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PEDAGOGICAL CONDITIONS OF USE OF FREE AND OPEN SOURCE SOFTWARE IN THE PREPARATION OF TEACHERS OF MATHEMATICS, PHYSICS AND COMPUTER SCIENCE

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Pedagogical Conditions of Use of Free and Open Source Software in the Preparation of Teachers of Mathematics, Physics and Computer Science

The problem of the introduction of free and open source software in the process of preparing future teachers of mathematics, physics and computer science through the definition and justification of pedagogical conditions. Defined organizational and pedagogical conditions related to the preparation of subjects to use the software and its methodological support, rational and balanced selection of free and open source software, which in turn, contributes to a modern outlook on information processes and their implementation. For psycho-pedagogical conditions of formation of motivational foundation attributed the use of free and open source software and its implementation psychological techniques, diagnostics implementation of the learning process and adaptation of free and open source software in educational activity. For didactic conditions included the use of innovative learning technologies based on free and open-source software, focusing on self-educational activity, and the need to use its advantages for the formation of the ICT competence of the future teachers of mathematics, physics and computer science.

Keywords: free software, open source software, pedagogical conditions, the preparation of future teachers.

Pedagogical research direction in the use of free and open source software are based primarily on the study of computerization of educational process in general and didactic analysis of opportunities and challenges of its implementation in particular. The issue of computerization of education regardless of the period is too small in terms of history, is one of the sections of pedagogy, dynamic. The use of ICT has led to information-educational environment, which in turn requires a new approach and a new look to the classic methods of teaching. Recent studies, including the availability of electronic forms and methods of teaching, talking about the need to review the

classical pedagogy and a new direction – electronic pedagogy. Considering the use of free and open source software in the preparation of future teachers of mathematics, physics and informatics platform as part of the establishment and operation of information-educational environment should consider it in detail the conditions for its use.

The study aims to identify and study pedagogical conditions of use of free and open source software in the preparation of future teachers of mathematics, physics and computer science.

In modern pedagogical studies related to problems improve functioning education system and improving the efficiency of educational activities is to identify study and test pedagogical conditions that ensure their successful implementation. In the works of scholars such as V. Andreev, N. Zhuravsky, M. Zverev, B. Kupriyanov, A. Nayne, N. Yakovlev and other general questions explored pedagogical conditions and their impact on the educational process. In the use of computer technology in the educational process already has significant scientific potential through the work of V. Bykov, A. Verlan, R. Williams, B. Hershunsky, A. Ershov, M. Zhaldak V. Izvozchykova, Ch. Clarke, K. Colin, M. Lapchyk, Yu. Mashbyts, V. Monakhov, I. Pidlasnyj, E. Polat, Yu. Ramsky, I. Robert, D. Savage, G. Selevko, O. Spirin, N. Talyzina, B. Tikhomirov, Yu. Trius, M. Shkil and others. The use of free software in education devoted their research E. Alekseev, A. Voronkin, V. Habrusyev, G. Zlobin, M. Karpenko, M. Kyjak, S. Semerikov, I. Teplitsky, V. Hahanovsky and others. However, the question remains unexplored identify and implement pedagogical conditions of use of free and open source software in the preparation of future teachers of mathematics, physics and computer science.

The use of innovative educational technologies, which also include computerization of educational activities, intended to create positive change in the condition of formation and implementation of educational conditions for their implementation. These general conditions of computerization of education based on research results V. Krasilnikova [1], referred, above all, study the possibilities of using information technology that will be the basis of new educational technologies.

In addition, it is necessary to develop detailed guidelines, laws, principles, attitudes, relationships and terms of information technology in educational activities. An important condition is to develop a conceptual model of learning in the information-educational environment based on understanding, modernization of teaching concepts and principles of traditional training model, selection and justification of new teaching principles that can provide quality education in information-educational environment. Another condition is to develop educational models formalized training in information-educational environment that includes the development of information tools training, testing; teaching methods and self-education in the information-educational environment taking into account the individual characteristics of the educational process, psychological and didactic requirements training.

In the academic dictionary of the Ukrainian language serves the following interpretation of the term "condition" [2, p. 441]:

- a fact that makes possible the implementation, creation, formation of something or promote something;

- circumstances, especially the reality in which there or done anything;

- rules existing or installed in a particular area of life activities to ensure the normal operation of anything;

- a set of data regulations that underpin anything.

The philosophical interpretation of the concept associated with the ratio subject to events around him, without which it cannot exist, that is what determines something else (which is due); essential component of complex objects (things in their states, interactions). Thus, a set of specific conditions this phenomenon creates the environment of its occurrence, occurrence, existence and development.

In terms of pedagogical studies include a variety of approaches to this concept. For example, according to E. Hrykova pedagogical conditions aimed at organizing educational activities to increase efficiency, meaning they are practical, normative orientation [3, p. 15]. A. Bratanych gave the following definition of pedagogical conditions. He believes a combination of objective possibilities of educational content, methods, organizational forms and economic opportunities for their

implementation [4, p. 7]. K. Nedyalkova believes that teaching is provided external to the individual circumstances of the student learning environment and education, which causes changes in his personality [5, p. 10].

Thus, in terms of implementing pedagogical means a series of measures that deliberately created in the educational process and ensure the most efficient use of free and open source software in the preparation of future teachers of mathematics, physics and computer science.

Defining a platform of information technology free and open source software is necessary, taking into account its strengths and weaknesses to determine pedagogical conditions of its use in the preparation of future teachers of mathematics, physics and computer science. Given the global and domestic experience in the use of free and open source software and found advantages and disadvantages of using it identified three groups of pedagogical conditions, organizational, educational, psychological, pedagogical and didactic.

By organizational and pedagogical conditions include:

• preparation of educational activities to use free and open source software, the practical result of which should be a phased transition to its proper use;

• development, preparation, testing and distribution of teaching materials for using free and open source software;

• unity professional, socio-cultural and informational components, important professional knowledge, emotional reasoning and practical steps for future teachers of mathematics, physics and computer science in the use of free and open source software;

• rational and scientifically justified selection of free and open source software, its operational update.

By psychological and pedagogical conditions included:

• proper statement of grounds for the use of free and open source software in educational activities;

• facilitate the intended learning outcomes, based on the use of free and open source software;

- process diagnostics using free and open source software by analyzing achieve planned results;

- adaptability free and open source software for use in educational activities.

Didactic conditions include:

- implementation in the educational process of innovative learning technologies based on the use of free and open source software;

- favoring independent slapdash and learning of future teachers of mathematics, physics and computer science using free and open source software;

- the need to take advantage of free and open source software for creating e-learning component of the program;

- implementation feedback and forming capacity for reflection on the use of free and open source software.

Describe each of the educational environment.

One of the main disadvantages of the use of free and open source software is the lack of appropriate training of the educational process. Analysis of school curricula school subject "Information" and corresponding school textbooks indicates that free and open source software is present only when proprietary software does not exist in this class. Thus, applicants of higher education have no experience with free and open source software in early education, which greatly complicates the process of its implementation. Also equally important is training teachers to use free and open source software. In this direction taken by the state legislation aimed at the widespread use of free and open source software in educational institutions. Thus, in 2002, the Cabinet of Ministers of Ukraine adopted a decree № 247-p of 15.05.2002 "On approval of the Concept software legalization and control of illegal use of it", the Ministry of Education and Science of Ukraine issued a decree number 903 of 02.12.2004 "On Approval of Rules use of computer programs in schools". However, in practice these initiatives are undermined by a number of obstacles related to lack of funding, human factors and competition with the owners of proprietary software.

Another organizational and pedagogical condition is the development, preparation, testing and distribution of teaching materials for using free and open source software in educational activities. Existing business models around free and open source software does not include aggressive advertising of its software products, one element of which is to support the development and implementation of methodological support the use of software in education (e.g. program from Microsoft "Partners in Learning"). Therefore, the development of methodological support of free and open source software is the prerogative of enthusiasts and can be compared with the ideology of Software Development appointed class.

One of the achievements of software use in educational activities is the creation of electronic educational resources. Due to the exclusive use of the open file format in the free and open source software should be created only e-learning platform. Despite the criticism of the ideologues of free and open source software policyholders proprietary software is free software ideologues initiate the creation of a common information component information and educational environment based on open file formats. Thus, in terms of the educational process, the results of free and proprietary software in the form of electronic educational resources are common.

A rational and evidence-based selection of free and open source software for the learning process is based primarily on its compliance with sanitary norms, pedagogical appropriateness of its use and available teaching capacity and is determined, usually expertise on the following parameters: technical (installation / removal, error-free operation of all components, technical implementation etc.); viable (support, updates, new versions, etc.); meaningful (volume of material submitted material content rating, level of development of the subject area, pedagogical and technical components of the material presented and its mode of presentation); ergonomic design (harmony multimedia quality multimedia, interface, ergonomics, comfort, simplicity, etc.). The presence of all these parameters in the software at a high level gives grounds to consider its use in educational activities.

One of the obstacles to the implementation of free and open source software in educational activities is a negative mental attitude to this product. Studies show that

the use of free and open source software in educational activities fundamentally different from the proprietary, in contrast to the mechanism of creation and legal aspects of its use. In addition, so creating good motivational basis is the use of free and open source software in educational activities through a process does not feature its use is one of the primary psycho-pedagogical conditions.

Fixing positive motivation for using free and open source software can be scheduled upon receipt of the results of educational research. Much of the success depends on the choice of an effective way of solving this problem, and a balanced selection of tools to solve it. It should be noted that the formation of these abilities and skills are quite complicated pedagogical problem and its solution is not limited computerization of education.

Another psychological-pedagogical diagnostics process condition is the use of free and open source software. The organization of this process is possible through ongoing monitoring of the results of the adjustment further steps if need be. The process of diagnosis is possible in case of self-education. Under such conditions, it is important to have the skills of critical analysis of the results.

Features of the establishment of free and open source software initiative by programmers and usually without the participation of specialists of other areas, have a special status provided its adaptability for use in educational activities. The advantage of free and open source software opportunities regarding its adaptation does not always provide software didactic appeal, and therefore only at wider use of free and open source software in educational activities will have the opportunity to boost its developers to use accounting features in education.

Ongoing computerization of the learning process in itself innovative technology through the widespread use of teaching the benefits of information and communication technology, and combined with new and specially developed methods and forms of education that belong to e-Education is the foundation of modern didactics. Free and open source software takes the first place in the ranking of network and server software and database systems and software development. That is why its use in educational activities can create innovative learning technologies.

Present Higher Education modified to provide knowledge to the start of working life the person to lifelong learning. Accordingly, the role of self-education for future teachers of mathematics, physics and computer science is a priority. History and development of free and open source software gives us an example of self-development teams of software developers that are the result of self-teaching and learning activities. Thus, self-educational activities within free and open source software will find not only a tool for solving tasks, but will be an example of teaching and learning activities.

These benefits of free and open source software as open standards, increased safety of use, the possibility of individual use, the ability to learn from open source software, education responsible citizen of the state and society provide free and open source software an advantage when selecting software platform e-learning component.

The process diagnostics successful use of free and open source software in the preparation of future teachers of mathematics, physics and computer science is, above all, create the ability to analyze the acquired knowledge and skills. The results of this analysis are the raw data feedback, without which it is impossible learning process.

Dedicated pedagogical conditions of use of free and open source software will not only harmonious use it in the preparation of future teachers of mathematics, physics and computer science, but also to transform the product of the medium of instruction in the software component information and educational environment.

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Величко В. Є.

Педагогічні умови використання вільного та відкритого програмного забезпечення при підготовці вчителів математики, фізики та інформатики

Розглядається проблема впровадження вільного та відкритого програмного забезпечення в процес підготовки майбутніх учителів математики, фізики та інформатики через визначення та обґрунтування педагогічних умов. Визначено організаційно-педагогічні умови, що пов'язані з підготовкою суб'єктів до використання програмного забезпечення та його методичного супроводу, раціональний та виважений відбір вільного та відкритого програмного забезпечення, що, в свою чергу, сприяє формуванню сучасного світогляду на інформаційні процеси та їх реалізацію. До психолого-педагогічних умов віднесено формування мотиваційного підґрунтя використання вільного та відкритого програмного забезпечення, та його реалізація психологічними прийомами, діагностика впровадження в навчальний процес та адаптованість вільного та відкритого програмного забезпечення до навчальної діяльності. До дидактичних умов увійшли як використання інноваційних технологій навчання, що базуються на вільному та відкритому програмному забезпеченні, приділяючи особливу увагу самоосвітній

діяльності, так і необхідність використання його переваг для формування ІКТ-компетентності майбутніх учителів математики, фізики та інформатики.

Ключові слова: вільне програмне забезпечення, відкрите програмне забезпечення, педагогічні умови, підготовка майбутніх учителів.

Величко В. Е.

Педагогические условия использования свободного и открытого программного обеспечения при подготовке учителей математики, физики и информатики

Рассматривается проблема внедрения свободного и открытого программного обеспечения в процесс подготовки будущих учителей математики, физики и информатики через определение и обоснование педагогических условий. Определены организационно-педагогические условия, связанные с подготовкой субъектов к использованию программного обеспечения и его методического сопровождения, рациональный и взвешенный отбор свободного и открытого программного обеспечения, что в свою очередь, способствует формированию современного мировоззрения на информационные процессы и их реализацию. К психолого-педагогическим условиям отнесены формирование мотивационного основания использования свободного и открытого программного обеспечения, и его реализация психологическими приемами, диагностика внедрения в учебный процесс и адаптированность свободного и открытого программного обеспечения к учебной деятельности. К дидактическим условиям отнесены как использование инновационных технологий обучения, основанных на свободном и открытом программном обеспечении, где особое внимание уделяется самообразовательной деятельности, так и необходимость использования его преимуществ для формирования ИКТ-компетентности будущих учителей математики, физики и информатики.

Ключевые слова: свободное программное обеспечение, открытое программное обеспечение, педагогические условия, подготовка будущих учителей.

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