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Using information-communication technologies in educational process organization

Uso de tecnologías de la información y la comunicación en la organización del proceso educativo

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Content

ABSTRACT:

The article addresses the influence of information-communication technologies on the development and improvement of informational-educational environment of a modern university. It defines the tendencies of further development and methods of information and Internet technologies' application in informational-educational environment of a university. The article presents and analyzes the results of a survey among students with the aim of revealing the level of activity in using informational-educational environment in the educational process. The following phenomena were defined as the tendencies of the development of informational-educational environment of a university: processes of converting universities' documents, document flows and communication channels to the electronic format; active introduction and use of electronic educational and educational-methodic documents; decrease of expenses related to the support of communication process, increase of its efficiency and accessibility of its results not only for

RESUMEN:

El artículo aborda la influencia de las tecnologías de la información y la comunicación sobre el desarrollo y mejoramiento del entorno educativo y de la información de una Universidad moderna. Define las tendencias de ulterior desarrollo y métodos de aplicación de la información y las tecnologías de Internet en el entorno de la educación informativa de una Universidad. El artículo presenta y analiza los resultados de una encuesta entre los estudiantes con el objetivo de revelar el nivel de actividad en el uso del entorno educativo y de la información en el proceso educativo. Los fenómenos siguientes se definieron como las tendencias del desarrollo del ambiente informativo-educativo de una Universidad: procesos de conversión de documentos de las universidades, flujos de documentos y canales de comunicación al formato electrónico; Introducción y utilización activas de documentos educativos y didácticos electrónicos; disminución de gastos relacionados con el apoyo al proceso de comunicación, aumento de su eficiencia y

university students and teachers but for the society in general by using the “free ware” type software. Control of students’ knowledge is an important stage in the educational process. If the tests are designed correctly, students’ knowledge, abilities and skills are reflected in the performance of the control tests’ tasks. Knowledge control in the StartExam program is one the possible ways of increasing the efficiency of students’ knowledge control and teacher’s work capacity.
Keywords: information-educational environment, educational process, electronic educational document, information-communication technologies, Internet service, Internet technologies, survey, control of knowledge, computer program for knowledge testing.

accesibilidad de sus resultados no sólo para estudiantes universitarios y docentes sino para la sociedad en general mediante el uso del software de tipo "Ware libre". El control del conocimiento de los estudiantes es una etapa importante en el proceso educativo. Si las pruebas se diseñan correctamente, los conocimientos, habilidades y habilidades de los estudiantes se reflejan en el desempeño de las tareas de las pruebas de control. El control del conocimiento en el programa StartExam es una de las maneras posibles de aumentar la eficiencia del control del conocimiento de los estudiantes y la capacidad de trabajo del profesor.
Palabras clave: entorno educativo, proceso educativo, documento educativo electrónico, tecnologías de la información y comunicación, servicio de Internet, tecnologías de Internet, encuesta, control del conocimiento, programa informático de pruebas de conocimiento.

1. Introduction

The most significant factors of information society development are the knowledge provided in the form of information resources and information-communication technologies (ICT) comprising methods, systems and ways of processing. In the current conditions, increase of the quality of education in higher school takes the leading positions because it is the future of our country. Rating of real educational quality of an educational institution is defined by its capacities for accessing, storing and high-quality processing of information, as well as using the information technologies correctly. (Dzegelenok, 2004).

Information paradigm, which came to the field of communication from exact and applied sciences in combination with other approaches (in particular, synergetic approach), allows universities to create their own informational-educational environment (IEE), the core element of which is documentation. This environment contains the functioning of educational documentation that exists both in form of hard-copy paperwork and in electronic form. Electronic forms of educational documents’ existence are defined by the development and use of ICT. Therefore, electronic educational documentation of universities is a necessary component of its communication potential, as well as of its official website, which, in combination, constitutes the IEE of a university. (Bondareva 2016).

IEE contains the processes of creation, storage, processing, transfer and consumption of information. In order to conduct these processes, it is necessary to have material, technical and intellectual resources. IEE of higher educational institutions is simultaneously a foundation for the activity of university subjects (professors and teaching staff, direction, students, information technologies personnel) and a result of their professional activity (Tikhomirova, 2009).

The problems of creation and functioning of universities’ IEE are addressed by IT-specialists, as well as by teachers. Different references contain different approaches to understanding the essence and structure of IEE. However, all studies define the IEE content as: subjects (students and teachers) and objects (means of education and tools of educational activity, methods, material foundation, regulation of the pedagogic process, means of communication). (Traynev, Teplyshev and Traynev 2008; Egorova 2015).

Using ICT substantially expands the content and the capacities of some IEE components. This allows using the following sources of exploring information: databases; information-inquiring and search systems; electronic textbooks, practical lessons, handbooks and encyclopedias; Internet resources, etc. Inventory of educational activity expands significantly (computer simulators, controlling programs), along with means of communication (local computer networks, Internet services, Internet offices, cloud data storages, electronic mail, virtual disks, flash drives, etc.). (Spivak 2016).

The center of university's IEE is a student and his/her motives, goals and needs; i.e., all questions of educational and methodic content (organization of educational process, use of techniques, means, methods, tools, information sources, etc.) are addressed and developed according students' needs, activity, skills, level of training and information potential (Khodyreva, 2010). In our opinion, this is what affects the creation of IEE structure and choice of its components.

University's IEE is created and functions primarily due to the presence of educational information that exists in various forms: traditional educational documents (hardcopy textbooks, educational and methodic materials, educational practical workbooks, lecture notes, educational programs, etc.) and electronic educational documents (electronic textbooks, workbooks, practical materials, educational and controlling computer programs, etc., which are also posted at the university's website). Hence, the object of university's IEE is the whole integration of educational documents; moreover, modern IEE of a university would be impossible without ICT, which are actively used in the educational process. IEE existence would also be impossible without creators and users of educational information, i.e., without professors, teaching staff and student audience. To summarize, in our opinion, it is possible to define the following main components of university's IEE: information resources (the integration of educational and supporting documentation and information, including the resources of the university's website); material and technical foundation (library, ICT, computer classes, multimedia technologies, software); subjects (professors, teaching staff, students, PhD students, doctorate students) (Khamzina 2014).

The key component of IEE is a computer: 1) a mean of information processing, communication, acquisition, presentation and updating of knowledge, and students' self-actualization; 2) an instrument of managing the educational process, conducting educational and scientific experiments, designing and constructing universities' IEE. Using computers in the educational process changes the priorities of educational means that are used in the process of teaching various disciplines, which therefore changes the educational environment (Shepetko, 2010).

Another equally significant component of IEE is university's website. Currently, the website is supposed to become the core element of university's communication policy, because it provides a wide range of additional opportunities for conducting communication and educational process. This facilitates the development of an efficient IEE, since the university has an opportunity to provide the users with an additional service, namely, to provide them with up-to-date information, conduct distance learning, increase efficiency of educational and scientific processes, etc. Moreover, the presence of university's own website provides its efficient positioning on the market of educational services within the Internet environment, which allows a user to obtain much more information and create a more complete idea about the university and its services.

The site is funded on the communication model, where the information is provided upon user's request. This trait of educational Internet environment is related to the active role of users, which is defined by control over the information search due to various search and navigation mechanisms. Because of this, the universities, which use the websites as educational Internet environment, are faced with a complicated task that consists in the need to apply considerable effort for attracting users and requires them to pay close attention to the users' needs and requests, new approaches and modern technologies.

To summarize, the value of websites as IEE's information-communication channel is defined specifically by their complex nature which is not reached and cannot be reached by traditional issues, because the websites represent the direction of universities' activity in multiaspect perspective. Any university hands out educational and methodical textbooks, scientific works, advertisement materials for prospective students, but they provide an impression of the scale of the university's activity and its position among other universities only when they are united within a single website. Furthermore, electronic educational documentation is a necessary component of a university's website (Gordienko, Gaponov, and Smirnova, 2016). Importance

and mandatory presence of correctly constructed and informationally relevant university's website is a reasonable requirement of the current time and a response to informational and educational needs of the users.

Along with the above-mentioned components of universities' IEE, cloud data storages and online offices, which are used for creating, storing and exchanging documents in the electronic format, gain increasing popularity. It is convenient to work with electronic documents, for example, in Dropbox (cloud technologies) and Google Docs (online office); similar Internet services include Office Web Apps (Microsoft), iCloud (Apple), Amazon Cloud Drive (Amazon), Pixlr (Autodesk), and others. Currently, these services are more and more frequently used by students and teachers for performing practical tasks, exchanging information, including educational one (electronic educational and methodic materials, questions for seminars, tasks for practical works, questions for exams, list of coursework topics, conductance of practical works, etc.). Each of these services has certain specifics and advantages. For example, Dropbox is more suitable for storing and exchanging information, Google Docs allows creating documents in familiar formats, because it has built-in functions for working with text documents and tables, etc. General advantages of such Internet services are: cross-platform (inter-platform) nature of the software; distance work with information; storage and exchange of information without being "tied to" time, specific work place and flash drive or any other removable information storage; security of information storage; "free ware" license type, i.e., free access; support of various formats (text, tables, graphics, pdf, presentations, etc.).

As shown by experience, the Internet services described above are currently gaining increasing popularity among students, hence, involving them in the educational process provides an opportunity for creating, storing, distributing and editing electronic educational and methodic materials without the use of special software but in the formats that are familiar to the users – both students and teachers.

We would like to point out that currently the following ways of providing electronic educational and methodic materials are actively used: storage on electronic drive (flash drive), on the university's website; materials being sent to a common electronic mail created by a certain academic group of students; storage on the computers in the classrooms, etc. Gradually, the active use of online services for working with electronic educational and methodical materials will occur. We would also like to note that students become aware of the advantages of such internet services before the teachers, and they are already using them for solving practical tasks given by the teacher. For example, it releases them from the need to store the documents in the e-mail or on a flash-drive. The main condition for working with online services is Internet connection, which is present in computer classrooms of almost all universities.

2. Methods

We conducted a survey of students in order to analyze and improve the education process with the use of the opportunities provided by IEE. To this aim, we developed a survey that contained 14 main questions, as well as additional proposal to provide the suggestions for use and content of IEE.

Survey questions and the general design of the developed survey are presented in picture 1.

Survey

(filled out by a college student)

Survey of students is conducted with the aim of defining the efficiency of innovation technologies use in the educational process in a higher educational institution.

Institute _____

Department _____

Specialty _____

Academic year _____

# of st./st.	Influence of ICT on studying in higher educational institutions	
1	Student’s age	
2	Secondary education institution in which you studied (city, rural)	
3	Work experience before studying in a university	
4	Experience of using Internet resources in education	
5	Current place of residence (university residence hall, rented apartment, home)	
6	Access to computers (present, absent)	
7	Are you registered in university’s IEE as a student?	
8	How many courses are presented in the IEE, according to the study plan?	
9	How many electronic disciplines presented in the IEE have you used in your studies?	
10	Have you used electronic educational issues for studying?	
11	Do you use the lecture materials presented in the IEE during the preparation for laboratory and practical lessons?	
12	Have you participated in online-seminars (webinars)?	
13	Do you use Internet resources and IEE for independent work, while conducting coursework, calculation works and literature reviews?	
14	Indicate the percentage (within 100%) of the frequency of Internet resources use: a) for searching the information interesting to you; b) for communicating with friends; c) for studying	

From the today’s perspective, do you consider the use of ICT in the educational process to be efficient? Yes. No. (Highlight).

Your suggestions for using and filling the IEE_____

Counterfoil for analysing the survey (not filled out by a college student)

Analysis and evaluation of IEE influence on the quality of the educational process

1	2	3	4	5	6	7	8	9	10	11	12	13	14

Pic. 1. ICT influence on the quality of university education.

The survey was conducted among 3rd- and 4th-year students who were active IEE users. 46 students of the 3rd year and 22 students of the 4th year participated in the survey.

3. Results

The results of the testing are presented in table 1.

Table 1 . Analysis of statistical data of the survey results

#	Survey questions	Students' scores (%)			
		3rd year of studies *		4th year of studies *	
1	Students' age (under 20 years/21 year and older)	97,8	2,2	72,7	27,3
2	Secondary education institution in which a student studied (city, rural)	69,6	30,4	74,5	25,5
3	Work experience before studying in a university	2,2	97,8	9,1	90,9
4	Experience of using Internet resources in education (yes/no)	91,3	8,7	90,9	9,1
5	Place of residence (university residence hall/apartment)	50,0	50,0	68,2	31,8
6	Access to computers (yes/no)	95,6	4,4	100	-
7	Registration in IEE (yes/no)	93,5	6,5	95,5	4,5
8	Number of courses in IEE that the student reviewed	82,36	17,64	74,64	25,36
9	Use of electronic courses in IEE	41,25	58,75	35,3	64,7
10	Use of educational electronic issues	97,8	2,2	95,46	4,54
11	Use of lecture materials presented in IEE (yes/no)	100	-	90,92	9,08
12	Participation in online seminars (webinars) (yes/no)	8,7	91,3	-	100
13	Use of Internet resources and IEE for independent work	91,3	8,7	61,4	38,6
14	Use of Internet resources:				
	• For searching information interesting to the student	30,65		24,23	
	• For communicating with friends	38,44		28,69	
	• For studying	30,91		47,08	

Note: * - the left column contains positive responses; the right column contains negative responses (in %).

According to the results obtained for the statement 7 of the survey, almost all students were registered in the IEE. The average number of unregistered students was 5.5% which corresponded to 4 people. The number of "courses presented in IEE that the student reviewed" (statement 8 of the survey) was calculated in accordance with the number of the courses planned for the autumn semester by the study plan. Hence, according to the obtained data, the students were familiar with the majority of subjects. Moreover, 3rd-year students were more active users.

The survey revealed high scores in such statements as the use of electronic educational issues and the use of lecture materials, unlike the statement about the use of electronic courses in the IEE. The lowest scores were revealed in statement 12 – "Participation is online seminars (webinars)", which pointed to insufficient number and practice of conducting such lessons.

In general, the activity of using Internet technologies in education was higher in 3rd-year students.

All students gave a positive response to the additional question of the survey about the efficiency of using ICT in the educational process. The students also provided the following suggestions for the use and content of the IEE: increased amount of supplementary materials; mobile application of IEE for Android and Windows; access without a password, free access to all materials of a course; possibility to copy and print the materials; creation of virtual library of textbooks on the educational course (all textbooks); less frequent updates of IEE because it led to "freezing", which made its use impossible.

4. Discussion

Evaluating students' knowledge is an important stage in the educational process, therefore, it's necessary to pay more attention to the efficiency of this stage. Knowledge control is primarily a characteristic of successfulness of acquiring educational material proposed by the program. This characteristic is primarily the subject of serious analysis by the teacher: the tasks were too easy or too difficult, and why, which topics were learned better and which – worse, and why. These characteristics are affected by the quality of the educational work conducted by the teacher, and the level of effort exerted by the student during the educational process.

Student's knowledge, abilities and skills in a certain course have to reflect in the performance in the control tasks. If a student demonstrates low level of performance in these tasks without objective reasons (missing the lessons because of illness, participation in sport competitions), it is possible to list three factors that define this phenomenon:

- A student did not spend enough time studying this material and arrived at the control event without appropriate preparation;
- The teacher did not put in enough effort to provide appropriate quality of education and/or too much material was proposed for student's independent studying without appropriate methodic support and time resources;
- Tasks of the control test were stated badly and/or were too difficult.

Each of these points can be analyzed further. All these factors often interact with each other. However, the subject of our discussion is the third factor that is preparation and conduction of the final knowledge control in the StartExam system, which is proposed for introducing into university's IEE.

Unfortunately, at present, IEE does not have an opportunity for the teacher to control the level of material processing by the students, with the number of each student's requests to the IEE, knowledge evaluation, etc. being stored separately.

StartExam program for knowledge testing, which is proposed for introduction, is suitable for conducting students' current and final knowledge control in the form of tests. This program implies the use of four kinds of test tasks: multiple choice questions with choosing one of several alternatives, or two-three of five-six alternatives, tasks of correspondence, and open

questions with typing answer with the use of a keyboard (Pechnikov, Turovskaya, and Tuktarov, 2013). Using such formats of test tasks allows the teacher to develop the tasks of different levels of difficulty.

StartExam testing program helps the teacher with evaluating students' knowledge by statistical analysis of the testing results with consideration of the testing tasks' parameters. Comparing the preparation of the computer version of a test and hard-copy one, the former would still take a lot of time, but the quality and "lifespan" would be significantly higher in the computer version of a test.

As an example, it is possible to describe the following variation of the program usage. If, according to the working educational program and the norms of study load, two academic hours are rationed for the examination and approximately one hour – for consultation with one group of students, and apart from that, a student has the right to have two attestations in one course, then each attestation lasts one academic hour, and half an hour is spent on the consultation with one group of students. If the first attestation is conducted with a computer program for knowledge testing, it becomes possible to finish within 45 minutes that is the time of the testing and evaluation of the performance. Therefore, using the computer program for knowledge testing, a teacher uses the time more productively.

In order to transition from hard-copy to computer type of conducting the intermediate or final knowledge control, it is necessary:

- To get acquainted with the specifics of using the formats of test tasks that are supported by the StartExam program;
- To develop a database of tasks on the topics of the course;
- To analyze the aims, at which these tasks are aimed; there are tasks of second and third levels of difficulty;
- To create a test and enter in the database in accordance with the topics;
- To conduct trial testing for revealing the tasks that have to be corrected. (Bugakov 2014)

The testing measures the level of students' knowledge in case if all the questions of a topic or a section were addressed and analyzed by the teacher and studied by the students. Computer version of the test allows adding new tasks and topics and exclude the topics that are no longer addressed within the course. In such conditions, all tasks of the test are relevant.

If a teacher completes all these stages once, each following time facilitates the perfection of teacher's proficiency in developing test tasks.

Organizing the examination lesson with Internet access urges the teacher to abandon the familiar passive position. It is necessary to arrange a classroom with computers and Internet access in advance, and make sure that there are no problems with the modules of other courses. Moreover, it is necessary to enter the lists of student groups in the program the day prior to the testing. Only administrator of the program has the right to do that, which also creates additional difficulties and requires time. Some organizational issues take more time than they should.

StartExam computer program for knowledge testing allows not only working more efficiently with test materials at the stage of development and editing, but also performing qualitative analysis of the test upon the results of testing students. (Ananchenko 2016).

"Statistics" menu provides a teacher with the following options:

- Analysis of test tasks upon the topics: difficulty (D) of tasks, correlation coefficient of a task with other tasks of the topic, differentiating capacity of a question (Kdiff).
- Topic-based analysis of test (analysis of the results on different topics): number of tasks on a given topic; mean difficulty of a task; mean alternation of tasks; correlation coefficient with other topics.
- Matrix of test results: allows defining easy (D = 0.1-0.15) and difficult (D = 0.75-1.0) questions, number of students that answered the given question; mathematical expectancy (M) and standard deviation (σ).
- Frequency analysis of the results for a group of students: visualizes the best, the worst and the

average result in the group; graphically represents the distribution curve of the results in the group.

"Test results" menu contains the following data:

- Time of testing: did a student finish fast or did he use all of the provided time;
- Final score: number of correct answers;
- Percentage of correct answers;
- Percentage of correct answers with correction for guessing;
- Grade according to the evaluation system selected by the teacher (5-point or 100-point).

Moreover, by clicking on student's surname in the electronic record sheet, it is possible to go to the table with student's answers and conduct the analysis of test performance, in particular, to see which tasks the student solved, and which he did not. It is important to consider these data during the second attestation: the topics that the student has learned badly have to be evaluated again.

5. Conclusions

To summarize, it is possible to define certain tendencies of development of IEE of a modern higher educational institution: processes of converting universities' documents, document flows and communication channels to the electronic format; active introduction and use of electronic educational and educational-methodic documents; support of multisided and multichannel communications, interactivity, integration and efficiency of universities' IEE by using the newest ICT, including the systems of electronic document flow, university websites and Internet services; decrease of expenses related to the support of communication process, increase of its efficiency and accessibility of its results not only for university students and teachers but for the society in general by using the "free ware" type software.

It is necessary to mention external factors that affect universities' IEE, namely: the state; informational-educational and consulting centers and services; other higher educational institutions; infrastructure of information market, etc. Thus, university's IEE develops an incoming information flow, which comes from external environment, and outgoing information flow, which the university directs outside and which contains the information about its potential, educational capacity, services and needs.

Analysis of the empirical study results allowed revealing the level of activity of using IEE from the perspective of students' audience.

Preparing a test in StartExam computer program can be considered as an alternative to hard-copy version of a complex control work. It is especially relevant for controlling the students' knowledge on the humanitarian subjects in the university. Such step in pedagogic practice would facilitate the increase of the efficiency of evaluating the level of students' knowledge, and teacher's work would become more productive.

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