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Information technologies in the system of higher pedagogical education

Abstract. In the modern world, educational institutions can no longer effectively perform their functions without using information communication technologies (ICT). The Russian education is not an exception. The problem of building, developing and raising the ICT-competence of teachers is a topical issue for the modern Russian society. Despite the implementation of federal target programs, the 'Education' priority project (rus. 'проект 'Образование') and the World Bank's 'Education System Informatization' project (rus. 'Информатизация системы образования'), the level of ICT using by subject teachers continues to be low. One of the tasks to do for solving this problem consists in training teachers to use ICTs effectively and purposefully in their professional activity. This paper presents practical experience of using ICTs to train masters in pedagogical education. This is the experience of teachers from the School of Education, Far-Eastern Federal University. The authors give examples of the use of the management systems of education in the School of Education. Two systems are used for training master's degree students: LMS Blackboard and LMS Moodle. In the article some possibilities of using in the educational process of web-technologies, social network technologies, technology of Augmented Reality (AR), technology of Flash-animation are considered. The difficulties of

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introducing ICT into the educational process are discussed. In particular, the problems of information overload, loss of national identity and transformation of cultural values are discussed.

Keywords: education; higher education; educational reforms; information technologies; distance technologies; Master's degree; academic Master's degree

I. Introduction

The system of Russian education has constantly been reformed over the last several decades. Reforms in higher education are first of all about the contents of education. The changes are aimed at eliminating the single-sided approach to education that existed up to the 1990s and demonstrated insufficient connections between the education in the field of arts, social research and economics, on the one side, and the scientific and technical constituents of the modern information culture, on the other, combined with the lack of practice-oriented interdisciplinary projects. The modifications that are being introduced make it possible to organize the training of graduates, including those majoring in pedagogical studies, in a way that would not only give them high-level professional qualifications, but also make them capable of analyzing and solving complex problems of the modern information society and environment [1].

There is no doubt that computer technologies hold powerful tools to work with all kinds of information. Combined with communication technologies and the Internet, they create a learning environment that has phenomenal capabilities and can become a basis for any educational environment.

The emergence and development of new information technologies, the continuous upgrading of technical equipment and communication media, the establishment of large educational communities and so on – all these result in the constant reconsideration of teacher professional training. Present-day teachers who can compete at the labour market must be able not only to design, form and implement the information education environment, but also to obtain and master the skills of finding and adapting the already existing electronic open learning resources (OLR), as well as to design and develop their own educational projects.

Training such professionals requires reforms in the system of teacher training and re-training, i. e. reforms in the system of higher pedagogical education. However, to increase the quality of education by introducing innovative ICTs and new standards for teachers' ICT-competence is not yet enough to solve the problem. The key element for successful transformations is high-quality training (and professional development) for educators. Unfortunately, this key element is not given enough attention to by the modern system of reforming. Meanwhile, it is the lack of effective professional development that is often considered to be the main reason for the gap between the potential abilities and the reality.

Studying for pedagogical master's degree is one of the opportunities to reach higher qualification levels in using ICT in education. The enrollment in these programs is carried out by the leading Russian higher education institutions. Let us consider the main characteristics of the latest regulatory documents which pedagogical Master's degree training complies with.

II. Federal State Standard of Higher Education

In November 2014, The Ministry of Education and Science of the Russian Federation approved a new Federal State Education Standard, (rus. 'ФГОС 3+', FSES 3+ – *translator's note*) for major 44.04.01, 'Pedagogical Education' (rus. 'Педагогическое образование') (master's degree level) that came into effect in February 2015. The analysis of the provisions in the new standard and those in the

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previous one (which has expired) proves that the FSES 3+ is a modification of the FSES 3, rather than a brand-new learning standard, which is why it retains the same number with a 'plus' [2]. Let us consider the provisions of the new standard which either were not included in the previous one or have been changed significantly.

The description of major 44.04.01 given in the FSES 3+ specifies that it is allowable to use electronic learning, distance learning technologies, and on-line study modes when implementing the corresponding master's degree programs. Moreover, the educational activity within these programs must be carried out in the official language of the Russian Federation (RF). According to the RF Constitution, Russian is the official language on the whole territory of the country. At present, these new regulations remain relevant, as they make it possible for physically challenged students to do master's degree courses. The standard specifies for these students that "education technologies must provide an opportunity of receiving and transferring information in intelligible forms".

The fields of master's degree graduates' professional activity (education, social sphere, culture) and the targets of this activity (teaching, educating, developing, enlightening, working in educational systems) are the same in both of the standards. But if previously the types of the graduates' activity were determined by educational institutions, now the new standard itself gives a specific list of these activity types:

- pedagogical activity,
- research activity,
- project activity,
- methodological activity,
- managerial activity,
- cultural and educational activity.

Educational institutions retain the right of choosing professional activity types when elaborating and implementing their master's degree programs, with due account for their own research resources, material assets and technical equipment, as well as the needs of the labor market.

The new FSES 3+ suggests two types of master's degree – the academic master's degree and the applied master's degree. The program of the academic master's degree is focused on research-oriented and (or) pedagogical type of professional activity as the basic one. The applied master's degree program is aimed at engineering-, manufacturing- and practice-oriented type of professional activity as the basic one.

In the FSES 3+, the structure of master's degree has been considerably changed. Now it consists of a basic part and a variable part. These parts represent different orientations (profiles) of education within the field of pedagogy.

The disciplines in the basic part are compulsory regardless of the program profile. They are determined by the higher education institution in the volume set forth by the federal standard. The disciplines in the variable part and work placement determine the program profile. They are set by the program developers for the corresponding profile.

The master's degree program includes compulsory work placement aimed at acquiring professional skills and work experience. The pre-graduation field experience is also compulsory and is done by the students to accomplish their graduate qualification paper (master's degree thesis). For physically challenged individuals, the choice of workplace for internship must consider the undergraduate's health condition.

Since 2010, the School of Education of the Far-Eastern Federal University (rus. 'Школа педагогики Дальневосточного федерального университета') (the FEFU School of Education) has been implementing a master's degree program 'Computer science and ICT in education' (rus. 'Информатика и ИКТ в образовании'). Since September 2014, the School has been implementing another master's degree program 'Distance technologies in educational activity' (rus. 'Дистанционные технологии в образовательной деятельности'). Both of the courses are academic ones. They imply two activity types – research and project activity.

The above-mentioned master's degree programs are aimed not only at additional training of employees in the field of education in order to expand their sphere of employment in the regional system of education, but also at creating the proper conditions to build a market of education services that are rendered with the use of ICT and distance learning technologies in the Russian Far East.

III. Professional training of master's degree students

The main advantages of modern information technologies (such as the use of visual aids, the ability to use integrated forms of presentation, processing and storing large amounts of information, access to world information resources) must become not only the goal of studying, but also the basis for supporting the process of education [3-7].

The spread of ICTs and distance technologies ensures the inclusion of educational systems of higher education institutions into the global educational space, which is the basis for students' personal and professional development. It should be noted here that it is not the information technology alone that is important for the learning process. It is about how the use of this technology serves the achieving of learning goals.

A. Information Technologies

Forming its pedagogical master's degree program, the FEFU School of Education has determined its main preferences for the ICTs that are included in the curriculum and used when organizing the educational process itself. The choice was determined by the types of tasks to be solved in the learning process, by the forms of the lessons, and by the requirements and facilities of the regional education system. Let us consider in more detail the technologies that are a part of the educational process of teaching master's degree students in the FEFU School of Education.

The so-called 'study platforms' are of fundamental importance in using information technologies. These platforms are learning management systems (LMS) which ensure the management of the teaching process and its contents. Two systems are used for training master's degree students:

1) LMS Blackboard – a closed corporate system of global management (http://bb.dvfu.ru/), which ensures the access of students to learning contents, controls the study process (electronic performance transcript), enables group work and remote work;

2) LMS Moodle – a training system that helps to prepare, upload and use remote study courses (http://lms.uss.dvfu.ru/). The use of LMS Moodle is first of all stipulated by the fact that it can be used freely. Secondly, the designing of electronic courses in LMS Moodle uses a top-down planning mode, which requires a student to build a structure of the subject field and systematize information. This contributes to a better understanding of the subject.

Using these platforms to organize student teaching has a number of advantages. It makes possible to provide services in various forms, consider the physical and mental growth of the students,

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and build the interaction not only between the teacher and the student, but also among all the students in real time and off-line as well.

Web-technologies, which are an integral part of the learning process, serve as a universal interface that unites all the previously existent solutions (from e-mail to file archives and personal websites). In particular, Web-technologies are used as a means to gain experience in building communication within the academic environment. Here, the document markup language HTML serves as a means that makes it possible to design open learning resources, a teacher's professional e-portfolio, and a learning-through-play environment. Web-2.0 technologies are used as a means of gaining skills in designing and experience in creating network education projects. The student project 'Arctic' located at http://trin-arktika.ru/ (refer to fig. 1) is an example of using these technologies.

Figure 1. *The student project 'Arctic' (compiled by the authors)*

Social network technologies are used as a tool to gain experience in building professional communication, learn network etiquette and the rules of Internet conduct, and acquire the techniques of communication in the modes of chat and forum. The designing of professional communities is based on social services that are the most widespread on the territory of the Far-Eastern Region of Russia – V kontakte' (rus. 'В контакте', 'In Touch' – *translator's note*) (https://vk.com/lego_legko), Google+, Facebook. Figure 2 gives an example of a Lego-robotics project developed with the use of the above-mentioned technologies.

Figure 2. *Lego-robotics project 'LegoLegko' (compiled by the authors)*

One more important trend is the spread of 'cloud technologies'. A great part in them belongs to distributed resources produced by cooperating authors (the FEFU SE teachers, master's degree students, and other participants of various joint projects). Google resources are used to organize practical classes in the form of online workshops, which is primarily stipulated by the easy interfaces, accessibility, and multi-functional nature of these instruments. Google tools help to organize the students' activity at different learning stages – group discussion and planning of joint activities, group designing and producing of information products, group assessment of work results. Google-forms, Google-documents, and Google-presentations are the most called-for tools to organize the learning process of students. The results of using GoogleAppsforEducation are presented at: https://sites.google.com/a/soe.uspi.ru/itogi-ispolzovania-gapps/.

Virtually since the opening of the pedagogical master's degree school in the FEFU, the technology of Augmented Reality (AR) has been actively introduced into the teaching process. This technology arouses genuine interest both as a means of teaching and as an object of study. As an example, we can take 'The Far-Eastern Red Book Animals' (rus. 'Животные красной книги Дальнего Востока'), an interactive art project with elements of Augmented Reality that combines the AR-technology and the peculiarities of art teaching (refer to fig. 3).

Figure 3. An art project with elements of Augmented Reality (compiled by the authors)

In 2015, the 'Center for Interactive Learning' (rus. 'Центр интерактивного обучения'), a student project bureau, was established as a processing laboratory available for all students. (FabLabforEducation). Master's degree students obtained an opportunity to project unique educational STEAM-projects with the use of modern equipment (the laboratory of 3-D modelling and prototyping, the laboratory of printing and copying, the laboratory of media, the laboratory of educational robotics).

One more technology that allows building ICT-competence in master's degree students is the technology of making educational computer animation (Flash-animation). Using the Flash-technology, students make educational cartoons, dynamic info-graphics, simulators, and animated interactive open learning resources. The range of topics for the produced resources is quite broad and includes covering the ecological issues of the region, promoting patriotism among the population, teaching cookery skills, telling about Orthodox saints, learning foreign languages (refer to fig. 4).

Studying virtually every discipline on the master's degree curriculum involves the use of electronic educational courses, electronic textbooks, test systems, information protection systems, electronic desktop printeries, and geo-information systems based on the technology of combining computer-assisted cartography and database management systems.

Figure 4. An Animation Flash-project (compiled by the authors)

And certainly, we cannot fail to pay attention to applied software and programming tools that ensure the fulfillment of specific learning tasks – processing electronic texts, working with databases

and spreadsheets, creating and editing graphics, creating audio and video information, making computer animation, etc.

B. Progress of Master's Degree Programs

The processes taking place in the modern society (technological advance, dynamism, information capacity) influence the system of education, which leads to the pedagogical community being driven to constantly strive for upgrading their qualification. Thus, a regional study conducted in 2013-2014 within the FEFU showed that 73 % of regional educational institutions did not use remote technologies and only 23 % applied them to work with children with special needs. At that, 75 % of the polled teachers indicated that they were not ready to work in the system of distance education, but they wanted to be given special training in that field [8]. Therefore, the master's degree programs implemented by the FEFU School of Education are currently relevant and in high demand. Naturally, the master's degree students in these programs are as well motivated to acquire ICT-knowledge, which is already half the battle won.

Also, the process of teaching pays special attention to active methods of training – discussions, brainstorming sessions, lectures on topical issues, creative practical work, didactic games, etc. These methods stimulate students to engage in active intellectual and practical activity, to develop initiative, to build their social skills, and to enhance their creative talents. The freedom of choice they feel when doing so makes their learning be conscious, productive and more efficient.

Being able to demonstrate one's achievements in ways that were not available in the recent past is an essential element of structuring the teaching in pedagogical master's degree school. Basically, that is possible with the use of modern technologies.

It is noteworthy that the programs of teaching master's degree students are built in such a way that the ICT tools and products generated in the course of study possess certain practical use and become the basic elements for students' own educational projects.

The positive learning results are due to a number of factors as follows:

- a student is able to choose the most suitable method for him/her to master the subject;

- the intensity of learning process is adjusted at different stages;

- a student is better adapted to the learning material with due consideration of his/her own abilities and potential;

- there is access to earlier unavailable educational resources of Russian and international level;

- the studied material is presented in visual graphic forms;

- the modular structure of teaching allows to duplicate separate components of the information technology;

- the learning material is interactive, it is possible to choose the mode of working with it;

- every subject has a basic (invariable) part and a variable part, both of them being adjustable.

The result of educational activity is a developed information competence in students which is defined as the quality of their activity. This quality should provide an effective search for and a good structuring of information, its adaptation to the specifics of the educational process and to the didactic requirements. In addition, information competence implies the ability to formulate study problems in

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different informational and communicational ways, as well as to work skillfully with various information resources and ready-to-use program methodical complexes that allow to design solutions to pedagogical problems and practical tasks. Information competence definitely implies being ready for carrying out distance education activity, using computer and multimedia technologies as well as open educational resources in the learning process, and using electronic media to keep documentation.

C. Difficulties of Teaching Process

It is impossible to avoid difficulties in the educational process. These difficulties are due to various factors such as technological, didactic, psychological and other ones.

The rapid increase in the number of technologies and their constant updating and renewal can also result in certain problems. It is important for modern teachers to remain capable of objective assessment of the technologies themselves. Also, hurrying to keep up with rapid changes in these technologies, teachers should not lose the ability to estimate critically how reasonable it would be to introduce the newest ICTs into the teaching process.

It is no secret that there is a problem of information overload, primarily among well-educated members of the information society. Information overload is a reality of the modern world. Moreover, having continuous access to information resources, students lose their motivation to memorize information.

It is also noteworthy that the overuse of multicultural educational resources can cause the Russian national education system to lose its peculiarities. This overuse can also result in a transformation of cultural traditions and values. This threatens not only to deprive students of their identity, but also to build a worldview in them which is alien to the national interests of the country.

Finally, the uncontrolled use of technologies threatens with ethical and legal consequences which result from the unrestrained copying and using someone else's intellectual property.

IV. CONCLUSION

In this paper, we have briefly considered the technologies used in the teaching process when training master's degree students at the FEFU School of Education. Also, we have demonstrated the influence (both positive and negative) of these technologies on the teaching process.

It is obvious that even the most sophisticated technology, if taken alone, cannot be an effective driving force for the educational process in general. Nor can it become a basis for making reforms. The key factor for the successful reforming of education is increasing the potential of educators by upgrading their professional skills. Qualified and motivated teachers and students should become the starting point on the way to reforming the whole system of education.

Nevertheless, modern technologies allow making a real use of the whole range of computer-based learning and teaching tools. However, their application requires the user to have rather a high qualification which is enough to:

- develop competitive educational projects and products;

- develop real contents of educational resources;

- model various situations and circumstances for teaching processes with the expanded use of ICT, making the tasks more realistic and avoiding routine tasks;

- study, update and adapt new electronic learning materials used in educational activity;

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- organize and control communication flows, supporting the modular structure of the material;

- promote the virtual communication and the sharing of experience with colleagues in social networks;

- develop the creative role of the teacher and the students, the sense of community and the spirit of innovations.

To sum up, technologies should help students to develop their creative talents, acquire new professional skills and abilities, enhance their individuality and improve their logical thinking.

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Информационные технологии в системе высшего педагогического образования

Аннотация. В современном мире образовательные учреждения уже не могут эффективно функционировать без использования информационно-телекоммуникационных технологий (ИКТ). Российское образование не является исключением. Проблема формирования, развития и повышения ИКТ-компетентности учителей является актуальной для современного российского общества. Несмотря на реализацию федеральных целевых программ, приоритетного проекта «Образование», проекта Всемирного банка «Информатизация системы образования», уровень применения ИКТ учителями-предметниками по-прежнему остается невысоким. Одна из задач решения данной проблемы состоит в обучении учителей эффективному и целенаправленному использованию ИКТ в своей профессиональной деятельности. В статье представлен практический опыт преподавателей Школы педагогики Дальневосточного федерального университета по использованию ИКТ в подготовке магистров педагогического образования. Авторы приводят примеры использования систем управления обучением в Школе педагогики. Для обучения магистрантов применяются две системы: LMS Blackboard и LMS Moodle. В статье рассматриваются некоторые возможности использования в образовательном процессе веб-технологий, технологий социальных сетей, технологии дополненной реальности, технологии Flash-анимации. Обсуждаются трудности внедрения ИКТ в учебный процесс. В частности, обсуждаются проблемы информационной перегрузки, потери национальной идентичности и трансформации культурных ценностей.

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