SYSTEMS OF EDUCATION IN HIGHER EDUCATION INSTITUTIONS IN THE CONTEXT OF THE DYNAMIC DEVELOPMENT OF INFORMATION AND COMMUNICATION TECHNOLOGIES

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Abstract

In the future, job positions are going to be specified not by requirements for "profession", but by the requirements for knowledge, which has to have an applicant for occupation. This will mean new requirement to supplement the curricula of universities by transferable skills and elements of IT and digital skills. Transferable skills, such as search and work with information, digital competence and language competence will play an increasingly important role in the field of lifelong learning, the importance of which is increasing with the dynamics of changes becoming more and more. Nowadays the demands on graduates are increasing. These graduates are able to meet such requirements, and thus find a place in the labour market. The future of education supports new courses focused on interdisciplinary integration and interdisciplinary experience. The paper deals with the used methods of education at universities and education support by method of e-learning. In the paper there is present a comparison of e-learning education systems at universities in selected European Union countries. The output of the contribution is an evaluation of education systems and direction of education in universities in accordance with the dynamic development of information and communication technologies.

Keywords: education systems, digital competences, e-learning, language competences.

1 INTRODUCTION

Nowadays, the learning by interactive courses is becoming more and more popular, e.i. through video calls and videoconferences. Students do not want receive information only passively, they want to be involved in the learning process and that they want to be active. Today's world requires students to think strategically, to be able to cope with crisis situations and to be able to think creatively and learn new things.

Thanks to learning through electronic technologies, the education is more interactive. Education in the classical form, based on the direct contact of the student and the teacher, is enriched by electronic learning. Many students prefer using a combined form of learning where they learn through e-learning materials but also use consultations. Internet technology has fundamentally changed technological and economic sphere so strongly that it is now possible to use new technologies in teaching very quickly.

2 E-LEARNING AND ITS BENEFITS IN EDUCATION

The term e-learning is stable and it is understood as a support for education through the internet. Ten years ago, not many people could get an internet connection. Nowadays e-learning has become a commonly available learning method. Nowadays the student can obtain a college degree also without being physically present in the classroom. It represents a big advantage for employees. They can study alongside the work without having to deal with a physical presence in an educational institution. [1]

As the e-learning evolved and developed at different times, also various definitions originated through these various periods of its development.

Due to the fact that the development of e-learning is dynamic and continuous, other information and communication technologies have been available at every stage of its development, the definitions differ. Some of them are very extensive, others are professional, some describe the meaning of e-learning very closely and some are simple. [2]
The offer of a new form of learning is based on a natural way of learning - self-study, provides a highly effective form of lifelong learning, low cost of study, use of computer and audiovisual means, and determination of speed of study. [3]

Students have access to study programs in their own place of living. They can pass the curricula with the pace that suits them. This way of learning allows the students to join the learning anytime they want and as long as they need. Students with excellent results have the opportunity to skip parts of the curricula which they have already learnt in previous courses. On the other hand, students who are not advanced, do not have to feel uncomfortable or weak and they can study at their own pace without influencing the advanced students. In addition, the students have free access to the study material which helps them to overcome barriers and represents a better access to information. [4]

As far as e-learning is concerned, it is not only an effective method of obtaining information and knowledge, but the students are forced to orient themselves in a big amount of information. Students are taught to select important information for their study, to work with it, and learn how to correctly assess it. The advantage of using links in a right way is that the student can get access to the right sites around the world, avoiding long lasting searching in books. The big advantage of such learning method is that information on the internet is much easier to update and reprocess. [5]

Distance education creates conditions for improvement of the learning process and also for a quick way of retraining or requalification. This type of education allows higher number of students, regardless of the teaching capacities. This training gives the teacher the role of a consultant and creator of study materials and multimedia learning aids for his students. Today's information supply fill the students with a lot of information they may not and sometimes they cannot remember, but they need to be able to work creatively with it and thanks to this learning, students learn to select what they need and make use of it. [6]

There are some forms of e-learning identified as synchronous - it means that students and teachers communicate in real time. Asynchronous method represents a communication where communicators do not have to be connected at the same time, which is an advantage in comparison to synchronous e-learning. Discussion fora belong to such often used communication solutions, email correspondence, etc. This form of communication has no real-time communication, but there are no demands on the occupied participants, and they can react according to their conditions. We recognize the types of e-learning - CBT (Computer Based Training), WBT (Web Based Training) and LMS (Learning Management System).

CBT is considered to be the first level of e-learning and it can be also characterized as computer-supported learning. It is an off-line form of e-learning, i.e. education, where an internet connection is not need. The study materials are placed on magnetic or optical media that give the student advantages, for example interactivity or multimediality of the study material, various learning games, simulation, etc.

WBT is referred to be the second level of E-learning and it is one of the first forms of online e-learning. The www service plays a major role here and the teaching takes place in so-called virtual classes. Web-based LMS technology serves for implementation, evaluation and planning of a particular service. A complex system has an interface for creation, management and presentation of electronic courses, as well as for support in communication between communicators. The advantage of LMS is the so-called "anytime and anywhere" approach. [8]

3 E-LEARNING AT UNIVERSITIES

E-learning is a modern way of teaching at universities, using information and communication technologies. It is the implementation of information technologies in the development, distribution and management of education. E-learning is an effective means how to connect with students or employees and to send valuable information from a distance. This transfer of information is mostly realised by on-line distance courses.

In the broader meaning e-learning is defined as the implementation of new multimedia technologies into the education method, in order to improve quality and to allow better access to resources, services and more effective cooperation. From a closer point of view, e-learning can be described as an education supported by modern information and communication technologies and implemented via internet or an intranet. [3]
As e-learning offers a wide range of applications and is characterized by a high level of creativity, it can be implemented in different courses. This fact supports a trend that will continue. E-learning allows to create multimedia knowledge databases that will be placed in the relevant internet courses and will be accessible at any time you connect to internet from anywhere in the world. [9]

E-learning is especially suitable for students in situations when:

- wide range of content is available for a high number of persons,
- they come from geographically different locations,
- they have limited time to learn,
- they have limited mobility.

E-learning has become a more frequent and almost standard method in the education process that involves a wide range of processes. As e-learning is so popular, it receives a lot of attention, especially from universities sides. Universities use e-learning as a means of improving the learning process, using different types of courses and in different forms of education.

Reasons for implementing the e-learning in teaching is:

- a need for more extensive education as it can be obtained in classroom,
- a need for faster and better acquisition of information,
- a possibility of teaching a higher number of students without expanding the teaching capacities,
- an active role of student in educational process,
- an individual timetable for teaching,
- a need for simple updating of educational materials,
- an ability to use new types of communication,
- a need for better management of funds. [10]

E-learning includes also learning processes, such as web-based education, computer-aided learning, virtual classrooms and collaborative work with digital information and communication technologies.

It is mainly about:

- online / off-line education,
- ICT-enabled teaching and access to educational content through a web browser,
- education distributed by CD / DVD-ROM,
- distance education,
- virtual classes. [3]

E-learning is a broad concept that represents the closeness of education and technology itself. It includes and provides a whole range of processes and applications for content distribution across the internet at the same time, audio and video technologies, etc.

However, mostly when using e-learning, we encounter the use of so-called blended learning. It means a using a combination of self-study and a course led by an instructor who distributes study material online as well as off-line.

Blended learning, combining presenting form of learning with e-learning, is a more effective solution, eliminating lessons only with e-learning courses. In this way, the absence of basic information can be eliminated, as well as the acquisition of theoretical knowledge. In practice, it looks like passing basic information and testing key knowledge, which are afterwards expanded through practical lessons from lectures and attendance seminars. It is precisely because of these characteristics that the combined option is increasingly popular at universities and replaces education with a full-distance method.

Some of the online activities can take place before lectures, with the aim to improve the knowledge level, but also in order to find out the differences between the students. Students can prepare for a lecture in this way, but the teacher can prepare or modify the material as it is required by the students. This modified system helps the students to practice and consolidate the acquired knowledge [11] [12]
4 THE PREREQUISITE FOR EDUCATION AT THE TIME OF USING NEW TECHNOLOGIES

The prerequisite for employment for graduates are specific professional knowledge and the ability to apply this knowledge to practice and to have general academic knowledge. They should serve to support analytic and critical thinking. High education plays an important role in this process. Compared to the past, higher expectations are given for college graduates.

Most of the previous analyzes in Slovakia point to technical and natural trade unions rather than to highly perspective ones. It is expected that a college graduate will acquire competencies that will make it better to act in practice after graduating from college. In addition, enterprises declare the need to acquire graduates capable of solving faster and more competent tasks, for example, innovations in practice. The results of the survey show, for example, that:

- contribution of the study is primarily in supporting the own development and further implementation in a particular job,
- most graduates who get the work place are involved in sector information technology and services,
- level of competence development is close to the required level of competency required in occupational theoretical methodological knowledge and in the ability to educate and organize their learning. [13]

It is a trend that social sciences are being promoted at secondary schools. On the contrary, in the future, mathematics-based teaching and programming basics will form the necessary basis for educating the new generation of workers in "Industry 4.0". It should be remembered that this is an area where practically no jobs places are left for workers without basic technical knowledge, whether they are educated directly in the technical, economic or social field. Even so-called. Non-technical unions are no longer interested in understanding the issues at the high technical and mathematical level. [14]

The basis for Industry 4.0 will be created by IT technologies, such as the networking of IoT devices, the respective support processing devices, but especially the massive database systems collecting and processing large amounts of data produced by the devices. The most promising basis for managing this data load is the Hadoop system. Its distribution and processing and data storage allows you to manage their management and also perform aggregation operations through Map-reduce or Spark-based scripts.

So, technology in this area can be taken as sufficient, or even rapid growing. So where's the weak spot? At present, it turns out that companies are counting on with increasing amount of data, but not the human capital needed for its:

- processing,
- evaluation,
- use,
- assessment.

In recent years this phenomenon has led to the fight for "brains capable of processing the data" between firms at the labor market in order to exploit the maximum potential benefits with an emphasis on the efficiency of their processing, future business, and monetization. The classic perception of the past: "First of all, it is necessary to set up business and then to deal with the produced data", nowadays the era is changing to "the data are being produced and we need to find out what business we can build on them."

This of course also changes the current share of business forces. While in past the rule was 40% of managers, 40% business intelligence and 20% developers. Today's time requires 70% of developers and analysts (data scientists), 15% of business intelligence employees, 5% of business development workers and 5% of managers of the total number of business forces.

Especially the occupation of Data Scientist is now a „rare commodity". It is a profession where it is necessary to combine three main components:

- mathematician - for understanding contexts, understanding and finding patterns in data,
• business developer - to be able to find in the data only essential insights suitable for business development,

• computer programmer - while for the evaluation of large datasets under the Hadoop systems, the excel with 1mil of rows is not enough. It is necessary for this occupation to master the languages of proof of solution concepts such as R. Scala or directly to develop programming jobs and algorithms as Python.

Managers or project managers or business managers as translators of requirements and they have to have necessary knowledge about function and capabilities of the issues. Lack of knowledge would lead to poor estimation of the capacities and technical needs of analytical teams, or misinterpretation.

Another fully evolving trend requiring an increase in student mathematical and statistical thinking is a division which aim is to slightly relieve the Industry 4.0 from the need for human analysis. This trend or direction is Machine learning. This is a discipline requiring the full use of "mathematical brains" but also an understanding of the managerial staff. Without awareness in each area, any similar solution can only result in reliance on the so-called "Magic box," results of which will be taken as a clear truth, without knowledge of the procedures that led to them.

5 RESULTS OF THE QUESTIONNAIRE SURVEY

University of Žilina is an institution providing predominantly technical and less economic education. The education system directly touches upon the above-mentioned idea of transforming education, which must keep up with the development of industry and the whole economy. The nature of education is changing substantially. Early in 2017, a survey was conducted on how students use new learning opportunities to learn how to adapt to current realities and future needs. University has approximately 9,000 students. In this survey participated 180 students (when calculating the minimum sample 148).

The forms of education change, the survey responded to the question about the preferred form of study – see Fig. 1.

![Fig.1 Preferred form of teaching. Source: own processing](image)

The results of the survey show that 70.20% of respondents answered that the preferred form of teaching is blended learning. It corresponds to the present state when the classical form is complemented by materials freely available to deepen knowledge.

E-learning is used by around 80% of the students surveyed. About 20% of students declared they did not use e-learning. They answered the question as to why they do not use e-learning as outlined in Fig. 2.
The most common answer, 42.50% was that I did not find what they were looking for. This factor is very important, because it means that the e-learning system contains the various information and backgrounds needed to study, but it does not quite cover the scope of the learning substance. Respondents had the option to choose only one of the answers. The second most common answer - 25% declared that they do not need to use e-learning. They rarely use it for basic study activities, such as enrollment for examinations, information and study materials obtained in other ways. The answer of 20% of students that they do not know how to work with eLearning means that they need to be trained and enrolled in the e-learning environment after taking up their studies.

On the other hand, most students use e-learning. In their opinion, they considered the e-learning positives perceived by respondents. The question had multiple possible answers – Fig. 3.

Of all the answers selected, the students marked the biggest position - 86.6 % making the study materials available in electronic form. The second largest positive feature, 64.5 % was an unrestricted access to study materials related to the first one. Students appreciate speed, also the ability to communicate with teachers, mobility, and transparency.
6 CONCLUSIONS

The survey shows that students do not use the full potential offered by e-learning support. This may be due to inadequate student awareness and poor technical skills of teachers. The Open Source software LMS Moodle solution, which is not financially demanding compared to commercial solutions, is used. Based on the survey, we know that students prefer a combination of classroom and e-learning. Students use e-learning at least twice a week. The success of the e-learning system also depends on a number of subjects supported by the LMS Moodle e-learning system and its content. An important factor is also played by the teachers themselves, mainly through the quantity and quality of the study materials they publish.

Enterprises need to identify key areas for development. It represents flexibility, speed, productivity and quality. They also need to analyze the long-term impact on the workforce, and this must be tailored to education.

In view of the changes that take place in all areas of life, the university of a predominantly technical focus and its students are standing up for the challenge posed by the rise of information and digital industrial technologies. Students must be prepared for the changes that were applied in innovative manufacturers, system vendors and other areas of the economy.

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