Influence of Spatial Factors and Types of Studies On E-Learning Classification upon Time-Based Criterion

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***Abstract*—This paper is devoted to the classification of e-learning and its main criterion: synchronicity and asynchrony of student-teacher interaction.The necessity to change the educational process is considered in order to ensure its compliance with the requirements of the modern information-oriented society. Opinions of e-learning classification are presented. Specific features of classification at time factor are discussed. Concept representations of synchronous and asynchronous learning are given; an example of holding one and the same seminar for different types of learning is cited. Positive and negative sides for each seminar are shown. The concept of "space" is introduced to the systems of time-based e-learning classification. A different view is presented on the classification of e-learning technologies, to a greater extent having an engineering approach and based on computer technologies and communication techniques. On the basis of the combinations of the concepts "time" and "space", the quadrants time and space dependent / in dependent are formed. The main advantage of this classification is the coverage of all e-learning tools. Rendering of such symbiosis is given. The influence of individual and group sessions on the classification model at time factor is reviewed and analyzed. Based on this analysis, the teacher can choose his own scenario of conducting classes.**

Keywords: **elearning; synchronouscommunication; asynchronouscommunication; time independent; time dependent space independent; space dependent.**

I. INTRODUCTION

In the age of onrush of scientific-technological progress, the educational process shall be up-to-date. The traditional educational model, in which the lecturer had knowledge monopoly, and the task of the educational system was to translate this knowledge, is outdated.

The advantages of e-learning are pressed into service to solve existing situation: accessibility, flexibility and perceptual efficiency of qualitative knowledge. E-learning is the term concealing the widely differing concepts. The number of classifications is provided to differentiate them in the scientific literature, which can be based on spatial-time factors, pedagogical approaches used in the creation of e-courses, as well as types of multimedia.

Different authors have various opinions on the classifications of e-learning, approaches to the forming a list of technologies and their relevant representations [1, 2]. The reason for this phenomenon, in our opinion, is a slightly different understanding of the term e-learning. Dozens of e-learning representations can be found in the contemporary literature. If we take the most enlarged understanding of e-learning, which can be formulated as the use of electronic information and communication technologies in education, and the logical version is classification based on computer technology and communications techniques. In this case, the classification has an engineering approach to a greater extent, and from the pedagogical scope it is converted into the field of telecommunications and information technology. For instance, the concepts of: webcasting, streaming video, Push technology, are unknown to many people, but this does not prevent individual authors to consider them as e-learning classes [3].

Let's consider the classification through e-learning tools: e-mail, webinars, and various chats. This list may be extended by new applications that appear and can be introduced to the classification of e-learning technologies. These tools consider communication systems, that is, delivery and access to content. By considering applications for creating content, classes will appear: for working with presentations, for working with audio, for working with video, for working with text, for working with images.

This article shows one of the types of classification of the learning interaction over time.

II. CLASSIFICATION UPON TIME-BASED CRITERION

Division at time factor may be considered as e-learning classification, and synchronous and asynchronous learning are distinguished here[1, 4].

In the case of synchronous learning, the lecturer and the student are simultaneously present in the learning system, the communication between them proceeds without time delay. This type includes text and voice chats, as well as videoconferences and webinars. During webinars (sometimes also called web conferencing), video and audio can be

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transmitted in real time, which brings this type of learning closer to the traditional class-lesson. However, webinars have their own peculiarities and procedure. More specifically, it is required to have a confident knowledge of the interface, functions and technical features of a particular webinar system in order to provide interactivity, to prepare a scenario of the session using an electronic presentation, to notice in time when the student wants to ask a question, create inquiry in the mode of tactile time, and etc.

One of the advantages of webinars is the fact that computer with an Internet connection and a microphone are sufficient for their performance. Each participant enters the virtual room independently and uses a program accessible via the Internet. If several participants in the same audience have to contact another group of participants, it is a videoconference. In this case, it is required to purchase and use special equipment. Such solution allows, for example, to simultaneously conduct classes for a group of students present in the classroom and for a group engaged remotely in another country or another locality.

Asynchronous learning involves a delay in communication with the lecturer-student and student-student. For instance, when working on a forum between the message of the student and the lecturer's answer, it may take several hours or even days. Asynchronous are courses that use multimedia resources, texts, electronic libraries: the student explores the material himself and can ask questions as they arise. In this case, the lecturer, by providing feedback, can focus not only on the students' questions, but also on the statistics that are created by the electronic system (visit the electronic platform, the percentage of tests, statistics of materials consultation). One of the bright examples of asynchronous learning is mass open online courses, in which the main elements are short video tutorial, testing and forums [5].

When planning asynchronous courses, there may be question of timekeeping of lecturer and students. In point of fact, how to calculate the time spent studying the material and completing tasks, taking into account that the presence of lectures and practical classes is no longer an obligatory component of the course? In this case, it is conventional to focus on the total scope of student work required in this course. This will help to calculate how long it will take to study the entire course, and prepare materials and tasks in accordance with these data. When explaining each task, you shall also specify the approximate time that the student will spend on it.

Each lecturer can easily combine these types of learning and offer students synchronous and asynchronous forms of work in one course. Such learning is also often called blended. In technical terms, this can be realized, for instance, through e-learning platforms (LMS) with an integrated webinar service. The choice of a synchronous or asynchronous type of material delivery will affect both the differences in the choice of the pedagogical scenario and the Course Duration [6].

Table 1 shows an example of holding one and the same seminar in a traditional class-and-lesson system and using different types of e-learning.

Table I: Holding Of Seminar In Traditional And Online Format

Form	Time	Actions of students and lecturer
Traditional class-and-lesson system	3 hours with break	The lecture is divided into parts, each has several tasks. Attention of participants is always concentrated on one theme. Not all students will be able to ask their questions. Most questions from students (may be all of them) will be answered.
E-Learning – synchronouslearning	3 hours	The lecture is divided into parts, each has several tasks. Attention of participants is always concentrated on one theme. Not all students will be able to ask their questions. Most questions from students (may be all of them) will be answered.
E-Learning – synchronous and asynchronous learning	1 hour of webinar + forum discussion	The webinar contains 1-2 tasks. The lecturer is in the center of action. Forum discussion is possible with fewer participants than during completely asynchronous communication
E-Learning – asynchronous learning	Forum discussion within a week	Less tasks than during synchronous work Discussion on several topics at once Deviations from the subject are possible. The format is customized for courses with a large number of participants. Some questions may be met with no response.

III. TIME-BASED CRITERION AND SPATIAL FACTOR

Classification by the time factor can be expanded by introduction of additional educational elements, for instance, the concept of "learning space".

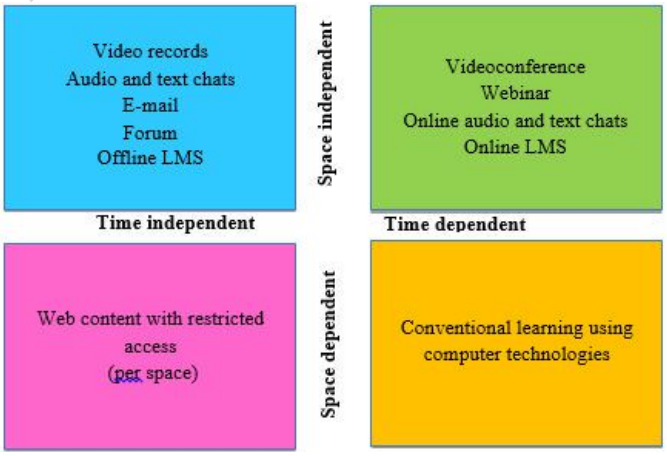


Fig. 1. Classification base on factors “Time” and “Space”

Figure 1 shows the classification consisting of 4 types, based on combinations of two factors: time and space. In order to understand the differences it is important to distinguish between the delivery of content and access to content. Horizontal axis - The "time part" of the classification refers to an asynchronous and synchronous learning process. Vertical axis is the "Spatial part" to the presence / absence of remote

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connection between the lecturer and the student, during learning process (Figure 1). The following classes are achieved by combination of these factors: space independent, space dependent, time independent, time dependent [7].

Although this classification may seem quite extensional, it covers all e-learning tools to the maximum extent.

A. Quadrant I: Space and time-dependent learning

This type of learning occurs in the traditional classroom but equipped with PCs and other hard- and software. Students and lecturer both are "physically" present in the same classroom at the same time (face-to-face learning). Belonging this type of learning to eLearning is determined by applying multimedia while delivering content to the students[8].

A concrete realization of this type of eLearning looks like this: teacher and students are in the same classroom at the same time, teacher is communicating topics by using Power point, multimedia, interactive whiteboards, PCs. Students are listening to the teacher.

This scenario suits for enriching traditional face-to-lessons lessons with multimedia elements. Hereby the role of teacher as instructor is essential. In many cases, teachers abandon their functions as instructor, or moderator, and rely only on the e-content (slides, or virtual labs). This is not effective for this scenario. The most important success factor and assumption is delivering information from teacher to students. This scenario does not mean using electronic means of communication, or distance technologies.

B. Quadrant 2: Space independent/time dependent learning

This scenario results in time-dependence, i.e., synchronously, but not in the same place: student and teacher both can choose their working areas. But they meet at the same time in a virtual classroom.

Time-dependence of this scenario makes it similar to the traditional lesson, but the big advantage is having spatial flexibility. Thanks Internet, this scenario is the most popular kind of eLearning. Example of this scenario is webinar, the most popular instrument of synchronous space-independent online learning. Drawbacks: teacher is not able to control the virtual presence of participants, student feedback is missing, and success of the webinar depends on the consciousness of the participants. Furthermore, teacher is not able to immediately change its own behavior and manner of delivery of the content, after an online survey at the earliest. Success of this scenario is also determined by technic chosen as well as quality of Internet connection.

Last years are characterized by using multimedia via Internet. Even having a bad Internet connection, using Streaming technologies enables access to the augmented data. Synchronous online learning would be not possible without contemporary Information and communication technologies (ICT).

Audio streaming is the first type of multimedia being used within the scenario "space independent/time dependent". Audio streaming, by contrast with video streaming, can be facilitated with fewer technical support. The disadvantage of audio streaming is missing visualization of student and lecturer. Video and animation streaming enrich this scenario and put it on an equal footing with traditional learning. But they also have their limitations such as channel capacity, computer capacity, software available. Missing technical requirements can hamper virtual learning. Thus, server capacities and quality of video should be ensured as well as ability to act in the virtual environment should be trained by lecturers. The first image of webinar where webcam is used is emotionless "speaking head" of the lecturer in the corner of the webpage. However, videoconferencing, webinar, and video calls are being increasingly applied and deem the most promising eLearning instruments.

C. Quadrant 3: Space independent/time independent learning

This type faces the most common vision of asynchronous eLearning where student and lecturer have no contact to each other, neither physical nor virtual.

Due to the missing interaction between student and lecturer during delivery of the content, this content should be produced in advance. Student can utilize the content later. Thus, delivery of the content and access to the content will occur at the different time. It should be mentioned that students enrolled at the same study course can use the same instrument for accessing content. As a rule, these are Learning management systems (Moodle, TraiNex etc.)[8,9]. However, a wide range of instruments can be used: SMS chat, email, chat-forums, video and audio podcasting placed in Internet.

Although this scenario means no direct interaction between student and lecturer while utilizing electronic content, possibilities to communicate should be given asynchronously and independently from the place where the content is stored. Furthermore, this scenario is characterized by self-paced learning. Each student can autonomously regulate its own time and working area for study. Example of this scenario can be Computer based training (CBT). Students have at their disposal learning content (for example, on CD or DVD rooms) provided by the home university. Communication between student and tutor is limited by granting technical support or other issues not associated with didactical issues (i.e. changing damaged data medium, receiving new resources). CBT-scenario could be recommended for using in continuing professional education, by studying foreign languages as well as element of blended learning concepts.

The most relevant advantage of this scenario is a wide flexibility and freedom, what could also be a disadvantage. You have to outweigh flexibility of time and space against self-discipline and self-control.

D. Quadrant 4: space-dependent/time-independent learning

This type of eLearning occurs asynchronously but it depends on the place of studies, to which the access is restricted.

The learning content is prepared by teacher in advance, it is very specific. Student can learn autonomously, but the study place has to be controlled. It can be lab works to be performedin PC classrooms, which are equipped with specific

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learning software, or other rooms within universities having access to certain resources. The time aspect is not relevant, student can regulate it himself. Student support is not needed, except of any technical assistance.

Since the special hard- and software is quite cost-expensive the most universities do not practice this type of studies.

IV. INFLUENCE OF TASK TYPES ON TIME-BASED CRITERION

Also, the classification can be supplemented with the types of tasks, meaning tasks for individual and group work.

Work in group under the e-learning conditions has its own specifics. It assumes the selection of appropriate technical means for organizing group work, establishing clear rules, creating groups, considering that participants may not be familiar with each other, taking into account technical difficulties in communication between participants, etc. At the same time, many studies indicate the positive impact of work in the group on the motivation of students engaged in the e-learning environment, as well as their success level and retention of material [4,10].

Table 2 shows analysis of the advantages and disadvantages of e-learning, delimited by the time criterion and the type of task.

Table II: Advantages And Disadvantages Of E-Learning, Delimited By The Time Criterion And The Type Of Task

Type	Individual work	Group work
Synchro-nous communi-cation	Individual consultation "Advantage" – Possibility of individualized approach "Disadvantage" - Time spending, cannot be used for a large number of students	Discussion Work with interactive applications Role play Work on a project: phase of discussion and decision-making "Advantage" Simplifies communication within the group, allows more efficient exchange of information "Disadvantage" A complex organization in terms of animation of group work
Asynchro-nous communi-cation	Multimedia resources with or without feedback Resources and individual workload scenarios created using LMS "Advantage" The most adapted type for classes with a large number of participants, the possibility of an individual approach "Disadvantage" Significant time spending and technical costs for the preparation of multimedia resources	Work with services for collaborative editing of documents Forums "Advantage" Adapted to work in small groups and for project activities "Disadvantage" Difficulties in the technical implementation and animation of group work

V. CONCLUSION

Currently, e-learning theorists and practitioners provide a number of classifications and types of this phenomenon. It is not only indicative of a relatively new reality, but also a growing number of studies in this field. Like other types of classifications, the types of e-learning suggested in this article are intended only to outline the boundaries of this field and to give an impetus to consideration on different pedagogical scenarios in which e-learning is used in either event.

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