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Student Oriented Bachelor Degree Engineering Studies

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Abstract: Development of information society is transforming not only business, but all other areas of human activities as well, including science and studies. Probably the greatest advantages of electronic studies are related to the distance studies organisation method, which is constantly becoming more popular due to its flexibility, possibility to study at a convenient time and place. However, variety of tools, used in distance studies, does not determine effective study process itself. It is necessary to have capability to select suitable instruments for the organisation of distance studies, assess possibilities of their use, to be aware of alternative tools, have a clear structural organisation scheme of distance studies, and answer series of related questions. The authors of the article discuss possibilities of increasing efficiency of bachelor's degree studies by applying methods of distance studies.

Keywords: Distance studies, Bachelor degree studies, experience of training organisation

Introduction

Modern world cannot be imagined without new information technologies, which provide an opportunity to transfer necessary information quickly and independently, contact necessary people, transmit not only static, but dynamic information, not only text, but sound; search for information not only in local, but in global data bases, as well. Newly emerging electronic tools improve and make traditional studies better, make them more appropriate and change the principle of organising the studies itself by orientating them to the student. Gradually, old training forms are supplemented or changed into flexible ones. Probably, the most advantages are related to the method of organising distance studies, which are constantly becoming more popular due to their flexibility and

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possibility to study at a convenient time and place. The process of distance studies uses specially established virtual study environments, which due to its complexity and necessity combine not only electronic study material, systems of knowledge assessment, but databases of scientific publication, news portals, and electronic mail, electronic communication tools as well; they occupy more and more users by their convenience and work speed. However, variety of tools, used in distance studies, does not influence an effective study process. It is necessary to have capability to select suitable instruments for the organisation of distance studies, assess possibilities of their use, to be aware of alternative tools, have a clear structural organisation scheme of distance studies, and answer series of related questions as well.

One of the most important challenges in distance studies in comparison to traditional studies is limited communication with auditorium (Trinkūnas et. al., 2008). Namely, this issue considerably burdens transfer of information during the study process, decreases possibilities to assess the level of student's knowledge quickly and effectively; makes organisation of study related consultations difficult, and provides other limitations, which are not typical of other types of studies. However, constantly developing information technologies provide more and more possibilities in this area. The most modern tools suitable for desktop video conference organisation ensure good connection of communication in a convenient place for a student, and provide an opportunity not only to communicate, but record lectures, conferences, transfer view of the surroundings of an interlocutor as well, organise presentations, perform internet broadcasting and provide more other possibilities.

While talking about distance studies, a particular significance is placed on technical sciences. Sometimes you may meet people, who think, that studies of technical sciences cannot be generally organised in a distance way. However, organisation of such studies has been performed in Vilnius Gediminas Technical University for years. Organisation of university bachelor degree studies of exact sciences is a great challenge and responsibility not only because of the fact that it is the process of preparation of future engineers, but also due to the fact that studies are considerably longer than that of the second stage studies, some students

have never been in touch with university studies and are not always ready to study independently. Therefore, it is important to select the lecturing staff with good knowledge in the subject and skills for working with information and communication systems. It is important to not only load material, but also organise the training process precisely and interestingly. The subject material has to be relevant and clearly presented. Constant feedback is important as well.

Founders of distance studies

The form of distance studies has been used from the middle of the 19th century, which has also been known as „correspondence courses", when training material was written by hand or printed and sent to the students by post. The first pioneer of distance training is considered to be Isaac Pitman, a scientist of the United Kingdom, who started teaching students stenography in 1840 by mailing material. Together with appearing new production, transport, communication and knowledge transfer systems, new opportunities appeared in training area as well. In 1971 the Open University of the United Kingdom offered its first 25 000 of students to select one of four courses in arts, social sciences, science or mathematics. The first chancellor of the open university stated that: „If you could use the media and devise course materials that would work for students all by themselves, then inevitably you were bound to affect – for good – the standard of teaching in conventional universities" (The Open University). At the same time, i.e. in 1973, the first correspondence school „Fotonas" of young physicists was established in Lithuania (Junior physicists' school).

However, distance studies started developing in 1998 when Lithuanian distance training network was established, and the following projects were initiated and implemented: "Development of Distance Learning in Lithuania" (a project, conducted by LieDM (Lithuanian Distance Education Network) in the year 1998); later „Development of Distance Learning in Lithuania (a second project of LieDM – 2 in the year 1999-2000); later while implementing the programme „Lithuanian Virtual University (2007-2012)". Today a large part of Lithuanian higher education institutions develop distance studies while communicating in the consortium of

Lithuanian Distance Learning Network, maintained and enhanced by LieDM. Now a national project "Development of LieDM network" is being implemented, which provides opportunities to unify the project partners while solving relevant issues in organisation of distance studies for all. Progressive solutions implemented under this project provide opportunities for more effective communication between a lecturer and a student in a virtual environment; tools are established for the statistical analysis and assessment of the needs of the studies; a platform is developed, which provides opportunities for exchange of open educational sources. While the consortium is participating in the programme „Integrations of Information technologies of Lithuanian Science and Studies" , infrastructure of Lithuanian Distance Learning LieDM network, is partially maintained, and conditions for constant quality improvement of distance learning studies are established (Lithuanian Distance Education Network).

Technical tools in the organisation of distance studies

Development of information technologies has inevitably changed some stages of the study process. It is difficult to imagine the preparation for lectures without a computer or internet starting from searching for the study material using large international data bases of scientific publications, tools for the preparation of presentations, and, finally, independent students' works with the help of informational technologies, computerised knowledge assessment and other tools. One of the main reasons for the study success is appropriate organisation of studies. While talking about distance studies, this aspect is even more important. Whereas students have significantly limited opportunities for direct communication, everything has to be discussed in detail. Virtual study environment plays extremely important role on the organisation of distance studies, which connects all tools into one complex and is a place, where all or almost all study process is going on. A student not only works in a virtual environment independently, but also communicates and cooperates with other members of the process and a lecturer, presents prepared tasks, uses various self-control tools, tests, prepares laboratory work in virtual laboratories; as well as performs other activity, which is inseparable of the study process.

Virtual study environment serves as walls of virtual university, behind which all the study process is performed.

Moodle is one of the most popular and widely used virtual training environments in the world. This environment has many advantages. First of all, because it is distributed for free and is accessible for all; moreover, a user interaction is available in many world languages and can be easily applied to the requirements of a particular institution; it is constantly updated while searching better technical solutions; and it has various software supplements used for various purposes (Kliukas & Vinogradova, 2013). It is also important that a lot of people have been acquainted with this system due its popularity, and this means, that its use will cause less inconveniences, and those, who start using it can find a lot of special methodological material.

While organising the process of distance studies in Vilnius Gediminas Technical University a virtual environment is mainly used for the following purposes: presentation of electronic learning material; knowledge assessment; communication and cooperation with students; organisation of training (learning) process; presentation of training process and attendance statistics; performance of surveys; accumulation of information on the student's learning process; organisation of individual or group work; presentation of a student, profile establishment; personalisation of a learning track (Kliukas & Vinogradova, 2013).

The environment of Moodle, as most of other virtual study environments, has a lecturer of a particular study subject, who is responsible for the organisation of the study process. However, it is important to have a purposeful view on the distance study process, and raise unified quality requirements in the whole institution, constantly search for the ways, suitable for the improvement of the studies. Therefore, even when virtual environment is quite good, it constantly acquires special needs. With regard to these needs, intellectual supplements of virtual environment are developed, which personalise training for a particular student. The aim of such supplements is to establish individual training plans or help to establish the most appropriate sequence of training material. It also helps to personalise the study material for a particular student with regard to

specific needs, such as learning style, cognition, competence, etc. While personalising the training process, students learn to take a decision and think independently (Dzemydienė & Tankelevičienė, 2005).

One of the most important achievements of information technologies, which are used in distance studies, is video conference systems. The first communication programmes provided an opportunity to communicate among conference halls with special professional equipment. Current technological solutions allow the participants of learning to connect to video conference from their personal computers, tablets or even smart phones, organise presentations and participate in lectures, communicate with other students, perform researches, and discuss their results practically in any place, where internet connection is available with no particular requirements. Such solutions are an important step towards distance studies, which not only bring distance studies nearer to traditional studies, but provide them with certain advantages as well. Video lectures can be recorded and later repeatedly viewed. It is also important, that students, who are not able to participate in video lectures, later can see video records and in this way directly obtain important information.

While studying exact sciences, practical courses are important. Laboratory equipment can be controlled in a distance by providing students opportunity to work in a distance. An alternative way is virtual laboratories, which are installed in a computer simulating the functioning of devises.

Use of virtual laboratories has the following advantages: 1) it is not necessary to buy expensive equipment and reagents; 2) modelling of processes, which functioning is impossible in laboratory conditions; 3) possibility to see the acting processes in other time scale; 4) safety, e.g., works under high voltage or dangerous chemical substances; 5) quick performance of several experiments with different inserted parameter means; 6) time saving by saving results in electronic form; 7) laboratory use when an institution does not have a laboratory or its equipment is old; 8) saving of laboratory materials and resources (Truchin, 2002).

Experience of VGTU while organising distance bachelor's degree studies

Distance studies in Vilnius Gediminas Technical University have been organised for more than ten years. A great experience accumulated during this period in the organisation of such studies provides an opportunity to constantly improve the study process, make such studies more accessible and qualitative. Appearance of new programmes organised in a distance are encountered with new challenges, and their solution helps to improve the study process. Currently it is possible to choose from 20 different distance study programmes at the university, which include not only the second, but the first stage study programmes as well. Namely, the first stage study programmes (which provide university bachelor's degree) have raised a lot of new challenges. First of all, these are not only the study programmes of technical sciences, but also it is important that a large part of students have never studied at a university and, sometimes, do not live in Lithuania. Therefore, it is important not only to present the study material in an appropriate manner, but also organise a study process in such a way, that students' attention could be kept during the whole semester without transformation of all study load before exams; as well as in parallel, taking into account that most of students have jobs, sometimes work shifts or even in different countries.

All this has conditioned the fact, that during organisation of bachelor's degree distance studies in Vilnius Gediminas Technical University Visa, an analysis of different measures and opportunities has been performed; and on its basis, a new order of organisation of distance studies was established, which was oriented towards a student.

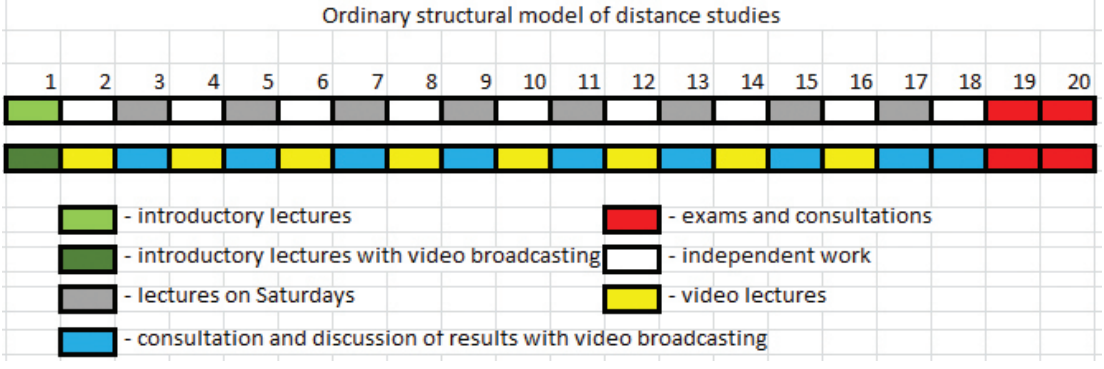
Regarding the study schedule, prepared according to the order of organisation of distance studies, the study process, in most cases, has been divided into three parts: 1) a week of introductory studies; 2) lectures on Saturdays; 3) Consultations and exams.

This means that students intensely participate in the study process at the beginning of a semester. During the semester lectures are usually organised on Saturdays, when students come to the university. Meanwhile, all other time is devoted to independent studies, where the results and effectiveness

of this process is difficult to assess. Moreover, having in mind that most of the students have never studied at all, such sequence of the study process may influence the fact, that part of the students will not be able to finish tasks on time and will be forced to leave studies or preparation for the examination will be of lower level than expected.

On the basis of a newly established model, the study process is spread through the whole semester, and lectures are divided into synchronic and asynchronous types. In this way students can constantly consult lecturers on the preparation of tasks; and constant preparation of tasks forces students to study during the whole semester. Moreover, integration of video transferring tools into the study process establishes opportunities to study without coming to the university. While talking about people, who have jobs, a very important opportunity has been implemented with the application of video records of lectures, when a student is able to get acquainted with information, which was presented during the lecture without participation in it. Whereas lectures are held not only on Saturdays, the study schedule is more divided by changing the study load. With regard to these provisions, the studies are organised according to the following structure, presented in Figure 1 (Vilnius Gediminas Technical University, 2013).

Figure 1: Structural study scheme



With regard to the scheme, presented in Figure 1, it is clear, that unlike traditional case, while organising distance lectures, video lectures occupy

a large period of time. During video lectures students are provided with structuralised information, which they have to know before practical courses, laboratory works or seminars. Participation of a lecturer is not necessary for the presentation of such material; moreover, while preparing the material, more attention could be paid for the presentation and quality of the content than during the conduction of a lecture alive. Students can use advantages of asynchronous lectures and get acquainted with information at a convenient time unlike in a traditional case, when students had to attend lectures every Saturday.

After having acquainted with the necessary material, students can actively participate in other courses. Those, who are not able to come for consultations and discussion of results, can do that with the help of video conference equipment. Therefore, students, who are in different towns or outside Lithuania, can combine studies with their daily activity by minimum correction of their ordinary calendar.

While working with distance auditorium, when students are in different countries and time zones, the organisation of studies has to be well-considered. Virtual training (learning) environment is used in order to bring nearer and improve traditional training methods. During the preparation of a distance course, it is important to plan the training (learning) plan comprehensively in order to present the material logically, in a convenient form, sequence and interrelation of all elements, and consider ways of increasing students' motivation. The presentation of a course depends on the auditorium. There are several ways of presenting the study material in virtual training (learning) environment. The material could be presented in chronological order, when material is divided into weeks or according to topics. Whereas the study process is divided into weeks, the presentation of material shall be more convenient when it is divided into weeks (Kliukas & Vinogradova, 2013). In this way, a student can prepare a plan, how much to study each week. If there were no possibility to attend lectures, it is easy to understand, what was missed and which tasks have to be prepared. All necessary material (video records, text information, self-test tasks, exercises, etc.) is related to particular days and shall be presented next to a certain part of a course of a particular day.

A lecturer is, first of all, responsible for the preparation of the study subject material. Therefore, a great attention is paid to the training of academic staff of Vilnius Gediminas Technical University. A distance study centre is specially established in order to obtain a unified structure of the study material, use existing technical and programming resources as much as possible for lecturers' working in distance studies. A prepared special training methodology is intended to provide lecturers with the main training (learning) possibilities of virtual environment, organisation of video conferences, preparation of video records, communication in a distance, etc. There are special auditoria established for this reason, where a simulation of distance studies is possible in order to train academic staff. While working in a group, lecturers are able to see the training (learning) process in the eyes of a student, as well as, see the study process though their subjects, and using their accumulated pedagogical experience, think about the most appropriate use of the system tools in their subject. Work with lecturers according to such methodology encourages development of new ideas and their application in the preparation of the study material and organisation of studies.

Each study subject presented in a distance way includes a material for independent studies and an opportunity to check knowledge by using tests. A lecturer checks students' knowledge during the studies. Students usually have a positive attitude towards computer tests, they are tend to experiments and often take a quick interest in things that make the study process more colorful or help to reveal additional study motives. Advantage of computer testing is a possibility of automatic selection of answers and elimination of a human factor, when students see a partner, not an opponent in a lecturer. Despite wide application opportunities of electronic tools in the study process and a complex structure of final assessment, a large part of final assessment falls on examination, during which a lecturer can directly assess obtained knowledge of a student. Currently this stage of the process is the least flexible, because exams are held in a particularly determined time, and a student has to physically participate in the exam.

One of the most difficult subjects is a preparation of an appropriate material. Video lecture recording tool is used for lecture recording, screen

recording tool is BBFlash, Vidyo conference system, which is distributed for free with the help of special equipment. Variety of equipment was influenced by high requirements of the study organisation process and target orientation of these tools, which is not universal.

Direct video broadcasting was implemented with Big Blue Button (BBB) software, which is integrated into the Moodle system, but due to a larger number of students, it was decided to choose commercial conference desktop software Vidyo. A group of students communicates with a lecturer in a realistic time using camera and a microphone. Any participant of a conference may broadcast documents of any format and a desktop of a personal computer.

Students send digital or scanned woks to a lecturer to check or solve test-type tasks. Tests include different answer types with regard to the subject (select a right answer from several possible, solve the task and enter an answer into the system, open question type, etc.). While preparing test answer variants lecturers take into account typical students' mistakes and present logical answers. This takes a lot of time, but it ensures, that a student shall not guess an answer so easily.

Training quality depends on the competence of a lecturer, training methodology, student motivation, favourable training environment and other factors. The quality of a course is assessed by a group of experts, relevancy is checked and how clearly the material is presented, self-control tasks, video material, learning schedule, etc. If a course is approved, it is considered as equal to a printed publication, which is included into certification of a lecturer.

Conclusion

After application of the Moodle virtual environment of in Vilnius Gediminas Technical University, the number of students in distance studies has increased. 8 distance programmes for a bachelor's degree students have appeared: Construction Technologies and Management; Mechanical Engineering; Transport Engineering; Engineering Informatics; Business

Information Systems; Telecommunication Engineering; Construction Engineering; Construction Engineering Systems.

While preparing a bachelor's degree courses an interactive material was prepared, laboratory works were filmed, and virtual training objects were created. The study time was divided into courses conducted at a realistic time, which cover not less than 50% of time, and video lectures, which cover up to 50% of all course time. Such division of work encourages constant independent work of a student and provides an opportunity to consult a lecturer periodically. During a video lecture, a lecturer can use a material prepared in advance, which makes the time of a lecturer more flexible, and the course material more qualitative. A video course material, once prepared, may be used in further study years, and free time may be devoted for the improvement of a subject and communication with students.

Assessment of students' knowledge is performed at the university; therefore, the quality of knowledge assessment is the same as in traditional studies. A student is interested to prepare offered tests independently in order to prepare well for the final knowledge testing.

In order to supply desktop conferences at a realistic time, it was decided to shift from a free Big Blue Button communication tool to a commercial product Vidyo, because of a possibility to connect a larger number of users at the same time, better quality of a view transmission, and more modern technical solutions.

A great attention is paid on the quality assessment of the distance study material prepared by lecturers. The study subjects, prepared for distance training undergo obligatory certification with regard to the order approved at the university. Such certification unifies requirements for the study material, develops students' expectations and facilitates the study process.

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