Information Technologies as an Incentive to Develop the Creative Potential of the Educational Process

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Abstract

The new millennium is characterized by an unprecedented breakthrough in knowledge and information and communication technologies, and the challenges of the XXI century require modernized paradigms of interaction in all spheres of life. Education continues to play a key role in national and global growth. The key role of education and its leadership in developing creative potential, as the main paradigm of the countries' stability, have significantly influenced educational centers. The developers of educational programs use information technologies as an incentive to develop creative potential of educational process. Professional training of the educational candidate is enhanced by the use of information technologies, so the educational applicants should develop technological skills to be productive members of society. Using the latest achievements in the field of information technologies for the organization of the educational process helps to form the operational style of education applicants' thinking, which provides the ability to acquire skills of processing information, that is presented in the text, graphic, tabular form, and increase the level of general and informational culture necessary for better orientation in the modern information space. The purpose of the research is to determine the effectiveness of information technologies as an incentive to develop creative potential of educational process on the basis of the survey, to establish advantages and ability to provide high-quality education in the context of using information technologies. Methods of research: comparative analysis; systematization; generalization, survey.

Results. Based on the survey conducted among students and teachers, it has been found out that the teachers use the following information technologies for the development of creative potential of the educational process: to provide video and audio communication process (100%), Moodle (95,6%), Duolingo (89,7%), LinguaLeo (89%), Google Forms (88%) and Adobe Captivate Prime (80,6%). It is determined that modular digital learning environments (97,9%), interactive exercises tools (96,3%), ICT for video and audio communication (96%) and interactive exercises tools (95,1%) are most conducive to the development of creative potential of the educational process.

As a result of the research, it was revealed that implementation of information technologies for the development of creative potential of educational process in educational institutions is a complex process due to a large number of variables, which should be taken into account both on the educational course and on the individual level. It has been determined that the using the model of implementation information technologies for the development of creative potential in educational process, which is stimulated due to this model, benefits both students and teachers by establishing a reliable bilateral connection between teacher and education applicant.

Keywords:

information technologies, incentive, development, creative potential, educational process, students

1. Introduction

The XXI century is connected with active development of information technologies, which allows to considerably expanding the ways of receiving and processing information. High-tech information environment requires search for new approaches and fundamentally new educational systems in higher education institutions, in connection with the development of the digital age (Voronov et al., 2013). The development of creative potential in educational process at the modern stage is connected with application of information technologies, which are effective innovative means of improving the quality of teaching at all levels of educational process (Gorbunova, 2015; Gorbunova, Govorova, 2018). Creativity is deeply connected with questions of information technologies integration, so they can be considered in tandem. While the latest technologies and discoveries have been constant in the history of mankind, digital technologies are rapidly accelerating technological growth. Due to modern conditions there is an incredible blossoming of creativity and innovations, which are led by possibilities of information technologies (Mishra, Henriksen, 2013; Henriksen et al., 2016). Creativity is important for success in the 21st century, as social problems become increasingly interdependent, global and complex. Pink D. (2005) said that the skills that were important in the past (the skills of the "left brain") are still important,

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but not enough, as "the quality of the "right brain" — ingenuity, empathy, joy (Pink, 2005)."

Despite the increased interest to the creativity in education, it has not always been implemented in practice. It is connected with the fact that education is based on standards and traditional approaches, which have displaced creativity from the educational program (Giroux, Schmidt, 2004). Despite all its importance, creativity is an idea that was not well understood, formulated or defined. Because of education sets its frameworks, it is necessary to help education applicants and teachers to develop creative thinking skills by using technology tools to implement creative solutions and results (Henriksen, Mishra, Fisser, 2016).

Creativity is one of the most valuable learning skills in the 21st century (Craft, Jeffrey, Liebling, 2001). Since creativity is perceived as a higher order thinking skill based on complex and post formal thinking, which is connected with the creation of new and valuable ideas (Larraz, 2015; Larraz, Antoñanzas, Cuevas, 2020). Higher order thinking skills are skills that are inherent in professional and strategic thinking, where these skills include critical, creative and metacognitive thinking (Valenzuela, 2008). The development of creative thinking in education applicants is considered an important process for achieving an effective and high level of education (Larraz, 2021).

The purpose of the research is to determine the effectiveness of information technologies as an incentive to develop creative potential of educational process on the basis of the survey, to establish advantages and ability to provide high-quality education in the context of using information technologies.

Research objectives of the article:

1. To analyze the structural components of the formed information technologies model that is introduced in educational institutions, for development a creative potential of educational
2. To carry out analysis of information technologies types for development of a creative potential in educational process.
3. To establish recommendations for creating conditions for the development of a creative potential in educational.
4. Conduct surveys among students and teachers to assess the effectiveness of information technologies as an incentive to develop the creative potential of the educational process.

2. Literature review

The creativity is defined as the ability of individuals to develop ideas to solve problems and use opportunities. Researchers point out that "creative people are creative not mainly because of some specific, innate rice, but rather because of attitudes to life: they usually respond to problems fresh and new ways, not thoughtless and automatic" (Lerner, Steinberg, 2009). Miller A. considers creativity as a capability that "promotes deep learning, creates confidence and forms an education applicant who is ready for professional activity" (Miller, 2013).

The main task of creative training is to reveal creative potential and transform personality in an active and creative person because education in the institution is to acquire the education of its own individuality. For this purpose it is necessary to teach the education applicants to think independently, to have their own point of view, to be able to justify and defend it in discussions, to make non-standard decisions, to demonstrate skills and desire to apply creative qualities in practice" (Ostroumova, Nizamieva, Nazarova, 2014).

The development of creative thinking of the education applicants in the course of study is based on the theory of gradual improvement of creative mental activity during study. The first stage is focused on the education applicants' conscious creative management of the educational process. The second stage leads to creative thinking and self-development, as the student must solve the problem himself, find a new way of action, where the students focus on the heuristic and creative level of cognitive activity. The main goal of development a creative thinking through the students in the course of the educational process is to set the following tasks:

1) stimulation of the cognitive activity of the education applicants and their desire for self-improvement;
2) providing education applicants with methods and techniques of reflective creative activity;
3) development a creative thinking of education applicants;
4) acquisition of new knowledge and their creative application by the education applicants.

The structural components of the creative activity of the educational applicants are motivational, cognitive and behavioral. The motivation component in the structure of creative activity is characterized by the system of dominant motives, which express the conscious attitude to values and goals of the future professional activity. The cognitive component in the structure of creative activity is shown in the cognitive activity. This allows distinguishing knowledge and skills as a criterion of their formation. A practical, effective aspect of creativity characterizes the behavioral component. It is aimed at the complete self-identification and self-expression of the educational and professional achievements.

The functional components of the development a creative activity of educational applicants are prognostic, project, structural, organizational and communicative. It is necessary to allocate the skills for each of the components that should be formed in the process of active recognition of the educational achievements in the educational process. The development a creative activity of educational applicants should be carried out in all years of study. Gradually acquiring the experience of creative activity leads to differences in methods and techniques, organizing and providing its acquisition (Sadykova, Shelestova, 2016). It is especially important to promote the development of the teacher's creativity, firstly during the professional preparation of the future teacher. Ensuring this process should be implemented by including one discipline on creativity in the teaching programs of preparing teachers, where through a truly creative environment of teaching and learning, teachers find ways to develop their creative potential in future teaching activities (Alencar, Fleith, Pereira, 2017).

According to modern pedagogical practice, modern innovative educational processes are developed in three main directions: change of the studying subject's system (Lau, Grieshaber, 2018), functions and hierarchical structure in the process of formation the personal style of the future teacher's work (Osadchuk, 2018). In this context, the problem of the professional training of future teachers and their readiness for creative activity is extremely important (Chase, Hatschek, 2010, Ermekbaev, 2019). Scientists consider technological culture an important indicator of professional culture of the teacher, which, according to Piekhota O. (2010), characterizes his creative professional activity: a combination of technological knowledge and skills that provide the teacher's activity and provide corresponding skills of application information technologies. The researchers outline various effective information technologies for training teachers, namely: Information technologies, which are based on activation, intensification, effective teaching management (Morosan et al., 2017; Jabbari et al., 2019; Angelo, Knigge, Sæther, Waagen, 2021), integrated adult learning technologies (Karlsen, Nielsen, 2021, Sysoieva, 2011), pedagogical technologies in formation of professional and personal qualities of the specialist (Yerastova-Mykhalus, 2016). Mishra P., Koehler M. J., and Henriksen D. A. (2011) argue that the best use of information technology should be based on creative thinking that covers openness to new and intellectual risk. Modern information technologies often open up new possibilities for creativity (Kheirabadi & Mirzaei, 2019; Nakhaee & Nasrabadi, 2019). From the point of view of training, teachers should understand a range of ways by which information technologies teachers can creatively present content and see how it intersects with different disciplines (Chess, Grieco, 2019; Eslami, Ahmadi, 2019).

TPACK is the central foundation for effective use of information technologies in the educational process. The structure of TPACK provides that teachers have specialized knowledge for using information technologies in the educational process, which provide an integrated combination of technological, pedagogical and content knowledge. Although the TPACK structure has received a significant level of scientific and theoretical attention (Henriksen et al., 2016; Mishra, Koehler, 2006), it is stated that the structure in general is neutral with regard to the aims of training. As stated by Mishra P., Koehler M. J., and Henriksen D. A. (2011), it is important to note that the structure of the TPACK does not offer specific guidelines. For instance, on what educational content to implement (science or music), which pedagogical approaches are useful (didactic or constructive) and which types of information technologies are effective for using in teaching (digital or analogue).

The main key aspects of information technologies and creativity in education are that the teachers should be creative in developing new ways of thinking about information technologies for teaching the relevant subject (Koehler et al., 2011). As well as, information technologies give new ways of designing, representation, transmission and exchange of

knowledge, providing opportunities for creative development of educational applicants (Henriksen, Mishra, Fisser, 2016).

Thus, the problem of application information technologies as an incentive to develop creative potential of educational process, as well as research of interference and prospects of their implementation in studies is not fully reflected in scientific publications in the form of theoretical researches and practical issues. Therefore, the issue of promotion the implementation information technologies as an incentive for development a creative potential of educational process in educational institutions remains topical and open for further research.

3. Methods and Materials

Realization of the purpose of this investigation involves the use of the following methods of research:

– systematization of basic types of information technologies for development a creative potential of educational process;

– systematic and logical analysis, method of synthesis of information, generalization of the newest scientific publications concerning development of theoretical and forecast model of introduction information technologies as an incentive to development a creative potential of educational process in educational institutions;

– comparison method for dissolving recommendations for creating conditions for the development a creative potential of the educational process.

In order to identify the specific features and assess the effectiveness of information technologies as an incentive to develop the creative potential of the educational process, it was conducted using descriptive statistics, which were provided because of the survey using MS Forms Pro. The survey was conducted to identify students' ideas about information technologies that stimulate the development a creative potential of the educational process to ensure quality training of future specialists and to analyze their attitude to such training. An online survey was conducted from September 22 to December 23, 2021, which gathered information from 2500 students and 250 teachers of Kyiv Taras Shevchenko National University, Ivan Karpenko-Kary National University of Theater, Cinema and Television, Lviv Ivan Franko National University, The National University "Lvivske Politechnika" and the Kharkiv National University named after V. N. Karazina. These participants answered questions about their experience in education, motivation, expectations and general satisfaction with the use of information technologies as an incentive to develop a creative potential of the educational process. The following questions were considered in this survey: 1. What information technologies do teachers use to develop a creative potential of the educational process? 2. In your opinion, what information technologies contribute to the creative potential's development of the educational process? 3. Do you constantly use information technologies to develop a creative potential of the educational process? 4. What is the students' perception the creative potential of the educational process in the context of the application information technologies?

4. Results

There is an important task of comprehensive development of the future specialist, both in professional and personal terms n front of the modern system of education. The choice of adequate forms and methods of teaching based on application information technologies as an incentive for development a creative potential of educational process is determined as an important task for the teacher in educational institution. 1. Information technologies used for the development a creative potential of educational process are reflected.

Information technologies for development a creative potential of educational process

Mass Open Online Courses (MOOC):
1. Tools for creating multimedia presentations: *Genially* is a platform for creating slides and presentations that look professional, not limited to photos and text, but using different interactive elements. *Video Puppet* – can be used to convert presentations to video with sound, where the voice generator will automatically read text saved in comments. *ScreenCast-o-Matic* is a video creation and editing tool that can be launched directly from your browser.
2. Tools for creating interactive exercises: *Kahoot!* - an application that provides the opportunity to generate tests and pass them in a game form. *Plickers* is an application that allows to provide testing with cards with QR code and to get results quickly. *Quizizz* is a platform that allows teachers to create different exercises. *Learningapps* is a program that allows you to create interactive exercises based on common templates. *Quizlet* is a platform that allows you to create your own dictionaries, to write your dictation to your ears, to include interactive games and tests.
.3. Tools for creating tests: *OnlineTestPad* is an online designer of tests, polls, and crossword. *ILearn* is an educational platform with online courses, tests and evening-shows. *Stepik* - educational supplement and designer of open online courses and lessons. *Testmoz* is a test generator that provides a wide range of suggestions for exercises. *Google Forms* is a tool for creating online surveys, developing tests with a set of different types of test tasks and analyzing student responses. *Socnative* is a tool for preparing a quiz, both in the form of a regular test and in the form of a test for time with other students. *Answergarden* is a tool that allows you to give short answers to the teacher's questions and displays them on the user screens as a general result.
4. Platforms MOOC for the distance education: *Coursera, edX, XeuetangX, FutureLearn, Udacity, Arzamas, General Assembly, Khan Academy.*
5. Platforms MOOC for learning foreign languages: *Duolingo, LinguaLeo, LearnEnglish від British Council, BBC Learning English, Livemocha, Exam English, Simpler, LyricsTraining, Bussu, Memrise, Callan Method, Lingohut, Hosgeldi.com, Babbel, LearningApps.org, Second Life, Preply.*

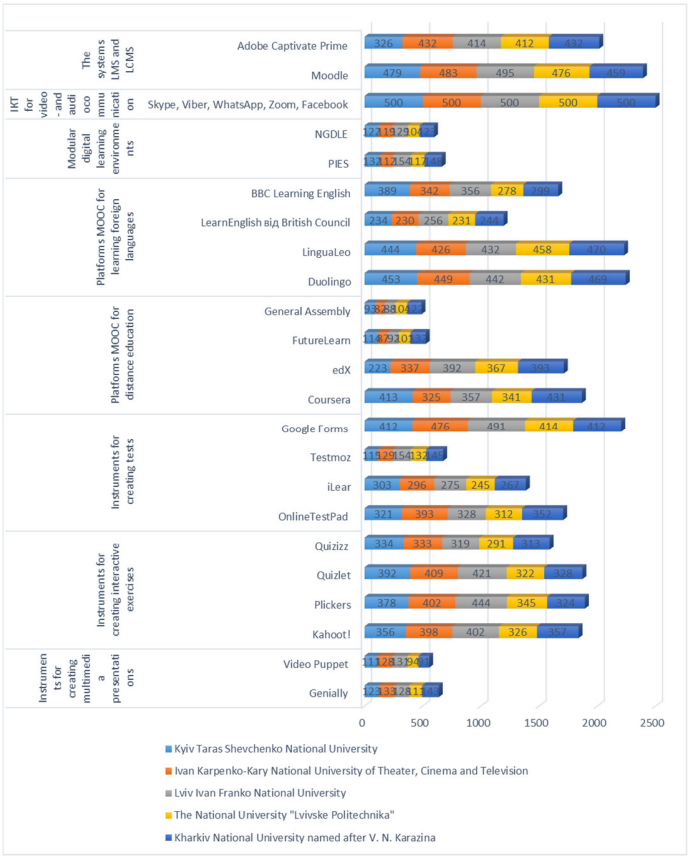
Modular Digital Learning environments:
1. *1. PIES (personalized integrated education system);*
2. *NGDLE (Next Generation Digital Learning Environment).*

Programs and applications for video and audio communication:
1. *Skype, Viber, WhatsApp, Zoom, Facebook* - messengers to provide the process of communication of participants the educational process in real time mode;
2. *Google Classroom, Edmodo* - plugins that speed information exchange and operational communication between participants of educational institutions.

LMS (Learning Management Systems) and LCMS (Learning Content Management System): *Moodle* - is an application that organizes a complete online learning process. *Adobe Captivate Prime* is a comprehensive learning platform for delivering personalized learning experiences to students. *Claroline* is a platform for e-learning and e-activities, which allows teachers to create effective online courses and manage learning process and joint activities on the basis of web-technologies. *Trello* is a platform that will help organize productive teamwork of students. *Linoit, Padlet* - virtual universal boards, which fix the appropriate stickers with information notes, pictures, videos and documents.

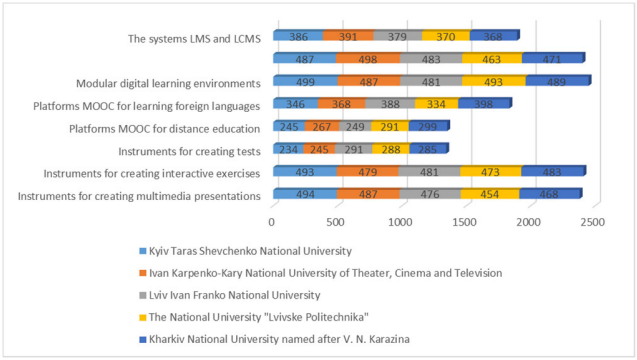
Picture 1. Information technologies used for the development a creative potential of educational process are reflected
Source: Compiled by the authors based on official data of Brown, et al. (2015), Freitas, et al. (2015), Kokhanovskaya, et al. (2020), Kalimullina, et al. (2021), Kokorina, et al. (2021).

To assess the effectiveness of the application information technologies as an incentive to develop a creative potential of the educational process in 2021 students of Kyiv Taras Shevchenko National University, Kyiv National University of Theater, Cinema and Television named after Ivan Karpenko-Kary, Lviv National University named after Ivan Franko, National University "Lviv Polytechnic" and Kharkiv National University named after V.v. N. Karazin asked: "How are the teachers' information technologies applied for the development a creative potential of educational process? Students of educational institutions noted that the most applied: Information technologies for video and audio communication (100%), Moodle (95,6%), Duolingo (89,7%), LinguaLeo (89%), Google Forms (88%) and Adobe Captivate Prime (80,6%) (see picture 2).



Picture 2. What information technologies do teachers use to develop a creative potential of the educational process?
Source: Compiled by the authors.

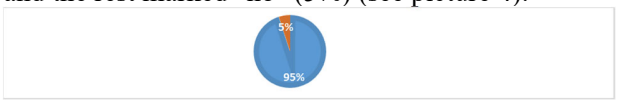
When it was asked, "What do you think information technologies contribute to the development of the creative potential in educational process? Students at educational institutions noted that the most promoted are modular digital learning environments (97,9%), tools for creating interactive exercises (96,3%), ICT for video and audio communication (96%), tools for creating interactive exercises (95,1%) (see picture 3)



Piicture 3. What do you think information technologies contribute to the development of the creative potential in educational process?

Source: Compiled by the authors.

On the question "Do you constantly apply information technologies for development a creative potential in educational process?" teachers of educational establishments of the reflected answered "yes" (95%), and the rest marked "no" (5%) (see picture 4).



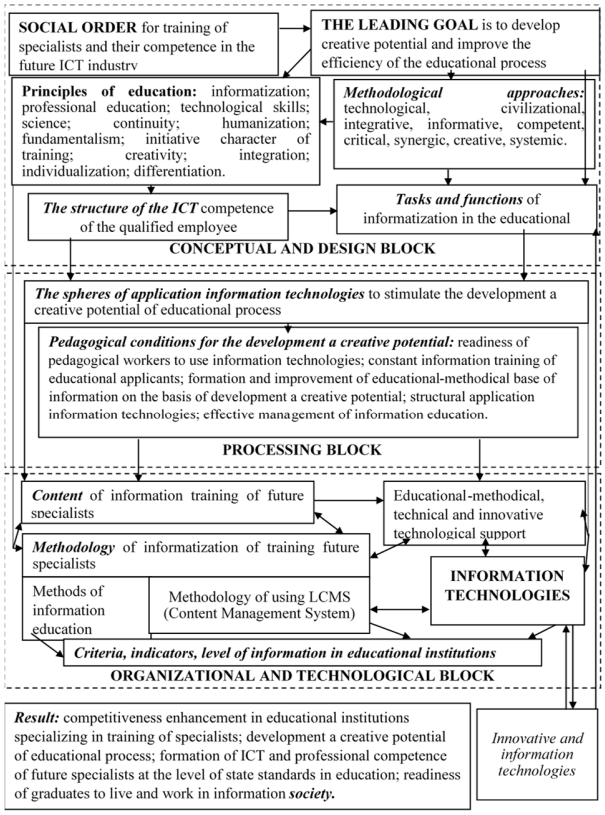
Picture 4. Do you constantly apply information technologies for development a creative potential in educational process?
Source: Compiled by the authors.

In order to help teachers to form conditions for the development a creative potential in educational process, scientists offer the following recommendations (see picture 5).

Recommendations for creating conditions for the development a creative potential in educational process
Ensuring that there is sufficient time and space in the curriculum to allow education applicants to develop their creativity.
Ensuring that there are different working situations in the educational process so that all students can be creative.
To give education applicants the freedom to work in new and interesting ways.
To offer the education applicants performance a real, demanding and exciting work in the process of studying educational discipline.
Development of an evaluation system that allows obtaining results that are not narrowly defined in advance.
Creating a favorable climate in the educational institution, which encourages reflection and personal development both for teachers and for the education applicants.
Helping education recipients get rid of emotional blocs, such as fear of making a mistake and fear of being criticized. Only to give the educational applicants constructive criticism and creation of a psychologically safe environment in which the educational applicants are not afraid to show themselves.
Encouraging educational applicants to study the topics that are most interesting for them.
Diversity of learning strategies used in the educational process for the development a creative thinking.

Picture 5 Recommendations for creating conditions for the development a creative potential in educational process
Source: Compiled by the authors based on official data of Wisdom, (2007).

Theoretical and forecast model of introduction information technologies as an incentive for development a creative potential of educational process in educational institutions (see picture 6), which is formed on the basis of general scientific methodology taking into account external and internal factors influencing the ability of educational institutions, to provide knowledge and qualitative competent training of specialists in Ukrainian education on the basis of application information technologies.



Picture 6. Model of implementation of information technologies for development a creative potential of the educational process in educational institutions
Source: Compiled by the authors based on official data of Lytvyn et al., (2020).

This model co-ordinates interrelated conceptual and design, process and organizational-technological blocks, which coordinate all elements of information technologies for the development a creative potential of the educational process in educational institutions. The conceptual and design block represents initial methodological and psychological-pedagogical positions of the process of implementation information technologies. The process block defines specific characteristics of educational institutions' activity due to the condition of application information technologies. The third block of the model demonstrates material-technical and educational-methodical base of information technologies in educational institutions.

5. Discussion

The results of the research of information technologies as an incentive for the development a creative potential in the educational process led to the

following conclusions. Planning and implementation of information technologies and resources that would provide targeted and competent training of specialists are in great demand. Eslami and Ahmadi (2019) noted that educational institutions are increasingly committed to using the potential of information technologies to develop the creative potential of the educational process and to promote the provision of quality knowledge and the development of appropriate skills in the educational process.

The results indicate that, despite significant achievements in this field and the development of the problem in general (Kheirabadi & Mirzaei, 2019; Nakhaee & Nasrabadi, 2019), opportunities to optimize the training of qualified specialists on the basis of application information technologies as an incentive to develop the creative potential of the educational process have not been fully explored, since there has been no comprehensive analysis and classification of the relevant educational software and other electronic means of education, there are no clear methods of evaluation of the quality of the information resources and technologies used in education.

The problem of using information technologies as an incentive to develop creative potential of educational process in order to provide competent training of specialists is widely spread among scientific works of modern scientists (Morosan et al., 2017). The current state of information provision in education does not correspond to the full expectations of the educational achievements, therefore requires scientific reorientation of the goals of education and information technologies (Lytvyn et al., 2020).

The development of the creative potential in the educational process is directly connected with changes in the outlook and thinking of teachers and students who are the main participants of the educational process. Teachers should provide such educational process, for which it is important for each student to have strong motivation for his chosen phase, as well as strong motivation to success in life or necessity to achieve success (Chess, Grieco, 2019). Competent training of specialists consists of creation of creative and social-pedagogical conditions based on application information technologies in educational institution to influence activation of creative potential of future specialists, to develop professional motivation and motivation to success in the process to provide quality of educational training (Jabbet al., 2019).

Implementation of the proposed model will facilitate the process of optimization and structuring of information education by selecting appropriate information technologies, development of methodological support of educational process and development of creative potential in educational process (Lytvyn et al., 2020). Thus, information technologies allow introducing new and creative pedagogical practices, as well as the fact that teachers should develop creative thinking before teaching and learning. Only then will they be able to exploit fully the potential of new information technologies (Henriksen, Mishra, Fisser, 2016).

The study shows that information technology is driving the creative potential of the educational process, as respondents reported that modular digital learning environments, interactive exercises, ICT for video and audio communication and interactive exercises are most conducive to the development of the creative potential in educational process. Due to the globalization challenges, teachers will have to work in a more complex educational environment and integrate into the educational information and technological space to ensure effective training of future specialists.

Therefore, teachers and students will face new problems, because the potential of information technologies for the development a creative potential in educational process is rather high, but not sufficiently implemented, in-depth research, which will increase attention to improvement of education training of future specialists.

6. Conclusion

The results of the research of information technologies as an incentive for the development a creative potential in educational process led to the following conclusions. Using information technologies as an incentive for the development a creative potential in educational process, undoubtedly, requires development of technological infrastructure of the educational environment: introduction into operation of computer equipment, means of network support, information terminals, educational and methodical methods and technical support of information technologies, as well as development of strategy equipping educational institutions with the necessary educational software.

Information technologies should be applied at all training cycles to stimulate the development a creative potential in educational process. The administration of educational institutions should develop a long-term program of implementation information technologies aimed at introduction of the automatic system of educational process management and development of its creative potential. This allows increasing the efficiency of management, productivity of students' training, competent preparation of future specialists, thanks to the provision of powerful feedback in the educational system.

The results obtained in the course of the research allow determining the directions of further investigation of scientific and methodical principles of development a creative potential in educational process in order to provide professional training of competent specialists. Constant improvement of the level of digital competence allows the teacher to use information technologies as an incentive to develop creative potential in educational process and promotes organization of successful educational process.

The practical significance of the research is that the conclusions and recommendations developed by the author and proposed in the article can be used to: avoid interference in the implementation of information technology as an incentive to develop the creative potential of the educational process.

Further research can be directed at improving the educational program using information technologies as an incentive to develop the creative potential of the educational process, which will allow stimulating the educational sphere and improving teaching activity in educational information and technological space, which will provide high-quality education. The expansion of opportunities and wide application of innovative, scientific and research approaches to providing competent training of specialists based on development a creative potential in educational process can become the basis for improvement of educational programs.

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