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Автор

Кириленко В.В. , Кириленко Н.М., Лосєва Н.Н.
Кириленко В.В. , Кириленко Н.М., Лосева Н.Н.
Kyrylenko V., Kyrylenko N., Losyeva N.

Назва

Застосування інформаційно-комунікаційних технологій у розвитку творчого мислення майбутніх учителів в Україні.
Применение информационно-коммуникационных технологий в развития творческого мышления будущих учителей в Украине.
Introduction of information communication technologies for the development of creative thinking in future educators in Ukraine.

Ключові слова

інформаційні комунікаційні технології; комп'ютерна дидактична гра; майбутні вчителі; творче мислення.

информационно-коммуникационные технологии; компьютерная дидактическая игра; будущие учителя; креативное мышление.

information communication technologies; computer didactic game; future teachers; creative thinking.

Анотації

У статті розглядаються методи вдосконалення підготовки майбутніх учителів України до використання інформаційно-комунікаційних технологій (ІКТ) у професійній діяльності через застосування у навчальному процесі комп’ютерних дидактичних ігор. Описуються нововведення, що впроваджуються в навчальний процес загальноосвітніх та вищих навчальних закладів, акцентується увага на розвитку інформаційної компетентності студентів, що пов’язується із розвитком їхнього творчого потенціалу. За результатами відмічається підвищення не тільки загального рівня комп’ютерної грамотності студентів, а й значне поліпшення їхнього творчого мислення, адже створені ними ігрові програми стають продуктом їхньої власної перетворювальної діяльності й містять виражений творчий компонент.

[1] Лосєва Н. Online освіта як сучасна форма безперервної освіти (Edukacja online jako nowoczesna forma kształcenia) / Н. Лосєва, Д. Терменжи // Zeszyty naukowe szkoly Wyzczej Rodzin w Warszawie. Seria Pedagogiczna, Numer serii 8. – Warszawa, 2016.– P.153-173.

Доведено, що саме комп'ютерні дидактичні ігри, ставши засобом фантазування і розвитку уяви, сприяють розвитку інтуїції, розвитку творчого мислення та знаходженню нестандартних розв'язків пізнавальних завдань, а впровадження ігрових технологій є одним із засобів успішного виконання творчих завдань майбутніми учителями.

В статье рассматриваются методы совершенствования подготовки будущих учителей Украины к использованию информационно-коммуникационных технологий (ИКТ) в профессиональной деятельности через применение в учебном процессе компьютерных дидактических игр. Описываются нововведения, которые внедряются в учебный процесс общеобразовательных и высших учебных заведений, акцентируется внимание на развитии информационной компетентности студентов, связывается с развитием их творческого потенциала. По результатам отмечается повышение не только общего уровня компьютерной грамотности студентов, но и значительное улучшение их творческого мышления, ведь созданные ими игровые программы становятся продуктом их собственной преобразовательной деятельности и содержат выраженный творческий компонент. Доказано, что именно компьютерные дидактические игры, став средством фантазирования и развития воображения, способствуют развитию интуиции, развития творческого мышления и нахождению нестандартных решений познавательных задач, а внедрение игровых технологий является одним из средств успешного выполнения творческих задач будущими учителями.

The article deals with the methods of improvement of future teachers' training for the application information communication technologies in their prospective professional activities via computer didactic games. Innovations introduced in education process of pedagogical university are analyzed, attention is concentrated on students' professional development which is considerably connected with the development of their creative potential. The results of the experiment show advance

[2] Mitchell A. The use of computer and video games for learning. Learning and Skills Development Agency / Alice Mitchell, Carol Savill-Smith, 2004. – 83 p.
[3] Buchanan K. Australian and New Zealand Information Literacy Framework principles, standards and practice. Second edition. Editor Alan Bund. Adelaide Australian and New Zealand Institute for Information Literacy, 2004. – 52 p.
[4] Meskill C. Journal of Educational Multimedia and Hypermedia 5: 179–201. Quinn CN 1994 / C. // Interactive multimedia in University Education: Designing for change in teaching and learning. pp. 45–57, Elsevier Science B.V., Amsterdam; Quinn, CN 1997.
[5] Prensky M. (2001). Digita game-based learning / M. Prensky. – New York: McGraw-Hill.
[6] Squre K. (2002). Cultural framing of computer/video games / K. Squire. – Game Studies, 2(1). London.

in the general level of students' computer literacy as well as a considerable improvement in their creative thinking, as gaming programs proposed to them become a product of their own transformative activities and contain a pronounced creative component. It was proved that computer didactic games having become a way of dream work and imagination development promote intuition, creative thinking as well as finding non-standard solutions for solving cognitive problems', while introduction of gaming technologies is one of the ways to cope successfully with creative assignments by future teachers.

1. Problem statement. The aim of modern education is a formation of a professionally competent, socially active and creative personality. In all spheres of education in Ukraine search is being performed for ways of the modernization of training system, education quality enhancement including introduction of information communication technologies as the basic tool of activity in modern information society and an essentially new kind of education. 'Global computerization of the society forms a new education that, being based upon modern computer technologies suggests introduces a number of innovations in education'[1].

A modern graduate from pedagogical university must have profound knowledge in the sphere of computer technologies and be a professional in applying information and communication technologies in their professional activities.

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[6] Squre K. (2002). Cultural framing of computer/video games / K. Squire. – Game Studies, 2(1). London.

It requires an introduction of the new information technologies in all spheres of education.

Many modern scholars, such as Mitchell A., Buchanan K., Meskill C., Prensky M., Squre K. research peculiarities of education with the help of information communication technologies[2,3,4,5,6].

Introducing of computer programs, electronic means for education purpose considerably increase the quality of education. However, while using ICT in teaching and education process in Ukraine several issues exist:

- lack of materials and technical provision in educational establishments;
- lack of the reliable methods of application of modern information technologies in education process;
- insufficient training of educators to apply means of modern information communication technologies in the education process.

Training of modern professionals implies a potential ability of pedagogical university teacher to organize effective cognitive activities based upon introducing ICT. Their application also allows to achieve a real success in professional activities via the development of creativity, imagination, proactivity, leadership skills. One of the unique forms of education that provides a possibility to increase interest in students to education and forms their information culture is didactic computer games. Gamification has become a productive idea of educational process. Its aim is to involve students, stimulate them to perform certain actions or procedures through

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[5] Prensky M. (2001). Digita game-based learning / M. Prensky. – New York: McGraw-Hill.
[6] Squre K. (2002). Cultural framing of computer/video games / K. Squire. – Game Studies, 2(1). London.

gaming mechanisms, form a positive experience of cooperation. However, a considerable drawback of professional training of future educators is a lack of professionalism in using of information and telecommunication technologies of modern educators as well as students which affects negatively effectiveness and the level of modern teaching and may lead to the same drawbacks in future.

[2] Mitchell A. The use of computer and video games for learning. Learning and Skills Development Agency / Alice Mitchell, Carol Savill-Smith, 2004. – 83 p.
[3] Buchanan K. Australian and New Zealand Information Literacy Framework principles, standards and practice. Second edition. Editor Alan Bund. Adelaide Australian and New Zealand Institute for Information Literacy, 2004. – 52 p.
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[6] Squre K. (2002). Cultural framing of computer/video games / K. Squire. – Game Studies, 2(1). London.

2. The analysis of the latest research and publications. The game as a cultural phenomenon and one of the ways of the human development is mentioned in the Bible, works of ancient philosophers such as Plato and Aristotle.

In philosophy and culturology the game is considered as a means of understanding the World. In pedagogical science the phenomenon of the game is considered as a way of organizing education and upbringing, as an intellectual method of pedagogical interaction.

For instance, K. Gross considers a game as a catharsis, G. Gudionis considers that a game is an instrument, R. Dreger defines the role position in a game as an expected one, J. Korczak perceives a student only while sharing their worries, success, M. Mid thinks that in a game a person creates their own self (the real Ego), M. Montessori asserts that a game satisfies needs of a child, F. Frebel describes a game as a natural activity.

Polish researcher S. Shuman asserts that a game is a form of activity due to which a human being can learn.

According to certain classifications there exists a variety of games. A cognitive load and the function of development are to our mind to the greatest possible extent carried out by didactical games. Educational potential of a game is realized as a certain task performed with the help of gaming actions and rules.

It should be pointed out that with the growth of access to information and communication technologies abilities for education development, new pedagogical tools appear, digital pedagogics emerges, and a digital education environment is formed as a new virtual reality where all elements of educational system interact with

[7] Лосєва Н. Online освіта як сучасна форма безперервної освіти (Edukacja online jako nowoczesna forma kształcenia) / Н. Лосєва, Д. Терменжи // Zeszyty naukowe szkoly Wyzczej Rodzin w Warszawie. Seria Pedagogiczna, Numer serii 8. – Warszawa, 2016. – P.153-173.

[8] Losewa N Organizacja kształcenia na odległość na Uniwersytecie Narodowym w Doniecku na Ukrainie) / N. Losyeva, D. T. Termenzhi, V. Puzyriov // Zeszyty naukowe szkoly Wyzczej Rodzin w Warszawie № 14. Seria Pedagogiczna, Numer serii 7. – Warszawa, 2015. – p.75-98.

each other and that lets building personal education paths in online environment[7,8]. More than a dozen millions of users are studying now on various platforms of mass online education. For example, on Coursera there is a Gamification online course that is based on approaches connected with computer games, usual and popular for the majority of users and involves application of such notions of computer games as ‘levels’, ‘icons’, online tournaments

[7] Лосєва Н. Online освіта як сучасна форма безперервної освіти (Edukacja online jako nowoczesna forma kształcenia) / Н. Лосєва, Д. Терменжи // Zeszyty naukowe szkoly Wyzczej Rodzin w Warszawie. Seria Pedagogiczna, Numer serii 8. – Warszawa, 2016. – P.153-173.

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with other players with educational aims. Besides, games for education purposes on Xbox called Xgames have been developed. These methods of education serve as a motivation for those who study to reach a desired goal. Various online technologies of education nowadays are being actively introduced to educational environment of educational establishments including Ukrainian ones[9].

3. The aim of the article is to clear up the meaning of the application of computer didactic games for the development of creative thinking, solving creative didactic tasks and forming information culture in future educators.

4. Theoretical basis of the research. Education of information society undergoes strategic changes demanding a search for non-standard information communicational decisions. Prominent Ukrainian educator Vasyl Sukhomlynskiy pointed out: 'Learn while playing, and play while learning'[10.]

Thus, distinguished educators considered a game an important method of education. According to them a game brings up, teaches and develops. For a child a game means life itself, with all its beauties, worries, fortune, and disappointments. A game is the most natural and attractive activity for primary school students and organizing of mutual activity with parents in a form of a game or an experimental game is very useful for them, for example: 'You may notice with your child that the cord needed to cover the base (a large circle) is approximately two times shorter than the cord needed to cover the surface of a half of the sphere'[11].

It is in games where informal communication of a child with other people starts. In the process of gaming a habit to concentrate, to work thoughtfully,

[9] Losyeva N. Distance technologies in action: E-learning in exile (the experience of Donetsk National University, Ukraine) / Nataliya Losyeva, Daria Termenzhy / Educación y Sociedad en Red. Los desafíos de la era digital. USAL, Buenos Aires, 2016 – Electronic resource. – Access mode: http://p3.usal.edu.ar/index.php/supsignosead/issue/current].
[10] Sukhomlynskiy V. Methods of group upbringing / V. Sukhomlynskiy - Moscow. - 1981.
[11] Losyeva N. Helping child to learn mathematics/ N. Losyeva, D. Gubar, V.Puzyrov // FAMA – Family Math for Adult Learners/ Family and communities in and out of classroom: Ways to improve mathematics' achievement – Barcelona, 2011. – P. 98-105]. P.99.

independently in the team, attention, memory, a desire to learn are formed in children.

Philosophical aspects of using games are touched upon in the writings of many scholars. Thus, G. Schedrovytskiy thought that a game is created by the society for ruling the development

[9] Losyeva N. Distance technologies in action: E-learning in exile (the experience of Donetsk National University, Ukraine) / Nataliya Losyeva, Daria Termenzhy / Educación y Sociedad en Red. Los desafíos de la era digital. USAL, Buenos Aires, 2016 – Electronic resource. – Access mode: http://p3.usal.edu.ar/index.php/supsignosead/issue/current].
[10] Sukhomlynskiy V. Methods of group upbringing / V. Sukhomlynskiy - Moscow. - 1981.
[11] Losyeva N. Helping child to learn mathematics/ N. Losyeva, D. Gubar, V.Puzyrov // FAMA – Family Math for Adult Learners/ Family and communities in and out of classroom: Ways to improve mathematics' achievement – Barcelona, 2011. – P. 98-105]. P.99.

of a personality and it is a special pedagogical creation[12]. Talking into account the thoughts of prominent pedagogues we rest upon the fact that modern school students and high school students study in the conditions of the development of the digital environment. A non-standard way of thinking is formed in them and ways of presenting education material are changed[13]. However, education at university, the content of subjects under study often have an alienated character from a personality of students, detached from something personally significant for them. We take as a point of departure that the interesting world of the game makes monotonous activities of memorizing, revision or adoption of information a positive and emotionally colored one. Emotionality of the gaming activity activates all psychical processes and, in such a way, the material studied by students goes through emotions, a kind of practice, makes the educational process varied and interesting.

In the process of a computer game the involvement of students in the model of professional activities takes place which allows them enter the world of a didactic game: to start acting, get to know an invisible line between the reality and a convention, acquire optimal samples of professional actions, more effective options of cognitive activities, form professional competency. The teacher's role is to propose definite educational situations that are professionally valuable to students, as they have a professional meaning, satisfy students' professional interest and at the same time give them an opportunity to develop profession-related competencies.

It is worth noting that researchers make a distinction between the notion of roleplaying business games and simulations of professional activity. For example,

[12] Schedrovytskiy G. P. Organizational activity game as a new form of organization and a method of developing of a collective mental activity / G. P. Schedrovytskiy, S. I. Kotelnikov // Innovations in organizations. – Moscow.: VNISI, 1983. – P. 33-53].

[13] Kirilenko N. M. Usage of internet technologies in teaching and learning of future educators / N.M. Kirilenko // Zbior artykulow naukowych. Konferencji Miedzynarodowej Naukowo-Praktycznej «Pedagogika. Wspolczesne problem I perspektywy rozwoju» (30.01.2017-31.01.2017) – Warszawa: Wydawca: Sp. z o.o. «Diamond trading tour», 2017. – 116 str.; S.92-94.

M. Elliss and K. Jonson note that in a roleplaying game views or beliefs of participants may not coincide with views of their characters, while simulations give an opportunity for participants to be themselves. Compared with a real professional activity, when decisions taken or an act have certain results (positive or negative with which one should agree), in a gaming interaction a flow and a way of activity can be altered, various variants of professional behavior can be approbated, forecasts for the future can be made. Thus, a game is a universal form in which powerful processes of self-determination, self-

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[13] Kirilenko N. M. Usage of internet technologies in teaching and learning of future educators / N.M. Kirilenko // Zbior artykulow naukowych. Konferencji Miedzynarodowej Naukowo-Praktycznej «Pedagogika. Wspolczesne problem I perspektywy rozwoju» (30.01.2017-31.01.2017) – Warszawa: Wydawca: Sp. z o.o. «Diamond trading tour», 2017. – 116 str.; S.92-94.

actualization, self-affirmation of a personality, so-called self-processes which are quite important for a development of a professional take place[14].

In accordance with the demand of the information society new computer didactic games appear for people of various ages on the basis of structures of artificial intelligence. For instance, the Jules company developed a digital literacy course for children of pre-school age, as they consider that the digital literacy should be formed in this very age. The course is aimed at children from the very childhood developing algorithmic creative thinking and computational skills. Developers of the Jules company believe that digital literacy should be formed in a pre-school age. In an educational application virtual characters are presented who stimulate children to a productive learning with the help of videos and games. The startup developers offer a system that will encourage acquirement of basics of digital literacy in a quite early age.

Quite many children of different ages in the world are absorbed in the Minecraft game. With the help of the game the Microsoft company introduced gamification to the educational system having developed an educational version of the game: Minecraft for Education with the aim of its integration into the structure of traditional classes. The game arouses children's interest and can reveal their creative potential. To adopt information in a proficient way children, have to take active part in the process of a game.

Minecraft for Education is not a collection of ready schemes and lessons. It is a platform that teachers can use to conduct lessons. It doesn't contradict the traditional methods of education and it completes and visualizes them. For instance, writing mathematical equations in a notebook is not an interesting thing. However, if an equation is given right in a game and a solution of the equation will be the

[14] Natalia Losewa. Tworcza samorealizacja podmiotu procesu pedagogicznego // Zeszyty naukowe szkoly Wyzczej Rodzin w Warszawie. Zeszyt 5-6. Seria Pedagogiczna, Numer serii 2-3, Warszawa 2011, p. 35-46.

coordinates on a map where a treasure is hidden, a process of its solving will be captivating.

This program can be applied for different subjects. Minecraft for Education isn't limited by one subject only. It is a constructor due to which phenomena can be studied in their dynamics. Children learn how to make an information search, master skills of cooperation in a team, perform an exploratory activity and on this basis they resort to business communication. Thus, Minecraft for Education can be applied while teaching school subjects as well as university courses.

Modern innovation of education process at pedagogical universities is introduction of this type of games in the education environment. Introduction of information communication

[14] Natalia Losewa. Tworcza samorealizacja podmiotu procesu pedagogicznego // Zeszyty naukowe szkoly Wyzczej Rodzin w Warszawie. Zeszyt 5-6. Seria Pedagogiczna, Numer serii 2-3, Warszawa 2011, p. 35-46.

technologies evoked the emergence of new approaches to teaching of various disciplines. We bac up the opinion, it is necessary to insure training of future educators to introduce information gaming technologies to their future professional activity and it is necessary to do this via similar instances in the process of their education activities.

In the course of our research a questioning was performed among students with the aim at revealing their evaluation of the level of teaching of mathematical disciplines. According to the instruction they had to pick up the most characteristic word which to their mind would reflect their idea of the method of teaching these disciplines. In the majority of answers such words as 'boring', 'not interesting', 'monotonous', 'grey' sounded. Further questioning showed that students considered teaching of mathematical subjects somewhat life-distracted. In the educational process it is required from them to memorize formulas, theorems, definitions which are forgotten right after taking exams. Taking into consideration results of the questioning, we offered a new strategy of learning, i. e. integrating gaming technologies and computer didactic games into the traditional educational process[15]. In the process of the strategy development we base upon the fact that students should become active participants of the educational process. Games must be developed in such a way that students should have an opportunity not just to memorize facts, but also research the study material like professional mathematicians do, setting problems and solving them. Due to the introduction of interactive computer didactic games students have an opportunity to put questions and solve cognitive problems while playing a game. In the process of evolution of the computer didactic game they feel how they master the material under study step-by-step and, at the same time, experience positive emotions when they manage to successfully solve a cognitive task. A gradual mastering of the study material and a presence of certain

[15] Losyeva N. Game Frame of Reference as a of Preconditions for Students and Teachers Self-Realization/ Natalie Losyeva // Journal of Research in Innovative Teaching. Publication of National University. Volume 2, Issue 1, March 2009. – La Jolla, CA USA.

achievements motivates students to go on with studying the material. Moreover, it pushes them to a search of additional information, even the kind a teacher doesn't demand. In such a situation the content of a study material is adopted in a high-quality manner, while two human spheres cooperate: rational and emotional, and intelligence, as it is known, can't function effectively without an affect.

Adventure computer games available nowadays can be applied as didactic ones. This type of games is applicable for students to have an opportunity to properly adopt such complicated notions and comprehend their own mistakes. They are built upon an adventure plot according to which participants move in a virtual space using a mouse as the main instrument of interaction with

[15] Losyeva N. Game Frame of Reference as a of Preconditions for Students and Teachers Self-Realization/ Natalie Losyeva // Journal of Research in Innovative Teaching. Publication of National University. Volume 2, Issue 1, March 2009. – La Jolla, CA USA.

the gaming interface. Moving through various gaming territories participants of the game search for information and hidden objects which helps them solve puzzles – problematic tasks.

Let's give an example of this type of the game introduced into the educational process while learning mathematics.

Computer didactic game 'Matematicus' consists of two parts: a captivating computer didactic game created in the genre of a classic quest and an electronic mathematical encyclopedia containing more than 100 articles and descriptions of mathematical experiments with such themes as digits and numbers, numeric phenomena, geometry, the theory of probability, equations and mathematical puzzles.

The program makes it possible to individually adjust gaming parameters: switch a commentary on and off, the help system, the Smoothing menu button for displaying of smooth passes between gaming scenes, adjust sound volume level. Current action mode is displayed by a mouse cursor. For example, in the process of 'move' choice on a mouse cursor an appropriate arrow appears with pointing at a movement direction (forth, back, go left/right, turn right/left, turn, move up, move down). A participants of the game can move objects located in the 'Inventory' repository. A detective tangle can be solved by the one who solves a set of various mathematical problems. To do it one can 'break' a mysterious key number, solve several equations and find a way out a mysterious labyrinth. A three-dimensional graphics makes a journey through a city interesting and captivating.

In the course of the game at any point a user can turn to an informative voiced encyclopedia ('Articles' button) which contains about 100 articles and descriptions of 20 mathematical experiments from such sections as: 'Digits and numbers (rules of divisibility, secret codes, triangular numbers, sequences)'; 'Digital phenomena (the π number, the magical number, magical square, Gauss problem, friendly

numbers)'; 'Combinatory (part, 3 pots, ferry, transposition)'; 'Geometry (tangram, parquet, Platonic solids)'; 'The theory of probability (event and chance, calculation of probability, birthday)'; 'Mathematical puzzles (labyrinth, small house); equations (numeric weights, Diophantus)'. Except the information on mathematics in the encyclopedia you can find clues to all puzzles of a computer didactic game.

Using this type of computer didactic games practicing educators can implement the principles of cooperation pedagogics. Psychological and pedagogical researches show that cooperation in the process of education is especially useful if the aim is set to form and develop

critical and combinatorial types of thinking, knowing how to set problematic objectives and find various methods to solve them.

Professional growth of future educators is to a considerable extent connected with the development of their creative potential, and a professional training of a teacher is considered in pedagogical science as a dynamic process of their professional development connected with an ability to self-actualization as a key characteristic of a personality, creative personality of a professional. Activities on the initiative of a personality, free choice is a self-actualization of a human activities itself[16].

The introduction of gaming technologies is one of the opportunities for solving of creative problems. These are computer didactic games that having become a way of imagination and development of mind promote the development of creative thinking and finding non-standard solutions. It should be noted that if cognition is based on the definite program and requirements are set, in this case interest must be considered as the main component and initiative, free choice of the theme.

However, the game participants of which are students requires a certain mental effort, endurance, concentration. How is it possible to draw a line here between learning and a game? And is it necessary to do it? And if it goes about making up computer games developed by students themselves. It is no doubt a creative work. From a group of students involved in this type of cognitive activities much effort is required: industry, curiosity, cognitive interest and resourcefulness, basic computer skills. Mutual discussion and evaluation of available games accustom students to percept alternative thoughts of game participants and find ways of elimination of mistakes made in the course of gaming. The teacher is to initiate creative work, effectively encourage students to play. Mastering the world with the help of didactic games is embodied in other forms which don't look like traditional education: here is fantasy, independent search for an answer, a new look at the well-known facts and

[16] Natalia Losewa Tworcza samorealizacja podmiotu procesu pedagogicznego // Zeszyty naukowe szkoly Wyzczej Rodzin w Warszawie. Zeszyt 5-6. Seria Pedagogiczna, Numer serii 2-3, Warszawa 2011, p. 35-46.

phenomena, fulfillment and enlargement of information base, establishing connections, similarities or distinctions between separate evens. The important thing is that out necessity, not under pressure, but at will of the students themselves in computer didactic games a multi-revision of the learning material in various communicative situations and new forms takes place. The gaming situation facilitates optimization of memorizing, analysis, synthesis, and comparison. A game forms in students ways of solving problems and creating new information which can be used in future professional activities. It is

[16] Natalia Losewa Tworcza samorealizacja podmiotu procesu pedagogicznego // Zeszyty naukowe szkoly Wyzczej Rodzin w Warszawie. Zeszyt 5-6. Seria Pedagogiczna, Numer serii 2-3, Warszawa 2011, p. 35-46.

worth noting that a student gets an opportunity to independently make decisions, both right and wrong ones.

In this connection we took into consideration the ideas of E. Thorndike. As it is well-known, he is the author of learning theory of, 'trial and error'. According to it in the process of training, animals and humans by means of trials and errors adopt the reaction corresponding to the stimulus. This connection of the stimulus and reaction invokes pleasure and it strengthens. With the repeated action of the stimulus the needed necessary reaction is achieved. This is the first law of E. Thorndike called the law of effect. The second law is the law of exercise, it lays in the fact that the reaction on the action of stimulus depends on the number of repetitions, strength and duration of stimulating material effect. The third law if the law is readiness to reaction. It lays in readiness to performing an action[17].

We consider, the mentioned psychological laws are built-in effectively into the gaming activities with didactic components.

A creative potential of people is a set of its qualities, states and abilities, a choice of ways and actions adequate for solving of creative tasks. The basis of creativity is a wide information basis and motivation, readiness to realization of a creative idea.

In this connection it is necessary to keep to a set of recommendations: intuition of students must not be suppressed; make up conditions for the development of confidence in their own resources; base upon positive emotions; stimulate an independent choice of objectives, tasks and ways of their solving; encourage readiness to a risky behavior as one of the features of a creative person; stimulate an ability to imagine. Due to the introduction to the learning process of computer

[17] Thorndike, E. L., & Woodworth, R. S. (1901). The influence of improvement in one mental function upon the efficacy of other functions. Psychological Review, 8, 247-261.

[18] Kyrylenko N. M. Pedagogical conditions of computer didactic games' implementation in professional training of future mathematics and information science, Ph.D. thesis in Pedagogical Science, VDPU, Vinnytsia, 2010. (in Ukrainian).

didactic games the above-mentioned qualities, and abilities to integral synthetic perception of information, divergence and accuracy of thinking, exploratory style of thinking are developed in students.

In the course of our research the use of computer didactic games provided a realization of various methods of teaching. Gaming programing environments used in the course of an experiment are presented in Table 1[18].

[17] Thorndike, E. L., & Woodworth, R. S. (1901). The influence of improvement in one mental function upon the efficacy of other functions. Psychological Review, 8, 247-261.

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Table 1

Gaming program environments used in the course of the experiment

	Program type	**Didactic tasks**	**Teaching methods**
1.	Demonstrational	Visual presentation of educational material, visualization of phenomena, informational processes being studied and interconnections between them	Explanatory and illustrative
2.	Teaching	Reporting of knowledge. Forming of knowledge and skills	Problematic showing, research
3.	Modeling	Acquisition of new information, development of creative thinking with help of studying a model an object, phenomena and processes being studied	Partly exploratory, research
4.	Teaching environments	Forming of computer literacy, teaching of programming skills	Research
5.	Simulators	Revision of material learned, improvement of skills	Reproductive, partly exploratory

6.	Crossword puzzles	Activation of mental operations, repetition revision of material learned	Partly exploratory, research
7.	Examiners	Control and self-control of educational mastering level	Reproductive, partly exploratory

The analysis of the obtained experimental results demonstrated that the highest effectiveness of training was provided by computer didactic games which contained educational, drilling and controlling functions.

Our research testified that the hypothesis of rational presentation of knowledge in the gaming form is justified. This method is effective when studying different subjects including programming. The sets of tasks for learning had a gaming character: from the development of separate gaming blocks at the beginning of education to creating by students full-scale computer didactic games at the final stage. Students made up the plot of the game by themselves, worked out all the components of the computer didactic game, consulted each other, shared information. We acknowledge the presence of cognitive interest aimed at solving tasks which were in fact set independently. The teacher mostly played the role of a consultant. Due to this method of conducting of lessons studying a programming language turns from a boring and unintelligible sequence of themes which are necessary to adopt (operators, constructions) into the answer to the question ‘how to do it?’

Acquisition by students of theoretical knowledge served as a basis for elaborating skills to fulfil practical tasks, and the evaluation of the level of students’ practical skills maturity was performed on the basis of the successful completion by them of the set of tasks in gaming software development.

In the process of the development of gaming programs students’ interest and positive motivation to the final product of educational activities increased, creative thinking improved. Tasks were fulfilled in the determined order and were composed in such a way that a skill of practical programming methods implementation could be developed according to following stages: basic algorithms types; processing data of various types; full-scale gaming programs.

Due to this it became possible as an evaluation criteria of students' practical skills in programs development to use a number of practical tasks performed by them. Besides, a criteria of performing of a task was a functionality of a program developed by a student.

Such an approach to creating a computer didactic game forms cognitive interests in students, activates emotional sphere in the course of team work, increases motivation, lets one acquire and confirm professional knowledge and practical skills, objectively control their quality, use time at the lesson in an optimal manner.

We defined four levels of readiness of future educators to the development and implementing of computer didactic games in their professional activity: adaptive; reproductive; heuristic; creative.

Superficial knowledge of material, full absence of the creative component in the chosen methods of cognitive problems solving, situational reproduction of standard decisions is characteristic of students who are on the adaptive level of theoretical knowledge acquisition.

The reproductive level is characterized by a basic acquisition by students of basic knowledge, consecutive reproduction of educational information in usual situations not demanding creative decisions.

Heuristic level involves students having stable theoretical knowledge, readiness to their implementation with the aim of educational tasks of various levels of complexity, showing elements of creativity in setting of an educational aim and choice of ways to reach it.

The creative level differs with a high level of development of general information culture, awareness, creative thinking of students on the basis of a profound, conscious theoretical knowledge, stable overweight of a creative component in an independent choice of a content and means of educational activity.

In the process of organizing experimental teaching gaming computer programs of various types were used: demonstrational, educational, modelling, educational environments, simulators, examiners. All of them were designed and developed taking into account didactic, methodic, program and technical as well as aesthetic requirements to design and introduction of pedagogical program means, contained questions and tasks of various complexity levels, involved an opportunity of independent setting of an educational objective by students, choice of ways and means to attain it. It encouraged a practical realization of a person-centered approach to education, allowed to provide its individuation and differentiation. The highest effectiveness was shown by the programs of complex character which combined in them educational, training, and controlling functions.

5. Conclusions. The above suggested method testified that introduction of computer didactic games allowed to considerably increase the level of theoretical knowledge, practical skills, promoted the development of creative thinking of students, made a positive impact on the development of the professional skills. Thus, the quality of academic progress in experimental groups increased on average by 19.4 % compared with control groups where academic progress increased by 5.7 %. On the basis of the analysis of students' questionnaires after the experiment the conclusion can be made that introduction of computer didactic games allowed to increase considerably motivation and information competence in students who participated in the experiment. We can state that the use of computer didactic games is a means that allows to structure and systematize education resources, promote self-actualization and self-realization of students and teachers in the process of studying a subject. Due to communication on professional themes students learn how to make a conscious choice with the aim of fulfilling the task anticipating its result at the initial stage.

The proposed education strategy can be recommended to its introduction into the education process of pedagogical university. To the perspective ways of work, we classify the development of the integral system of introduction of the computer didactic games into the structure of the education process, further development of pedagogical programing means with a gaming component, the development of the model for introduction computer didactic games and an adequate methodic provision which will facilitate effective professional training of modern educators.

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