specificity of distance learning methods in the future music teachers' instrumental and performance training

The method of involving information and communication technologies, including multimedia. In order to create a complete performance interpretation, immersion in the content of a musical work requires not only technical perfection but also professional performance skills, the level of which depends directly on a whole complex of musical knowledge, skills, formed aesthetic needs, values orientations, and other personality traits. Therefore, the performer must know and systematize musical forms in their historical development, instrumental studies, and relevant musical literature (biographies of composers, information about musical works), understand the problems of musical aesthetics. The development of artistic trends and creative schools, various aspects of the composer creativity influence spiritual life of society. In addition, musical and instrumental performances involve the use of interdisciplinary connections with history, literature, culture study, and various arts (painting, theatre, cinema, and choreography). Consequently, musical performance interpretive activity is one of the most diverse kinds of musical activity, which includes a considerable amount of information.

Modern technologies, in particular, multimedia and other computer

technologies, make it much easier to search for information and help deepen awareness of a particular musical phenomenon due to the other types of information (textual, graphical, static and dynamic visual).

The involving ICTs was in the following areas:

- studying (or profound immersion) the composer's life and work, his individual works on the Internet; studying the scientific articles; listening to audio files; viewing video materials, providing "immersion in an era";
- searching for musical and performance interpretations of the work performed by well-known and little-known pianists in order to analyze the musical performances and compare author's interpretations;
- creating their own verbal interpretations aimed at the certain audience, on the basis of generalization of information from various Internet sources and conducting of thorough analysis of composer and performance expressive means;
- using the resources of musical notices of Internet libraries (Knot's library: http://nlib.org.ua/; Sheet music classical library: http://nlib.narod.ru/; B. Tarakanova Book archive: http://notes.tarakanov.net; D. Roizman's book archive: http://roisman.narod.ru/compnotes.htm and many others);
- involving the electronic context of multimedia encyclopedias and other information publications (New Media Generation, Masterpieces of Music from Encyclopedia, "Sonata: World Culture in the Music of the Mirror of Music" multimedia collection (http://www.sonata-etc.ru/main.html), KorAx multimedia encyclopedia "Musical Instruments"; "Virtual Museum of Musical Instruments" "Terra Musicalis"; Encyclopedia Music Conservatory from Voyetra Technologies, etc.);
- recording the performance of a musical composition using a video camera or phone for further analysis of the performance interpretation (alone or with the teacher);
- involving visual associations, searching for works of painting and other types of fine art, using of associative ties, artistic analogies to deepen the interpretation of the content of the musical composition.

The method of involving information and communication technologies contributes to the development of certain musical and interpretive performance skills:

- developing musical thinking autonomy, mastering skills of self-presentation and communication with different audiences;
- creating auditory model of performing musical work interpretation;
- forming the ability to use the media in training and to evaluate critically their own media activity.

Project method. We determine the algorithm of the creative project activity of the participants in the experimental study for developing the readiness of the future music teacher to perform and interpret the activities in musical and instrumental learning:

- nominating the participants of the artistic and performing project and the choice of the topic;
- setting the problem, purpose and targets of the artistic project;
- defining the type and content of artistic and project activities;
- selecting the methods and tools of implementing artistic and creative project;
- students' independent performing and interpreting activity.

Choosing the project topics, students are offered two types of projects: single-subject project on discipline "Basic Musical Instrument (Piano)" (design and interpretation activities within the repertoire and performance tasks in the classes of musical specialty) and a multi-subject project within the professional disciplines ("Workshop on the school repertoire", "Additional musical instrument", "History of musical styles", "Analysis of musical works", etc.). The specific themes of the projects are agreed with the participants of the experimental study for developing the future music teachers' readiness to perform and interpret the activities in musical and instrumental education. In the information block of the distance learning course, students are offered topics of various content, taking the individual level of project group members and their musical tastes into account.

The projects are carried out in the academic year and are evaluated by the teachers at the stage of both current and final control. Students discuss their projects in the forum and send interim and final reports on project implementation using the module "Task".

Project "Harmony of Music and Painting in the Work of M. Churloniss". To implement the project, a group of students is divided into teams:

- search engineers (main activity is information retrieval: search for information about the life and work of the famous Lithuanian composer and artist on the Internet, as well as search for piano

pieces — Fugue C minor, Preludes in the minor, Preludes in C major in the performance of various pianists and paintings M. Churloniss "Fuga", "Signs of the Zodiac", etc.);

- art critics (main activity is musical and analytical: musicology, musical-pedagogical and interpretive analysis of the certain works of M. Churloniss for piano; the creation of analytical schemes; aesthetic and stylistic analysis of paintings and analysis of the principle embodiment of musical expressiveness in the artist's paintings).

The final stage of the project "Harmony of Music and Painting in the Work of M. Churloniss" is an executable interpretation of three musical works by the composer, and they are accompanied with a multimedia slide show, which presents the author's pictures that are closely associated with the musical text. The performers' laconic and accurate comments go along with the sound of music.

The project "Pictures at an exhibition" by M. Mussorgsky: implementing the principles of integrating musical and pictorial. The purpose of this project is to direct the students' interpretation to the search for adequate sonorities, colours and shades, and the departure from the traditional canons of interpreting the famous piano cycle by M. Mussorgsky.

For this purpose, we nominate the project teams:

- search engineers (main activity — information retrieval: searching for information about the life and work of M. Mussorgsky and his friend V. Hartman on the Internet, searching for the most vivid piano and orchestral interpretations of the cycle "Pictures from the exhibition", as well as searching for reproductions of works, inspired the composer to create music);
- art critics (main activities — musical and analytical: musicology analysis of individual works of the cycle, as well as analysis and evaluation of performance interpretations found);
- IT specialists (the main type of the activity is creating the informational multimedia support for the interpretive interpretations of M. Mussorgsky's piano cycle, their visualization by means of computer technologies);
- performers-interpreters (main activity — interpretative: musical performance with brief comments on the content, means of expressiveness and musical form).

The project is implemented in the form of a concert performance by students-performers who offer their own interpretations of famous works

by M. Mussorgsky's "Walk", "Two Jews", "The Chants' Ballet", "Dwarf", "Baba Yaha". Their play is accompanied with a brief poetic story (art critics choose poetry lines) and a visual series (listeners can at the same time listen to music and review the works by V. Hartmann, inspired by the composer). The main content accent of performing interpretation is made not on the "figurative" aspect of works, but on the embodiment of feelings and emotional essence of events, that is, their "expressive" reproduction.

Specific features of controlling the knowledge and skills, acquired during the study of the course "Basic Musical Instrument (Piano)". In order to test the formation of the key knowledge gained while studying the distance course "Basic Musical Instrument (Piano)", it is enough to conduct an ordinary test in the MOODLE learning environment using different test types (Fig. 3).

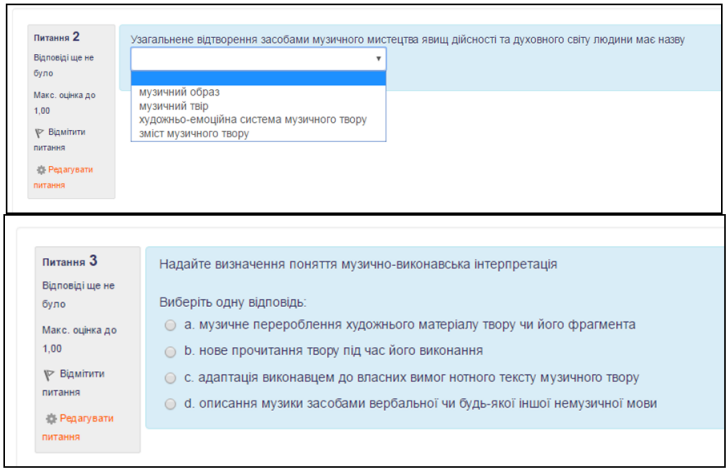

Fig. 3. The examples of the question in the test

The verification of specific musical knowledge, as well as the formation of special skills to percept music, the development of music listening skills, the recognition of musical works while listening requires the musical quiz conducting (recognition of works with the definition of their authors, parts or a specific topic of the great work). The quiz is developed using the possibilities of the service "Test" of the learning environment MOODLE in two versions:

- the task of the closed form (listen to the piece of music and choose the correct answer among the proposed ones);

- the task of the opened form (the "essay" question type: after listening to the fragments of the musical composition, you must enter the answer to the designated place, indicating the author, the exact title of the work and section, the act of the opera, part of the symphony or topic, etc.) (Fig. 4).

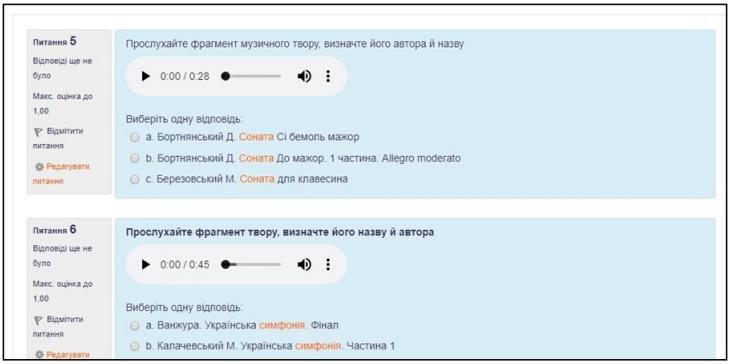

Fig. 4. Questions of the musical quiz (service "Test" of the MOODLE)

The practice of using e-tests as a tool of control proves that they are more appropriate for monitoring the cognitive component of the future music teachers' instrumental and performance competence than the operational and motivational ones.

4.3 Analysis of the efficiency of the distance course implementing into the future music teachers' instrumental and performance training

In the end of the academic year, the evaluation of the distance course efficiency has been held. Respondents were separated into two groups: experimental group (27 students) and control group (25 students). The experimental group worked in the distance course "Basic Musical Instrument (Piano)" in addition to the classes. The students of the control group were involved in studying according to traditional methods and techniques. They attended individual and group classes on the basic musical instrument, ensemble and concertmaster class, and others, which corresponded to the typical curriculum. Classes with students of control groups were conducted using traditional methods, without the involvement of information and communication technologies and distance learning.

The level of the motivational component of the future music teachers' instrumental performance competence was assessed with the interviews.

The interviews were conducted informally through discussion as a part of observation. The results are presented in the table (Table 1) and demonstrate higher indicators of the students' interest in instrumental and performance work. It was also noticed that student attendance in the experimental group had increased by 12% compared to the control one.

Table 1. Level of the motivational component of the future music teachers' instrumental performance competence

Levels	**Experimental group**		**Control group**	
	Students	**%**	**Students**	**%**
High	9	37	6	24
Upper middle	12	44	9	36
Lower middle	5	19	8	32
Low	1	4	2	8

In order to assess the cognitive component of the future music teachers' instrumental performance competence, the results of testing, implemented in the virtual learning environment MOODLE, were involved. The results are presented in the table (Table 2) and prove that the pedagogical experiment significantly improved the artistic and professional thesaurus of future teachers and increased the level of students' skills in the field of instrumental and performing interpretations.

Table 2. Level of the cognitive component of the future music teachers' instrumental performance competence

Levels	**Experimental group**		**Control group**	
	Students	**%**	**Students**	**%**
High	10	37	5	20
Upper middle	13	48	10	40
Lower middle	4	15	8	32
Low	0	0	2	8

The level of the operational component of the future music teachers' instrumental performance competence was assessed with the final exam, which involved verbal communication and musical performance. The results are presented in the Table 3.

Table 3. Level of the operational component of the future music teachers' instrumental performance competence

Levels	Experimental group		Control group	
	Students	**%**	**Students**	**%**
High	10	37	6	24
Upper middle	15	44	9	36
Lower middle	5	19	10	40
Low	0	0	0	0

Overall, our results demonstrate a strong effect of implementing the distance learning course "Basic Musical Instrument (Piano)" into future music teachers' vocational training, since the level of each component of the instrumental performance competence has increased in the experiment group.

5 Conclusion

Implementation of the distance course "Basic Musical Instrument (Piano)" into the system of future music teacher training at SHEI "Donbas State Pedagogical University" makes it possible to draw conclusions:

1. Students' work in the distance course "Basic Musical Instrument (Piano)" should be combined with the curricular activities, piano playing practice, and direct contact counselling. Therefore, this combination of forms and methods of distance and traditional education represents a blended model [18], rather than purely distance learning. In this mode of work, the teacher begins to fulfil duties of a tutor, who accompanies and directs the instrumental and practical training of students in the e-learning environment and in curricular instructions.

2. In view of the positive results of implementing distance courses in the instrumental and performance training of future music teachers, the prospects of further scientific research are to develop and use new forms and methods of distance learning: scribing, intellectual maps and comics as varieties of modern educational infographics, etc.

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E-learning resources for successful math teaching to pupils of primary school

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Abstract. Ukrainian primary schools are undergoing significant changes as for Reform 'New Ukrainian School', it reflects rapid updating information technology and high level of children' informational activity. Primary schools are basically focused on development subject knowledge and general study skills. One of the ways of their developing is to use tools and apps. There are the examples of using interactive tools and apps for teaching Math for young learners by teachers-to-be in the article. The article presents as well the experimental data about training teachers-to-be to use tools and apps. Interactive tools and apps provide real task variability, uniqueness of exercises, operative assessment of correction, adjustment of task difficulty, a shade of competitiveness and gaming to the exercises. To create their own apps teachers-to-be use the tools that are the part of the integrated Microsoft Office package using designing environments, and other simple and convenient programs. The article presents experimental data about the results of training teachers-to-be to create apps. A set of criteria for creation apps was made and checked at the experimental research such as ability to develop apps, knowledge and understanding the functional capabilities of apps, knowledge of tools for creating apps and their functional capabilities, ability to select and formulate tasks for young learners, ability to assess adequately the quality of the developed apps.

Keywords: tools and apps, teaching Math, young learners, primary school, experimental research.

1 Introduction

As for ongoing Reform 'New Ukrainian School' in Ukrainian primary schools and education changes occurring in the society, the particular

attention should be paid to the primary level of education. Primary schools are the foundation for creating intellectual and general study children' skills, development their cognitive activity, and independence. It is the elementary school that affects all subsequent nature of the relationship of young learners with the educational environment and society.

There are some reasons for changes. The present stage of education system development in primary school is undergoing the significant changes. These changes are associated with a wide penetration of information and communication technologies in all areas of human activity, rapid updating of information technology and high level of children' informational activity. The evidence to this is as follows:

- reduction of the age of a child's first encounter with a computer. As a rule, a child who comes to primary school, already has the first experience of using a computer. This is facilitated by the presence of household digital devices in the family such as photo and video cameras, mobile phones, smart phones that are compatible with a computer and assume data processing by a computer. In addition, current software market is filled with entertaining and educational multimedia programs for children aged 3–4 years. However, the lack of purposeful use of information technologies in educational activities that meet child's needs, is mainly compensated by gaming activities on the computer;
- the emergence of mobile devices connected to the Internet. The capacities of such mobile devices are not used in training process. However, young learners tend to be well acquainted with such devices and use them solely for entertainment. In addition, other technical devices of algorithms automation could be used in the learning process: household and office equipment, robotic machines, automated construction sets, etc.;
- presence of specific skills to use information technology for personal use with young learners of primary school age. Currently, young learners get familiar with the computer components and software tools for themselves as a need arises for writing and editing papers or reports (text processors, program browsers, image editors), for communication (social networks, communication software), for finding new applications for mobile phones and so on. However, existing skills can be used to develop the necessary substantive and general study skills;
- approaches of presentation new information to children in the

classroom need to change. Young learners expect beautiful, bright illustrations, presentations, videos to be used, game situations to be created and so on. This is due to the changes in the media — modern TV programs are bright, emotive, dynamic, in order to maintain the audience's attention; stories in publications for children are accompanied by high-quality illustrations, videos, etc.; modern books expect the reader's action to color, to find the path of the character, find differences, etc.;

- presence of a large number of applications and devices that can always help a young learner such as calculators and translation tools in mobile devices and computers; electronic reference books; spelling dictionaries, built into text editors. Prohibition to use such applications can be changed for the selection of such tasks, which provide for educational research and give young learners an opportunity to use various means to test their own suggestions;
- willingness of teachers, especially in primary schools, to use the new information technologies in education. In primary school a teacher and a textbook remain the primary source of information, and that is the teacher who determines the level of acquired knowledge, the level of general study skills.

The named reasons condition the need for new approaches to implementation of information and communications technologies in teaching young learners. Primary school is focused on the development subject knowledge and general study skills such as skills of writing, reading, doing sums, spelling and others, assured command of which is a prerequisite for further successful studying in school.

Achieving success in building subject and general study skills is a natural need of every young learner. Each child comes to school with an aspiration to be successful and to gain recognition of personal achievements. For a young learner the expectations of success are connected with the efforts to gain recognition on the part of people important for him/her — parents, teachers, principal, classmates and getting approval from them. Experiencing success by young learners affects the quality of education, the development of the inner child's world, the formation of self-confidence.

As we know, success is a feeling of joy, satisfaction from the fact that the result, which the personality was striving for in his work, either matches his expectations, hopes, or exceeds them. Success is always connected with actions, it is not an end in itself. This is the result of achieving the desired goal, accepted, recognized and meaningful to a child, experience of

feelings of joy after overcoming difficulties. Achievement provides for getting a specific result, and recognition can be public, local or individual [12]. The success supports a child's interest in learning, encourages him/her to overcome the difficulties, urges to achieve new goals.

One of the modern ways of forming a general study and subject skills by primary school children are tools and apps. Tools and apps are educational software that designed to shape and consolidate practical skills after preliminary mastering of theoretical data by young learners.

2 Literature review

The literature also holds many studies related to the positive effects of educational use of information and communication technology (ICT) in general [13] and cloud technology in particular [9]; instructional design principles, their interrelationships, overall process of designing effective teaching with ICT [4]; engineering design thinking, teaching and learning with ICT [5]. Some issues about primary learning were discussed such as developing technological pedagogical content knowledge in pre-service science teachers [1]; using ICT in primary school curriculum [8]; e-learning for primary teachers [7]; using ICT in primary Mathematics [11].

We wrote some articles concerning such a significant investment in the theory as didactic potential of digital educational resources for young learners [2]; on cloud-based complex of computer dynamic models and their transdisciplinary facilities [3]; and in practice as use of GeoGebra in primary pupils training [10].

3 Methods

In this research theoretical, empirical and statistical methods are used. Theoretical methods (analysis and synthesis) serve to analyze opportunities, advantages and disadvantages of tools and apps as new means to teach Math for young learners in primary school.

Empirical methods (observation, testing, pedagogical experiment) provide conducting the experiment itself, detailed and achievement tests in order to collect data for examining the efficiency of use systematic tools and apps to teach Math for young learners in primary school.

Statistical methods helped make statistical analysis of the pedagogical experiment data; the experiment was conducted at H. S. Skovoroda Kharkiv National Pedagogical University (Ukraine) at Computer Science lessons during 2016–2018 with 82 teachers-to-be for primary school.

4 Results

4.1 Interactive teaching tools in ensuring the success of young learners in Mathematics study

As mentioned above, using tools and apps to teach Math for young learners in primary school is relatively new teaching means for Ukrainian educationalists. Definitely, tools and apps can provide successful learning.

To educate young learners there are many tools and apps developed that facilitate the acquisition of skills in Math, in native language, in foreign languages, etc. However, a tool is only relevant if it allows you to work out exactly what caused the difficulty in a particular lesson, when the specifics of teaching material is taken into account, especially the perception of young learners.

Tools and apps unlike traditional manuals provide real variability of interactive tasks, uniqueness of exercises designed to form appropriate skills. In particular, for training young learners in performing calculations and doing sums, tools and apps are able to generate an unlimited number of numeric values to each task type, which allows diversifying the learning objectives, avoiding memorizing answers.

Tools and apps feature operative assessment of correctness of each task. Immediately after each task a child can get a reaction, indicating a correct solution. This immediate response is important in the early stages of training young learners when they expect approval for successful tasks or reassurance if making errors. Immediate reaction of the software will improve learners' confidence in their abilities, willingness to effort to improve their results. However, with getting experience in work with the software, instant control must be reduced in order to maintain and encourage learners' initiative.

An important feature is the adjustment of task difficulty. The difficulty level can be preset designated by a teacher or selected by a learner. Of particular interest there are tools and apps that implement adaptive algorithms and basing on learners' performance of first proposed tasks adjust automatically the level of subsequent tasks. Such adaptive interactive tools and apps are useful especially in primary school, because the difference in learners' background, in level of their habits and skills is the most notable among children in a class there are those who perform calculations easily, read quickly, etc., and those who are only acquainted with basic rules, learn to form syllables.

Automatic control of the difficulty level of tasks enables a teacher to identify quickly gaps in learners' knowledge and eliminate them. To learners

whose skills, which are being trained, are already formed at a high level, tools and apps provide an opportunity to test their skills in doing exercises of increased difficulty. Thus, tasks for each learner are in the zone of their proximal development.

Tools and apps feature the ability to provide a shade of competitiveness and gaming to the exercises. It is worthy of note that game is not the main activity for primary school children, but it takes a significant place in child's life along with educational activities. Playful learning requires substantial intellectualization of primary school child's activities such as prompt realization of task, analysis of possible solutions, and search for the optimal variant. Moreover, the game encourages a learner to show initiatives, to develop activity, stimulates memory development, initiative thinking, releases emotions.

Using computer can realize the benefits of playful learning to the full extent. Exploring the specifics of computer games in education, there are the benefits as we know: increase learning motivation, encouragement of initiative and creative thinking, inclusion all learners into activities, getting experience of cooperation and teamwork, establishment of interdisciplinary connections, creation an informal environment for learning, favorable conditions for different strategies formation for solving problems, etc.

The emotional appeal of computer games, competitive game aspect, variety of events, exciting plot, realistic graphics, ability to control characters by oneself can instigate learners to achieve only a gaming purpose. Therefore, an important prerequisite for using computer games in education is to provide conversion of a gaming purpose (to help the character, to win, to release someone, to get the prize) into achieving educational goals.

For example, amid spectacular finding a way out of the labyrinth, there may be a process of mastering of subject skills. Playful presentation of a task, its dynamic nature, the practical purpose (to color a picture, to collect the keys, to rescue the princess, etc.) turns a routine work on developing skills into an interesting game that motivates learners to perform typical tasks. In addition, ability to compare the results of their own work with other learners' ones, gives such activities as sport excitement and an incentive to improve the obtained results.

There are some principles of construction interactive authors' apps. With the development of tools, the availability of information sources a teacher-to-be is able to create interactive authors' apps that take into account the specifics of training learners of a particular grade on a particular topic, their individual characteristics and hardware of educational process. Authors' apps can be directed to practice exactly the skills that cause difficulties for learners.

4.2 The principles of construction interactive authors' apps

Based on the analysis of existing experience of using tools and apps in the practice of primary education, we have identified the following principles of their construction to ensure successful teaching primary school children.

The first principle to be taken into consideration at app design is the following: *developed apps should generate learners' interest.*

The matter is a child who works with an interactive model is unobtrusively involved in educational and cognitive activity. It is important to emphasize that a learner is got involved in this activity by not direct teacher's instructions, but on his own desire to resolve the situation occurred on a computer screen. Plot design of a training material encourages him/her to educational activities. These actions require revealing subject knowledge and skills as well as the ability to apply them to a new environment. The combination of training and practical purpose that is achievable and understandable for a child gradually transforms into the learning motive. Such a transformation is promoted by the circumstance that at summarizing the child's work with a didactic model, his attention is focused on the importance of the knowledge and skills that have helped to achieve a successful outcome.

In primary school it is crucial to include pure life realities into the learning content. It provides implementation of the didactic principle of training and practice connection.

Tools and apps must allow applying a learning task with all its attributes: for example, travelling cars, a chocolate bar that is being eaten, a pie which is being divided etc. A learner can move the car, divide the chocolate bar, cut the pie in different ways.

Tools and apps allow expanding the diversity of training tasks, suggesting the problem having various solutions. So, a learner is assigned not only to solve the problem correctly, but also to make a rational choice of the solution method. The second principle to be taken into consideration at app design is the following: *apps should be visually presented to create pleasant emotional background.*

Child's emotions at classroom activity have a significant impact on it. Emotions initiation of primary schoolchildren usually is associated with a particular situation. It might be nice visual design, familiar objects or characters, valid comments. All this calls up a learner's pleasant feelings.

Development of positive emotions and aesthetic senses is also promoted by the series of techniques. They include friendly interface of didactic interactive models, harmoniously picked up colors, using special techniques

to attract and focus learner's attention, to develop his imagination, thinking, and memory. A positive emotional background of a child's learning with interactive models is also guaranteed by the possibility to cancel his actions at any moment and to return to the previous step. A learner has an opportunity to feel free doing his trials at searching right or effective task solving. He is not afraid of any negative consequences. It promotes creation of a learner's positive emotions, forming his persistence and confidence. The third principle to be taken into consideration at app design is the following: *problem definition should involve learners into critical analysis of input data as for their adequacy, redundancy, actuality.*

For this purpose, the developed apps have redundant information, so that a child could choose what he/she needs. For example, additional measurements, additional data etc. The fourth principle to be taken into consideration at app design is the following: *apps should allow learners to operate free, for example, to perform transformations of geometric solids* (*rotate, drag, resize them*).

The peculiarity of young learners' perception is a close connection with an action. For schoolchildren, especially in their 6–7 years, to perceive the subject means to do something with it, for instance, to touch, to rotate, and to change. Practical actions play a significant role for the development of child's cognitive processes. Therefore, apps should allow manipulation with learning objects.

Apps which are focused on learners' research activities should provide possibility of the figures transformations such as rotation of geometric shapes, overlapping some shapes on others for their comparing and resizing. Making changes with shapes meets child's need to experiment. At the same time it allows to see results of his activities and to make his/her own conclusions.

Some additional principles to be taken into consideration at interactive models design are: developed apps should provide support (step by step assistance) of learners' activity to achieve success and completeness at tasks performing; developed apps should provide an opportunity to verify the correctness of the obtained result.

On the one hand, to succeed in learning it is important for a child to have an opportunity to achieve his intended result. Timely assistance is crucial for learners who have just started learning. Developed apps contain elements that provide necessary support for a learner. Every child who works with the model can get help in time. A child can get help after his request in the form of textual commentary, additional constructions, and solution. The system of multi-level assistance in tools and apps focuses on

achievement the result by each child.

On the other hand, training should be accompanied by overcoming difficulties feasible for a learner. Depriving a learner of difficulties we, however, deny him feeling joy and pleasure of success gained through his/her own efforts. Difficulties in the learning process are essential to meet learner's needs in cognitive activity. Therefore, learner's assistance at difficulties should be dosed, not excessive, but sufficient to support his efforts and aimed at making him/her overcome obstacles himself/herself. Learners in their learning activities should not act on a pattern and algorithm and retain the right to initiative, possible errors and their correction. A learner should be relaxed in his own actions. The experience in this activity is now appreciated higher than well learned rules in solving typical tasks as this experience teaches a learner how to acquire knowledge.

Taking dosage help for learners in apps is a complex task and is currently being implemented fairly rarely, but this assistance will help developing initiatives to identify creative abilities, creating strong-willed child. Successful and progressing schoolchildren can employ maximum available to overcome difficulty level tasks for schoolchildren.

4.3 Interactive tools for construction authors' apps by primary teachers-to-be

We would like to show the basic tools for construction interactive authors' apps. A teacher-to-be, creating apps, independently, can use modern tool kits to create interactive exercises and didactic computer games. The interface of many tool kits, oriented to design author's didactic resources, is simplified and intuitive for an average user and it does not require additional training. In addition, as a rule, these tools include a set of templates for rapid development and offer the available examples.

To develop apps a teacher-to-be can use programs that are part of an integrated Microsoft Office package, spreadsheets and applications to create presentations.

The choice of these applications is due to several reasons:

- wide spread of Microsoft Office package among different specialists;
- preparedness of teachers-to-be to use office technology in teaching;
- presence of large collections of teaching resources developed by teachers for their own educational activities. Ready didactic resources are available to teachers and can be adapted to the conditions of a particular grade and lesson;

- teachers' experience of usage software package for the preparation of teaching and learning materials, documents, etc.;
- possibilities to integrate various forms of information in apps, so, slide or book may contain author's drawings prepared in appropriate graphics software, sounds, prepared in music editors, text fragments.

There are the examples of authors' apps. Apps developed by our students from H. S. Skovoroda Kharkiv National Pedagogical University, teachers-to-be for young learners for primary school to teach Math in Microsoft Excel spreadsheet are presented in the form of tests, didactic games, crossword puzzle (Fig. 1).

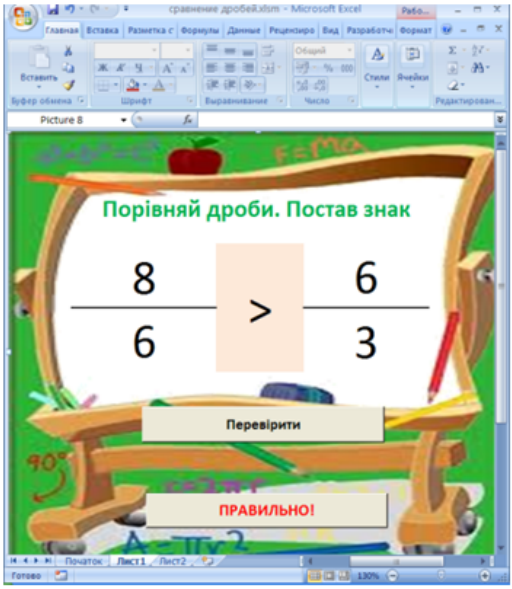


Fig. 1. Apps for learning fractions developed in Microsoft Excel

Basically, such capabilities provide convenience to create training systems in Microsoft Excel:

- data exchange between applications which facilitates the process of preparing the environment for apps and enables to provide an attractive appearance;
- modifications and additions to the tasks when they are needed;

- programmable generation of numerical values in the text of tasks and answers. This allows to prevent memorizing the answers by learners and provides variation of the tasks.
- simplification of the analysis of the assignment correctness by the relevant functions;
- presentation of the test results in the form of tables, charts, graphics, etc.;
- storage of test results and the ability to further analysis;
- availability of templates to create tests that are available to teachers-to-be at any time.

The advantage of using presentation software to develop automated tests is the possibility of their attractive design, providing a soundtrack, the ability to support each task or question with a desired scheme or pattern. In addition, the PowerPoint environment allows the construction of matching tasks, where the correspondence between the elements of two sets is defined, the tasks of ordering the sequence of actions.

Of special convenience for a teacher-to-be is access to ready-made templates that have a programmed tasks check. In the environment of Microsoft PowerPoint presentation the apps developed by our students are presented (Fig. 2, Fig. 3). The apps include controls designed for automatic creation of tasks for learners and elements that analyze user actions.

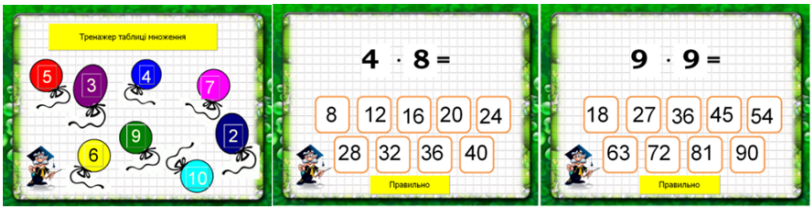


Fig. 2. Apps for learning multiplication tables developed in Microsoft Power Point

However, the development of apps in these packages requires knowledge of the programming language Visual Basic for Application and it is a painstaking task for a teacher-to-be. To create apps primary school teachers-to-be can use designing environments which include a substantial set of templates and patterns associated with school material. In particular, such app designers can be useful for a teacher-to-be. They are the designers: Classtools.net, Zondle, Learningapps.org, Studystack and others.

Within the environment Classtools.net (http://classtools.net/) a teacher-to-be can develop interactive posters, charts, diagrams, computer educational games to support any school subject such as Math, Science, Reading and more. The environment is an online resource that offers a set of templates for creating teaching tools. In particular, the template "Arcade Game Generator" used by our students (Fig. 4a) enables to create computer games such as quizzes in the form of arcade games (search for pairs of questions and answers, hitting the target with the answer), pattern "Dustbin Game" used by our students (Fig. 4b) creates tasks related to the grouping of elements, template "Post It" allows to create interactive posters in which an explaining text is shown when you hover your mouse on a specific part of the image. Options of patterns are improved and their number is constantly growing.

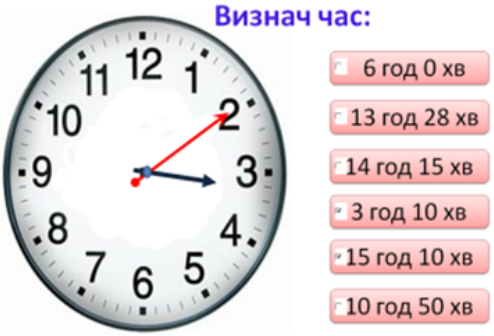
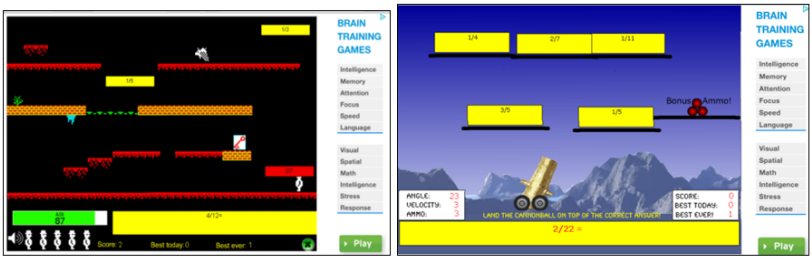


Fig. 3. Apps for learning analog clocks developed in Microsoft Power Point



a *b*

Fig. 4. The template "Arcade Game Generator" (a) and pattern "Dustbin Game" (b)

Of special convenience for teachers-to-be is that developed apps can be stored on the server for the organization of joint work of learners, on the local computer for future use in the classroom, or printed out.

The didactic games designer Zondle (http://www.zondle.com) allows a teacher-to-be to create apps for any subject. The designer offers template games to fill in with the subject content. In this case, a teacher-to-be needs only to prepare assignments and choose a template of the offered. Designer offers to use certain types of tasks, among them the tasks that include:

- select the correct answer from the offered;
- enter the correct answer from the keyboard;
- confirm the correctness of a statement;
- insert missing words into the statement and others.

The environment also provides an option to develop the game scenario, chose the characters and fill in substantive tasks by oneself. Creating author's games does not require programming and additional training.

In Fig. 5 the examples of education games made by our students for young learners are shown, reviewing the multiplication table and the formation of ideas about true and false statements.

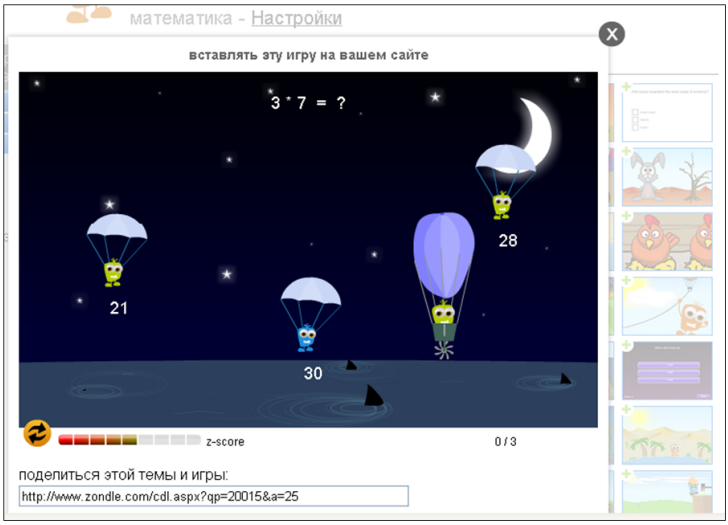


Fig. 5. Example of education games in Mathematics in Zondle environment

The developed educational games are stored in a network that allows to use them in extra-curricular activities for learners. The designer of interactive exercises Learningapps.org (http://learningapps.org) allows you to create training exercises that require practical actions from user: to place in the correct order, to choose the correct answer, to solve a crossword puzzle, to solve a puzzles, to group etc. Many templates are offered to a teacher-to-be as well as a set of ready-made interactive exercises that can be used as templates. They help in creation of such didactic exercises that would be appropriate in a particular grade, in the study of a particular topic. Ready projects can be stored on a local storage or network.

In Fig. 6 some examples of developed interactive exercises made by our students are shown, they illustrate mathematical operations to learners and train their verbal counting.

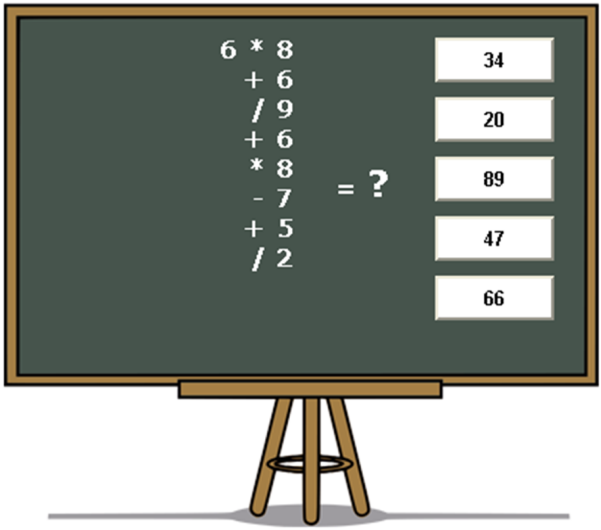


Fig. 6. Examples of interactive exercises created in the Learningapps.org environment

The designer of education games Studystack allows not only to create interactive exercises using the set of templates, but also offers practical tasks already available from a variety of subjects: Mathematics, Nature, Art, History, etc. (http://www.studystack.com/) Projects are stored on the server, which allows using them both in the school and home training. The designer has been working since 2001 and has accumulated a significant amount of ready interactive exercises for children from preschool to high school. The advantage of using this designer is ease of preparation of

training exercises: a teacher-to-be simply enters tasks text and correct answers, on which base different versions of interactive exercises are created automatically such as quizzes, crosswords, hit on target games and hangman games, etc.

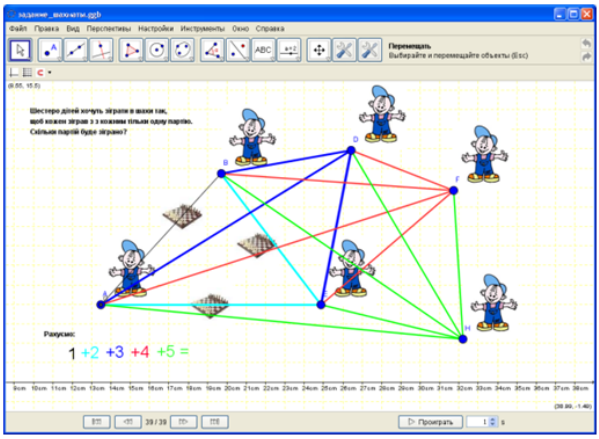


Fig. 7. Apps for task about chess: Six children want to play chess, so that everyone plays with each player once. Find how many parties will be played

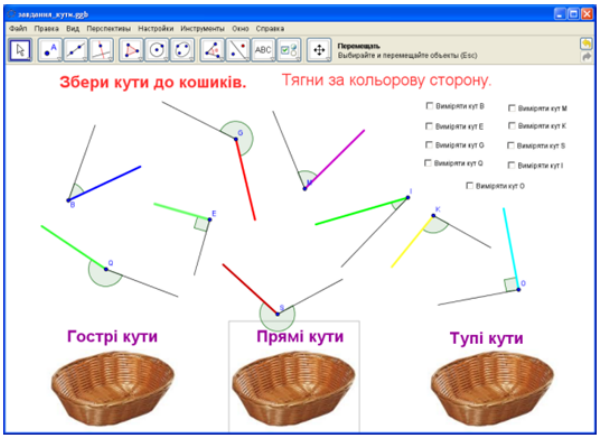


Fig. 8. Apps for tasks about angles. Children collect right, obtuse and acute angles into baskets

To create apps a teacher-to-be can also use an environment GeoGebra (http://www.geogebra.org). It is very popular nowadays [6]. Some examples of apps developed by our students for young learners on GeoGebra are shown in Fig. 7–11.

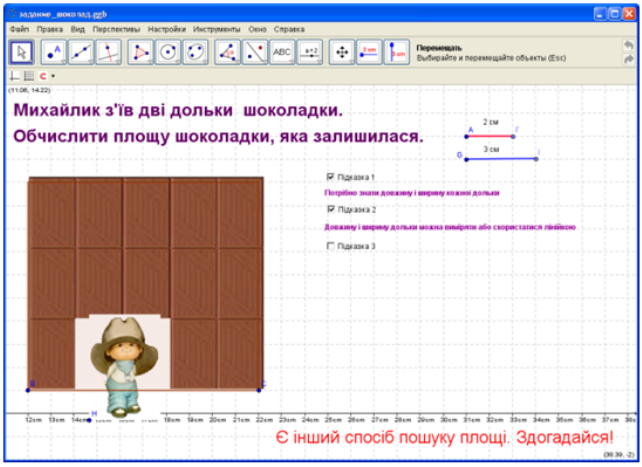


Fig. 9. Apps for a task: Mykhailyk has eaten 2 pieces of the chocolate bar. Find the square of the chocolate bar that remained

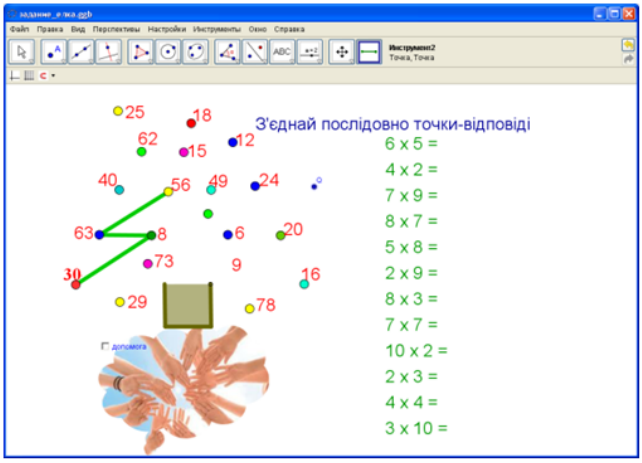


Fig. 10. Children solve arithmetic tasks and connect in series points-answers. As a result, children get a Christmas tree

All apps were developed by teachers-to-be for primary school during their studies at H. S. Skovoroda Kharkiv National Pedagogical University. Apps in figures are original and tested by the students during teaching practice. They are always available for primary school teachers. We think that the experience for the development of these apps will be useful for teachers-to-be, and working teachers in their professional activities.

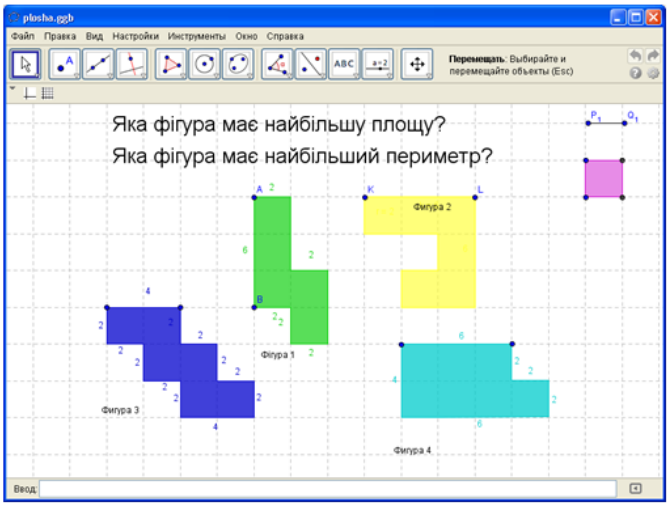


Fig. 11. Apps for a task about square and perimeter of shapes. Children determined which of the shapes has the largest square and the largest perimeter

5 Discussion

The main results of effectiveness of tools and apps are confirmed by many scholars, namely:

- instead of being knowledge-focused, tools and apps are built around the skills [1] necessary to carry out specified Math tasks in primary school; the focus is on what young learners can do at Math lessons rather than on what they know;
- young learners are expected to demonstrate practice-added skills which are assessed by looking at outcomes of apps rather than process [8];
- young learners' performance is evaluated during the instructional process against common learning standards [6, 8], and all forms of assessment are standards-based and criterion-referenced [7]. After all,

teachers-to-be will be able to deliberately choose the most effective direction in learning young learners with tools and apps.

6 Conclusion

Use of tools and apps is an effective way of developing successful general study skills for young learners. Tools and apps feature the ability to provide real variability of tasks, uniqueness of exercises, operative assessment of correctness in each task, adjustment of task difficulty, ability to provide a shade of competitiveness and gaming to the exercises. Tools and apps can be created by the universal software tools, such programs that are part of an integrated Microsoft Office package or special designing environments.

The capabilities of the tools and apps are covered, which ensure successful acquisition of knowledge, for developing young schoolchildren's skills. Considered tool kits enable a teacher-to-be to design independently author's apps that meet the needs of a particular lesson, enable to achieve the lesson goal with the peculiarities of the educational process in primary school.

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Practical use of cloud services for organization of future specialists professional training

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Abstract. The article is devoted to the peculiarities of the practical use of cloud services for the organization of qualitative professional training of future specialists. It is established that in order to implement state policy, there is an essential need for using various ICT, in particular cloud services, which are not only economically acceptable in the new educational environment, but also a powerful tools of obtaining new knowledge, skills and abilities.

The advantages and disadvantages of using cloud services in the educational process of higher education are substantiated; the examples discuss the methods of using cloud services in the process of studying fundamental disciplines. The object of the study is the professional training of students in higher education institutions. The subject of research is the process of organizing professional training of future specialists with the use of cloud services.

To achieve the set goals, a set of general scientific (analysis, synthesis, comparison) and specific scientific (bibliographic, problem-based) was used. Observation and conversation manipulation allowed to highlight the advantages and disadvantages of using cloud services and draw conclusions from the problem under investigation.

The foreign experience of using cloud services has been researched and the features of the application of traditional and distance technology training abroad have been determined.

It describes the use of the blog as a media-educational technology during the advent of pedagogical practice. The methods of using cloud-based services on the example of creation of a distance course “Linear algebra and analytic geometry” are considered.

The prospects of research, which consist in getting acquainted with cloud technologies of the humanitarian profile future specialists at the second higher education, are determined. It has been established that the practical application of cloud technologies in the educational process will promote

more qualitative and progressive learning; the formation of a close interaction between the teacher and student; development of professional skills and abilities of independent work.

Keywords: cloud services, high school, specialists.

1 Introduction

The 21st century is safe to call the century of cloud technologies. It is for the cloud-based services themselves, namely, their skillful use by teachers and students in the educational process depends on the quality of the material being learned. Educational changes that produce today are not only changes in the effective use of modern techniques, but also the complex use of communication tools, both in the study of humanities and fundamental disciplines. Therefore, innovative youth education is, first and foremost, a preparation for active and full-fledged life in the new conditions of today, which is the key to the successful development of Ukrainian society.

The normative legal documents of Ukraine that determine the priority directions of educational activity in the field of ICT include: Laws of Ukraine "On Education" (2017), "On Higher Education" (2014); Decrees of the President of Ukraine "On Measures to Ensure Priority Development of Education in Ukraine" (2010), "On the National Strategy for the Development of Education in Ukraine until 2021" (2013), "On Measures for the Development of National constituent of the global information network of the Internet and ensuring wide-ranging access to this network in Ukraine" (2000); Order of the Cabinet of Ministers of Ukraine "On Approval of the Strategy for the Development of the Information Society in Ukraine" (2013) and others.

Referring to the text of the aforementioned documents once again convinces in the understanding of the domestic scientific community the feasibility of using modern cloud services aimed at improving the educational process, ensuring the openness and quality of education, training young people in the use of progressive information tools, as well as creating an information security system in the field of management of educational institutions. Therefore, today, in order to implement the state policy, there is an urgent need to use various ICT, in particular cloud services, which, in the new educational environment, are not only economically acceptable, but also a powerful tools of acquiring new knowledge, skills and abilities.

It should be noted that ICT have found their wide coverage in domestic and foreign scientific and pedagogical discourse. To domestic scientists whose work is a significant contribution to improving the methods of using

the cloud technologies in education include the Maiia V. Popel [12, 17] and Mariya P. Shyshkina [17, 21], who in their works violate the problems of cloud-oriented systems use in the educational process of higher educational institutions. The solid work in this direction is also found in the writings of Yurii V. Tryus [25].

The scientist raises issues related to the cloud services use in the teaching of mathematical discipline, namely freely distributed web-oriented systems of computer mathematics and technologies of mobile mathematics learning. Vladimir N. Kukharenko is emphasizing some aspects of students distance learning and the webinars use in the educational process. The researcher believes that mass distance courses are possible under the condition of the formation of students of the personal learning environment and the skills of the curator of the content, that is, the ability to work with large unstructured information, create electronic magazines, service, write blogs [10].

Oksana M. Markova [13, 24], Serhiy O. Semerikov [16, 24] and Andrii M. Striuk [9, 22] study the experience of using cloud services by foreign scientists, as well as prospects for the use of information and communication technologies in Ukraine. Scientists have come to the conclusion about the continuity of the development of cloud technologies over the past 55 years and their close relationship with the development of ICT in general [14]. Yuliia V. Yechkalo [26] explains the possibilities of using basic Google services during the study of physics at a high school, and draws attention to the fact that services today are an effective means of assimilating a significant amount of information [5].

Important contributions to the research and distribution of cloud services are made by foreign researchers such as Davide Salomoni [20], Gustavo Gutiérrez-Carreón [7], and others; the questions of on-line learning of students are explored by Robert W. Mendenhall [15], William G. Bowen [2] and others; network technologies are described in detail in the works of Tianping Dong [4], Faten Karim [8]; the use of cloud technologies in teaching mathematics is considered in the works of Georgii A. Aleksanian [1] and others; the trends and prospects for using cloud-based services in education are studied by Ghazal Riahi [19] et al.

In their publications, scientists draw attention to the fact that the knowledge of the cloud technology, the availability of computer software and open access to Internet resources expands the range of opportunities for both teaching and learning. However, Michele D. Dickey [3] and Gordon Freedman [6] who are working on the use of distance learning technology increasingly insist that the use of cloud services should be not only effective,

but also accessible to the general public of students.

Consideration of domestic and foreign works allows us to state that despite the considerable number of scientific works aimed at the large-scale study of ICT, the use of cloud services, namely their advantages and disadvantages, remains controversial and requires profound analysis and theoretical generalization.

We believe that the scientific achievements of domestic and foreign scientists today serve as a powerful theoretical basis for the use of cloud services for the organization of professional training of future specialists in various fields of activity.

2 Methods

The purpose of the research is to determine the peculiarities of the practical use of cloud-based services for the organization of qualitative professional training of future specialists. The purpose is led to the choice of a set of scientific methods, in particular the following:

- general science: analysis, synthesis, comparison, generalization, classification and systematization allowed to study and group the research material, to show the scientific views on the use of cloud services for the organization of high-quality professional training of future specialists, provided the opportunity to formulate conclusions;
- special scientific: informational and bibliographic methods ensured the development of scientific literature, normative-legal documents, materials of periodicals; the problem-chronological method helped to determine the degree of research problem.

3 Results

Modern youth as humanitarian and technical specialties widely uses information and communication means, in particular cloud services, although the application of them began in the early 1960s, but they gained the greatest popularity in the early 2000s. It is worth noting that the future mathematics teachers of Kryvyi Rih State Pedagogical University in the process of studying the methods of teaching mathematics widely use the cloud technologies (sites, blogs, electronic courses, mobile mathematical environments) that help to change the educational environment, and also make education more qualitative in conditions of constant competition of higher educational establishments.

3.1 Use of cloud services during the pedagogical practice of students in school

Traditionally, during the pedagogical practice, students are offered to maintain a prescribed form of a paper version of the psychological and pedagogical diary, which reflects not only the content of the work carried out by the students, but also the results of his research activities and the execution of individual tasks. A feature of the modern approach to gaining knowledge by students is blogging [18]. Therefore, the practical significance of using cloud technologies is determined by such advantages as: attraction of like-minded people, time saving, constant filling, since mobile devices are always on hand at hand, constant control of the written, the teacher can always read the blog and write their comments or timely point out certain disadvantages. In turn, experience shows that the massive use of the blog as media-educational technology [27] in the learning process affects the content of the material that is taught by students on the Internet. According to our belief, the youth cannot always write everything truthfully and frankly covering the details, thereby realizing that the blog may be available to a wider range of users than the paper version of the diary. This experience has shown that the use of cloud services opens up a wide range of opportunities for interpersonal communication and professional growth of students. Instead, the cloud services help the teacher not only control the effectiveness of the classes, but also make adjustments during the practice.

Thus, a blog can act as a subject educational environment for the student himself who conducts it and for readers who read it. In our belief, the practical use of the blog opens up wide opportunities for implementing their own ideas and initiatives. The use of this service allows:

- students freely and openly communicate with each other during the practice;
- teachers and other members of the group will evaluate the work of students, since the blog in this case serves as a tool for organizing and conducting control.

What is important is that cloud services are an effective tool through which reflexive, research-based teaching methods are implemented through the re-viewing of necessary information, reading of publications and participation in online discussions.

In table 1, features of the practical use of cloud services during pedagogical practice in the form of advantages and disadvantages are presented.

Table 1. Advantages and disadvantages of using cloud services in the educational process while undergoing pedagogical practice in school

Advantages	Disadvantages
Feedback between student and supervisor	Constant control written by the student, which leads to a decrease in sincerity
Making comments from readers and like-minded people	High standards of reporting quality
Save time	As user grows, information leakage increases
Constant updating of data	

3.2 Use of cloud services at Intel program "Learning for the Future"

In order to consolidate the knowledge gained and develop the skills of independent research, students are encouraged to master the international Intel program "Learning for the Future". The purpose of the program is to help young people develop their own projects on selected subjects and develop their mathematical learning skills through ICT and project methods.

The program implementation is involves the modular student training with a clear algorithm for learning. It is aimed at creating projects with a wide range of cloud-based services. This approach to teaching gives the teacher the opportunity to apply various forms of organization of the training process, such as: independent work with computer, work in pairs, interactive work in small groups, collective discussion of issues, etc.

It can be noted that the content of the program is aimed at the formation of the following student's abilities: to handle a large amount of information; to find and select the required information; to create new knowledge; to carry out research and project activities; to work with information resources, including cloud services.

In general, the program is aimed to improve the mathematical competence, the implementation of teaching tasks, which in turn contributes to the qualitative development of competitive professionals capable of adapting in the new educational environment.

In table 2, features of the practical use of cloud services cloud services at Intel program "Learning for the Future" in the form of advantages and disadvantages are presented.

Table 2. Advantages and disadvantages of using cloud services in the learning Intel program "Learning for the Future"

Advantages	Disadvantages
Maintaining the relevance of information	Not for every topic you can and need to create projects
Rapid correction	High requirements for the quality of communication channels
Ability to properly prepare for classes	
Accounting software usage	

3.3 Features of the study of mathematical disciplines using cloud technologies

Depending on the course offered by the student to study, it is recommended to use a variety of computer mathematics systems that are freely available on the Internet to save time, since more and more credits are related to the independent study of the learning material. At Calculus study, the graphic editors should be used to construct areas and integration surfaces, but one should not forget that students should use graphic editors only when they can build it and define the boundaries of the area or the surface of the integration on their own, and it is time to use graphic editors to save time. Also, when studying the probability theory and mathematical statistics, they can use software tools to calculate the numerical characteristics of random variables that require cumbersome numerical computations, and so on. We have also taken into account the students' ability to work with spreadsheets, edit mathematical formulas, etc.

Table 3. Advantages and disadvantages of using cloud services in the study of mathematics

Advantages	Disadvantages
Ability to prepare for the classroom qualitatively	There is no opportunity to work out the skills of mathematical calculations and transformations
Rapid correction	Constant monitoring of the data entered
Ability to customize the software for the needs of a particular course	
Saving time	

We believe that when using cloud services in solving mathematic

problems it is expedient to apply problem and research methodology of training using individual and group activities. In this case, cloud services give an opportunity, regardless of the choice of program, to get the desired results.

In table 3, features of the practical use of cloud services during the study of mathematical disciplines in the form of advantages and disadvantages are presented.

3.4 Application of cloud technologies in students' research activities

Cloud services are a powerful tool for improving the quality of higher education in its development and modernization. Therefore, students, which is constantly moving cloud services, will promote:

- qualitative preparation for various forms of educational work;
- interest in educational subjects;
- the desire to acquire skills and skills in a relatively short time;
- the emergence of interest in learning and the desire to succeed;
- curiosity, the desire to know the essence of the observational facts, the phenomena surrounding them in life.

You can also improve the quality of writing master's theses by utilizing cloud services. It is advisable to use cloud services to create online questionnaires, interactive tasks, and electronic courses on selected topics of research.

In table 4, features of the practical use of cloud services during the research activity of students in the form of advantages and disadvantages are presented.

Table 4. Advantages and disadvantages of using cloud services during research activities of students

Advantages	Disadvantages
Wide opportunities for creating and testing non-standard hypotheses	Verification of information from online resources
Online surveys to conduct research	Borrowing someone else's experience
Use of services to create interactive exercises on the topic of research	
Familiarity with the expertise of a large number of industry experts	

3.5 Features of creating electronic courses

Cloud technologies play an important role in the organization of all elements of the educational process, including the independent work of students, through the information support of the learning process.

The use of cloud services in the educational process provides an opportunity for effective implementation of the principle of continuity of education and openness, as well as the ability to implement independent educational activities of students. We define the requirements for the organization of independent work during training with the use of cloud services:

- control effectiveness;
- provision of feedback;
- high activity of interaction between students and teachers, between students themselves;
- individualization and differentiation of learning;
- the possibility of using a collective form of independent work;
- a more comfortable atmosphere of independent work (establishing a democratic style of communication between students and teachers);
- providing each student with the necessary materials for self-study (lecture material, glossary, useful links, assignments, online teacher tutorials, Internet resources, etc.).

In our opinion, the problem of developing and implementing electronic distance learning courses in the educational process is more urgent for a more successful organization of independent work of students.

An electronic course "Linear algebra and analytic geometry (part 1)" [11] for future mathematics teachers meets the new State Standards and Programs, in particular for university.

The purpose of the course is to familiarize students with the theoretical foundations of linear algebra, which are necessary for the further study of courses of special disciplines, to teach students to experience the formation and development of practical skills and abilities that are needed for the analysis, research and solving problems.

After studying the course, students should get:

- knowledge of basic properties, theorems of linear algebra and examples of their application;
- knowledge of mathematical methods and algorithms for problem solving and their application;

- ability to prove the basic theorem;
- ability to use methods and techniques of linear algebra.

The proposed course contains three modules. Study course is provided by the curriculum in 18 weeks. For each of the course topics, the following components have been developed and proposed:

- the purpose of studying a specific topic;
- the content of the topics being studied;
- self-training plan for the student;
- tasks and questions for self-control;
- tests;
- typical mistakes made by students when studying a particular topic;
- list of used and recommended literature;
- additional links on the Internet (list with electronic bible libraries, some educational courses, catalogs and search engines).

In the process of mastering the course, students will have consultations, chats, forums, topic discussions, etc., both with the teacher and with the students.

The course has a system of hyperlinks for didactic-methodical literature on the course, which will enable students to at a higher level learn the teaching material and reduce the time spent by students at the computer.

The propaedeutic of the study of the electronic course are:

- knowledge of elementary mathematics;
- availability and ability to work with e-mail;
- access to the Internet;
- ability to work in different editors (text, spreadsheets, etc.).

In the process of studying this course, the students undergo the following types of control: incoming, current (control questions at the end of study of each topic), intermediate (presented in the test form for each course topic), final (exam). At the same time, current and intermediate control is carried out remotely, and the final one — in direct communication with the teacher (not necessarily with the testator) of the course.

This experience has shown that the use of electronic courses in disciplines, not only makes it possible to master the subject qualitatively and systematically, but also allows them to perform tasks of increased complexity, to solve non-standard tasks.

The mentioned problems in their scientific investigations are actualized by Serhiy O. Semerikov. The scientist emphasizes the need to use a variety of cloud technologies in the learning process and draws attention to the fact that it is technologies that open up new prospects for learning, especially for those who live in isolation or in remote places or face learning difficulties [23, p. 189]. In particular, the scientist singles out the following features of e-learning:

- the possibility of interaction between the teacher and the student in the dialogue mode, which in some cases can be closer to the dialogue interaction in traditional educational technologies;
- fast sending / receiving of educational materials in electronic data;
- operational access to Internet information resources;
- the possibility of checking and controlling knowledge in remote mode;
- the possibility of organizing laboratory workshops in a virtual mode through the implementation of remote network access to real laboratory equipment;
- creation of "virtual groups" for operational interaction between students;
- the possibility of accumulation of statistical data and, on the basis of their analysis, the management of the training;
- improving the quality of teaching and management;
- introduction of automated quality management training;
- individualization of vocational training through the creation of individual training schedules for individual students [23, p. 191–192].

Expediency and possibilities of using cloud services are of interest not only to domestic, but also foreign scientists. In particular, William G. Bowen [2] believes that the rapid growth of online learning in the United States is an indication that cloud clusters occupy an important place among the many areas of educational development by opening up opportunities and perspectives for young people. Interestingly, our study is a test conducted among students to test residual knowledge. Test results have shown that there are no sharp differences between experimental groups (traditional and remote learning technologies). However, one cannot ignore the fact that the group that was learning to use cloud services in terms of performance was better.

In the context of our research, research by Robert W. Mendenhall [15] is interesting, which points out that the quality of education is largely

independent of the way services are provided; alongside there is a high-quality, distance and quality traditional classroom in the classroom, but in both cases there is a low level of self-esteem of the material. Scientist points out that the disadvantages of distance learning still exist, many of them can be identified as follows:

- most universities have not yet found new ways to use cloud services for high-quality conversion;
- for educational institutions with distance learning it is difficult to calculate the number of hours and minutes that students spend on direct learning;
- the most important aspect of this issue is the use of time in an audience: whether students can acquire the knowledge they need to be successful by other means.

Mendenhall draws attention to the fact that the distance learning form demonstrates its advantages over other forms:

- in an online tutorial that really uses a variety of cloud-based services, the role of a tutor can vary from mentoring to effective teaching;
- using cloud services to evaluate the student's learning can clearly identify the student's level of knowledge of the program material and how much time it takes for the tasks in and out of the audience;
- cloud services allow to fundamentally change the model for individualization of training and thus improve learning and reduce costs.

As a result, Mendenhall emphasizes that the use of distance learning is a matter of higher education quality [15].

Table 5. Advantages and disadvantages of using cloud services in the electronic courses

Advantages	**Disadvantages**
Continuous reflexive and evaluation activity Convenient remote control navigation system Wide opportunities for interaction between members of the education through the system of messages, forums, chats Ability to pass the distance course at a convenient pace	Lack of "live" communication between members of the educational process High requirements for the quality of communication channels

In table 5, the peculiarities of the practical use of cloud services in the application of electronic courses in the form of advantages and disadvantages are presented.

4 Conclusions and perspectives for further studies

Research has shown that the benefits of using cloud services are far more than disadvantages, so their use in the educational process will only improve the quality of learning and will in the future serve as a powerful incentive for the professional development of students. It should be emphasized that the use of cloud services should be deliberate and methodically feasible. Therefore, the disadvantages of using cloud services in the educational process can be eliminated or their impact reduced to a minimum.

To summarize, qualitative professional training of specialists will be effective if institutions of higher education can safely use cloud services, thus inducing teachers to master modern methods and techniques of their practical application. At the same time, the result of scientific research have shown that it is cloud services that open up wide opportunities for the realization of creative abilities for both teachers and students.

The research carried out within the framework of this work does not exhaust all aspects of the practical use of cloud services for the organization of high-quality professional training of future specialists. Given the urgency of the issue raised for the domestic education system, further issues of relevance to the issues related to the possibilities of using cloud services during the study of the disciples of the humanitarian cycle.

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