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ADVANCED LEARNING TECHNOLOGIES
ALTA'2014

CONFERENCE PROCEEDINGS

The conference aim is to promote international cooperation and to invite specialists, teachers and trainers, participants of virtual communities, and business sector participants to discuss about advanced learning technologies and applications in e-education.

Kaunas, 2014

PAŽANGIOS MOKYMOSI TECHNOLOGIJOS
ALTA'2014

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Konferencijos tikslas – skatinti tarptautinį bendradarbiavimą, suburti diskusijai įvairių sričių atstovus, t.y. mokytojus, dėstytojus, bendruomenių atstovus, mokslininkus ir verslininkus aptarti IKT kompetencijų svarbą švietimo ir profesinėje veikloje.

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Advanced Learning Technologies – Proceedings of the international conference ALTA'2014

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- innovative educational processes
- scientific cooperation of academic and business institutions

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- challenges of mobile technologies in e-learning
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- E. education paradigms, models and methods

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Turinys / Content

Pratarmė

Švietimas suvokiamas kaip visuomenės gerovės kūrimo pagrindas, todėl švietimo kokybė bei jos užtikrinimas yra daugelio šalių diskusijų objektas ir prioritetas. Švietimo kokybė priklauso nuo sėkmingo novatoriškų, informacinėmis ir komunikacinėmis technologijomis (IKT) grindžiamų mokymosi metodų naudojimo. IKT naudojimas ugdymo procese ne tik suteikia plačias galimybes, bet reikalauja iš pedagogo kasdienio efektyvaus laiko planavimo, metodinės medžiagos kūrimo bei kaupimo ir naujų strategijų, skatinančių moksleivių mokymąsi, realizavimo. Vienas iš svarbiausių informacinių ir komunikacinių tikslų yra siekimas palengvinti žmonių darbą, mokymą, mokymąsi, suteikti kasdieniniam gyvenimui daugiau džiaugsmo bei praplėsti žmogaus galimybes. Naujos technologijos atsiranda tiek besimokančiųjų, tiek mokytojų bei dėstytojų kasdienybėje, todėl švietimo sektoriuje dirbantys asmenys turi ne tik išmanyti naujausias tendencijas, bet ir žinoti, kaip efektyviai suteikti naujų žinių bei įgūdžių kitiems.

Tarptautinė konferencija „Pažangios mokymosi technologijos - ALTA'2014“, skatinanti tarptautinį bendradarbiavimą, Lietuvos mokslo plėtrą bei mokslinius ryšius, yra organizuojama didžiausio technikos universiteto Baltijos šalyse - Kauno technologijos universiteto.

Konferencijoje mokslininkai, studijų ekspertai, valstybės ir švietimo institucijų atstovai iš įvairių šalių pristato naujus IKT grįstus pedagoginius sprendimus, skirtus švietimo sistemai. Pranešimuose analizuojamas pažangių mokymosi technologijų taikymas mokymosi procese, tiriamos galimos jų plėtros perspektyvos Lietuvoje bei užsienyje.

Konferencijos dalyviai išreiškia nuomonę bendrose diskusijose apie bendravimo naudą, verslo ir mokslo bendradarbiavimo galimybes, švietimo pokyčius bei mokymosi technologijas, ypač daug dėmesio skirdami mokslo pažangai, technologijoms bei kitoms viešoms ir privačioms iniciatyvoms, kuriomis siekiama skatinti IKT naudojimą, mažinti kliūtis švietime ir atrasti daugiau lanksčių bei kūrybiškų mokymosi būdų.

Dr. Danguolė Rutkauskienė
Kauno technologijos universiteto docentė
Nacionalinės distancinio mokymo asociacijos prezidentė

Preface

Education is perceived as grounds of welfare, so the quality of education and its ensuring is the priority and subject of discussion in many countries. The quality of education depends on the successful development of innovative information and communication technology (ICT) based learning methods. The use of ICT in the educational process not only provides wide opportunities, but also requires an effective teacher's daily time management skills and the development of methodological materials and new strategies to promote student learning. One of the most important information and communication objectives are to facilitate the pursuit of the people's work, teaching and learning, providing more joy to the daily lives and extend human capabilities. New technology evolves learners and teachers in their daily life and those who work in the education sector should not only be aware of the latest trends, but also should know how to effectively bring new knowledge and skills to others.

International Conference "Advanced Learning Technologies - ALTA'2014" is hosted by the biggest technical university in the Baltic States - Kaunas University of Technology. The conference aims - to promote international cooperation in the development of Lithuanian science and scientific relations.

Scientists, study experts, representatives from state and educational institutions in different countries presents a new ICT based pedagogical solutions for education. The papers analyse advanced learning technologies in the learning process, analysis of possible prospects for their development in Lithuania and abroad.

Conference participants expressed their views in public debate about the benefits of communication, business and scientific collaboration, changes in education and learning technology, devoting particular attention to the progress of science, technology, and other initiatives aimed at promoting the use of ICT to reduce barriers to education and to find more flexible and creative ways of learning.

Dr. Danguolė Rutkauskienė
Associated professor at Kaunas University of technology
The President of National Association of Distance Education

A Practical Framework for Gameplay Quality Testing

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ABSTRACT. It is a common idea that successful video games provide the following properties; addictive, entertaining, easy to learn but slow to master, and customizable. The gameplay quality testing of video games should consider these aspects and ensure that they are accomplished. This study aimed to create a practical framework for gameplay testing. The framework is constructed by enhancing the existing theories and mapping them into practical methods. Heuristics are gathered from past researches about the subject and merged together by sorting out and updating the existing heuristics directly related ones to video gaming. The updated heuristics are then converted into a checklist for practical usage as a list of tips needed for a good gameplay design. Surveys and algorithms were developed in this study for computing game test related statistics and evaluation methods. The proposed framework was applied on different cases to evaluate the game design phase of a browser game developed by the researcher. Data were collected from three groups of students of different ages by testing the framework on this game. The results were used to improve the proposed techniques and evaluation ideas. In the light of the results, solid ideas were developed about the game design process. The feedback obtained helped to improve the gameplay of the game. The study also provided some tips that are needed for a good gameplay design.

Keywords: *Game Design, Gameplay, Playability, Flow Theory.*

Introduction

Video games have become a huge industry and this fast growing industry is playing an important role in the entertainment business with many highly competitive dimensions. Intense competition in the global business world highlighted the increasing importance of quality. History of video games includes several crashes brought on largely by poor quality video games in the market. Today, companies invest a lot of money in their games, and therefore they cannot afford a failure in the market. Thus, game testing is becoming more and more important issue in the gaming industry. As a result, the game testing job is seen as one of the most vital aspect of developing games.

Game development process includes both technical and artistic aspects which are to be taken separately yet synchronized. For the game development; the aim is to make players have fun out of the game. A successful video game should provide features such as; addictive, easy to learn but slow to master, replayable, customizable and put the players in a vivid mood. In order to have these features in the games, the gameplay should be designed and tested with a fun oriented quality testing methodology.

There is no single solid solution for gameplay testing because of the vast variety of video game types. However, there are common heuristics that can be used with most genres and can be adapted to each game. The area to apply these heuristics and methods is the “gameplay”. Gameplay is the user experience during a video game. The elements that create a gameplay are; the visual, physical and audio feedbacks to the user, the mood change experiences, the rules of the game, the challenges in the game and interactions with other players or AI (Artificial Intelligence). Current methods in this area are either simple or not public. The simple ones are examples of few academic researches and they are mostly speaking in terms of theories and they suggest general ideas, not practical steps. On the other hand, professional game companies are using their own gameplay testing methods but those methods are not public because they have commercial value.

The academic researches which are found in the literature are commonly based on Nielsen’s “Ten Usability Heuristics” [1]. This work is not directly related to video games but it proposes intersecting ideas which can be applied to a video game design. The works of Federoff [2] and Caplan, Desurvire, Toth [3] are based on this idea. Since video game industry is a rapidly developing industry, updates are required even on the latest works which are dated approximately 7 years ago.

This study aimed to take a step into creating a practical framework for gameplay quality testing to evaluate and enhance entertainment factor in video games. The framework was constructed by enhancing the existing theories and mapping them into practical methods. In order to construct an updated method of

evaluation; popular and updated articles were examined in this study. The updated heuristics were then converted into a checklist for practical usage. Surveys and algorithms were developed in this study for computing game test related statistics and evaluation methods by sorting out and updating the existing heuristics. The framework provides a heuristic checklist as a list of tips needed for a good gameplay design, helping the developers even in design phase. The proposed framework was applied on different cases to evaluate the game design phase of a browser game developed by the researcher. The feedback obtained helped to improve the gameplay of the game.

1. REVIEW OF LITERATURE

1.1. Flow Concept

Flow Theory is proposed by psychologist Mihaly Csíkszentmihalyi and dates back to 1980s. It is a definition for quality measurement of human experiences such as games, hobbies, entertainment. In basic, Flow Theory states that if the person is in a mental state where he or she is fully immersed in the activity with full involvement and success, then the level of enjoyment is high. The Flow can be visualized as the rate between the challenge and the abilities performed during the activity as in the Figure1. If challenge is too much, the person can go into an anxious state. On the other hand, if the challenge factor is low according to person's abilities, the activity becomes boring. A balance between these will provide the person to be in "Flow".

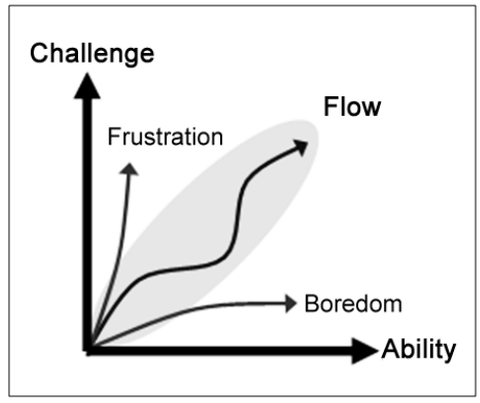

Figure 1. Basic Figure of Flow. Figure adapted from [4].

The components of a Flow producing activity can be summarized as [4],[5],[6]:

- Person is up to the activity.
- Person is able to concentrate.
- The activity has clear goals.
- The activity has direct feedback.
- Person feels that he or she is in control.
- Person's worries and concerns disappear.
- Person's subjective experience of time is altered.

As the Flow Theory claims that, doing an activity, it is important for the person not to be bored or not to be challenged too much. Therefore, Fun Theory tries to make the activities more attractive. It is possible to make people do some activities that they normally don't even bother to do, with an enthusiasm. As the "piano staircase" project from [7] illustrates, people may choose the harder way to do something just because it is funnier. In the piano staircase project, every stair is designed as a real piano button, giving a note tone as people step on it. Meanwhile, there is an escalator by the stairs. Normally people choose to take the escalators, but just out of curiosity and the fun factor, the stairs are used twice as much as before. Therefore, the fun theory emphasized that "Fun can obviously change the behavior for better". Another example is to illustrate the rate of change in the usage of trash bins. Normally people do not always use

the trash bins, they rather choose to throw their trashes away. However a different type of bin is designed to take the attention of people. As a trash is thrown into the bin, a voice simulating the fall of an object from a height is heard. Whenever a person throws a trash this gets the attention of the others as well, and they want to try it. At the end of the day, it is observed that the trash bin has 71 kg of trash, which is 41 kg more than the usual.

1.2. Core Game Types

In their study, Amory, Naicker, Vincent, & Adams examined four different games representing four different game types such as: strategy, shoot-em-up, simulation, and adventure [8]. It is for sure; developers can extend the existing game types, or implement new ones. In this study common game types are listed as in Table 2-1 with their characteristic properties. Additionally, there are other elements such as the gaming platform, target audience that will affect the target game design's properties of interest. The ones given in the table are the common characteristics. For the actual game test, specific characteristics dependent to game's system or subgenre must be added.

TABLE 1. AN EXAMPLE SET OF PROPERTIES FOUND IN COMMON GAME TYPES

	Strategy TB	Strategy RT	Action	Adventure	Sports	Puzzle
Interaction via User Interface	X	X				X
Player controls many objects	X	X				
Player controls avatar			X	X		
Reflexes		X	X		X	
Exploration			X	X		
Fixed Scene					X	X

According to the target game type, polls and evaluations will differ. Each game genre has its own key elements and interests. Some heuristics will never work with certain game types.

1.2. Game Phases

For focusing the tests, gameplay is divided into phases and categorized into genres. Within this study common phases of games are explained in the following paragraphs with design tips.

- Learning Phase: This might be the most critical phase since it is the orientation of the player into the game's rules and controls. Player should be able to grasp the logic of the game without background information, or a user manual. Otherwise, it will cause an unnatural experience and it will be hard to maintain the flow. The learning phase should be as natural as it can be. If you need to teach the rules, the best way is to blend the teaching into the game and leaving some of the features to be discovered by the player. A developer telling tester what to do is never a good idea for gameplay testing. The participant should figure it out without help. You will not be present with every player when your game is distributed.
- Playing Phase: Playing phase is where player uses all the main rules and controls of the game. This phase starts when all the tutorial levels are done. This is also the stage that you will be telling your game's story to the player. The story should start to unfold. Additionally, you will start getting feedbacks about your story after this test.
- Mastering Phase: When player is oriented into the game controls and rules, the game should produce challenges in order to maintain the flow. You will get detailed feedbacks about your game controls and abilities. Game balancing and economics will be calculated mostly in this phase.

2. THE STUDY

2.1. The purpose

The purpose of the study was to find an answer to the research question stated as: "What are the implicit heuristics in game design for providing the players a desired "flow" experience?". While finding an answer to the research question this study aimed to create a practical framework for gameplay testing.

2.2. Proposed Practical Framework for Gameplay Quality Testing

This study aims to take a step into creating a practical framework for gameplay quality testing to evaluate and enhance entertainment factor in video games. The focus will be maintaining the Flow in the gameplay. In addition to the testing templates, a tool to gather numerical information to be used with these tests will be designed and implemented. A general view of game testing steps can be visualized as below in Figure2.:

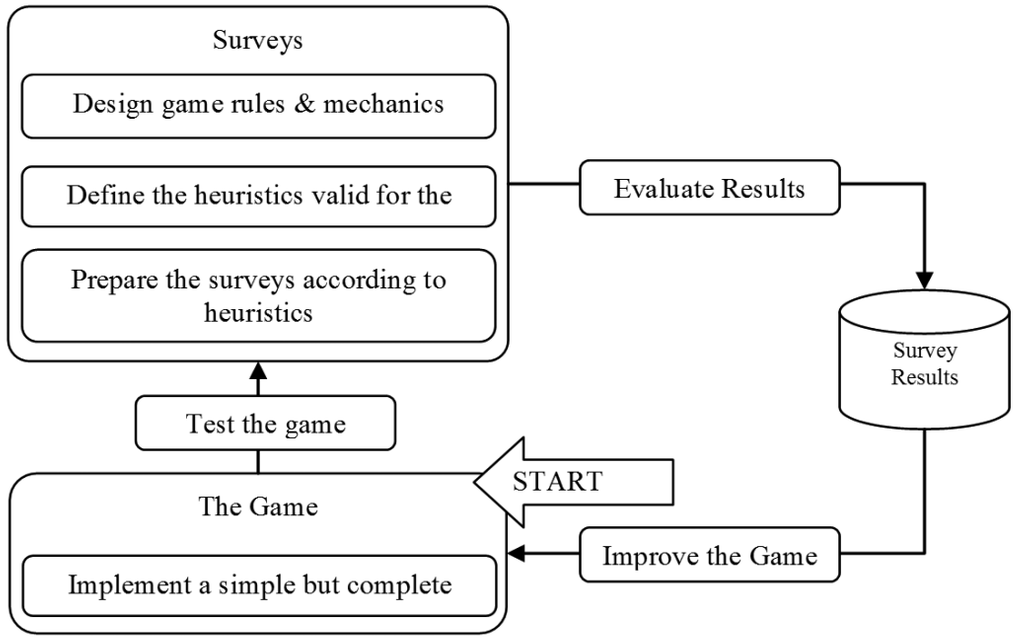

Figure 2. Game testing framework.

The listed heuristics are valid for most game types. Some of them are specific to games where the player controls a character, i.e. an avatar. The heuristics are the key points that the designer team should ask themselves at the first place and then to the players after. The development of fun can be built around these key points.

Game genre is an important concept that will shape the key points to be considered in testing. Definitions for core game types will be given with the important heuristics pointed out for each of them. There is no single survey or step by step template for gameplay testing. That's because for every different type of game, different kinds of issues are important. This study helped to construct a guideline covering most popular game genres and common issues.

Statistic gathering tool will help staff to keep track of numerical data from the tester's performances. The statistics will be such as; player's time spent when stuck in a level, duration for player give up/solve a puzzle. The tool will be used with embedded commands in the game software. Message declaration enforcement method in developmental aspect oriented design is going to be used in order to inject testing functions into the game executable. These functions are going to be values and triggers about the gameplay. For example, a trigger will be activated when a player reaches a puzzle and another when player solves the puzzle. An outer program will gather these messages and evaluate them as the puzzle's duration. More functionality will be achieved with a customizable messaging system.

2.3. Gameplay Testing Heuristics and Description

The following groups of heuristics will be the main questions to be answered during the gameplay testing. These ideas are prepared for expanding Nielsen's "Ten Usability Heuristics" on the subject of video games [9]. The heuristics are compiled from the works of [3],[2] and updated with research [10], [11], [12]. On today's video games and recent columns about video games. The verification of these ideas is made by mapping them to Nielsen's heuristics. The survey of this study is prepared to answer the achievement of these ideas. To evaluate the test results, they should be clearly understood. Also, a checklist is provided in the appendix of this report, in order to see clearly that the required heuristics are achieved in a target game design. These heuristics are also mapped to a checklist which is named as Heuristic Checklist.. This checklist was developed in this study to determine the attributes of a good game. These attributes were then obtained and listed by using this checklist for evaluation of different parts of a game. In this study it is accepted that a game consists of three parts such as: Game interface, game mechanics, gameplay, and game story.

Game Interface

The main purpose of the game interface is to make the game controls abstract and natural in order to smoothly connect the player to the game world and keep the player informed about the game. The attributes of a good quality game interface are listed as follows according to the evaluation results by Heuristic Checklist. Firstly, they should be easy to learn. If players are able to start a new game right after launching the game and get started by the tutorials by themselves, which means the game achieved this goal. Secondly, a good quality interface should be as discreet as possible. It should be minimalist yet useful. It should provide consistency in control, typography, layout, colors and sounds. Harmony with the game itself is required; player should feel that the interface is part of the game world. Other important attributes are that the interface should be customizable; a certain level of complexity brings up personal choices. Interface should be fast with immediate feedbacks even for unavailable actions; an interface with delayed responds is a vast mood killer.. That idea is mapped by the 7th heuristic of Nielsen: "Flexibility and efficiency of use".

Game Mechanics

Heuristics in the game mechanics group are the art of hiding the software underneath the game. The attributes of a good quality game mechanics are listed as follows according to the evaluation results by Heuristic Checklist. Software is a mode based mechanism; however a game world should give a modeless feeling. Loading times and out of game menu times are negative durations for flow and they should be reduced. Similarly, AI behavior in the game should be hiding its modes and be as smooth as possible while making decisions. AI should also act in reasonable conditions as a human expects and additionally should give the feeling of fairness. The idea maps to prerequisites of the Csikszentmihalyi's Flow Theory and Nielsen's 2nd heuristic: "Match between the system and the real world".

If the target game supports multiplayer modes, the process of creating a multi-user game should be quick and easy. The game should do all the routine works and let the player connect in a few steps. For custom systems, game should supply varying visual quality settings in order to work properly in lesser systems. Again, this setting process should be shortened with automatic assistance in performance setting. This idea maps to Nielsen's 7th heuristic: "Flexibility and efficiency of use".

Gameplay

The rules and abilities of the game construct the basics of gameplay. The attributes of a good quality gameplay are listed as follows according to the evaluation results by Heuristic Checklist. The gameplay should include multiple small tasks that lead to a main goal. Both the small tasks and the main goal should be clear and presented early in the game. The tasks and strategies to reach to main goal should be varying; player would be able to think about different strategies which are balanced. These conditions will provide the two aspects of the Csikszentmihalyi's Flow Theory; "The activity has clear goals" and "Person feels that he or she is in control".

The warm up of the gameplay starts usually with small hints and a tutorial. The tutorial should be interesting and blended with the story. Player is taught skills right before the new skill is needed. By

showing new abilities evenly distributed through the game, a varying activity and award flow will be maintained, minimizing the fatigue and boredom. Challenges for earning abilities, cut scenes or such rewards should be positive experiences, not a repetitive torment. Game should prevent the same mistake to happen repeatedly. The learning phase is based on Nielsen's 10th heuristic: "Help and documentation". As the game progress, player will get used to controls and will have the need for challenges to master the abilities. These conditions will satisfy the 3rd heuristic of Nielsen: "User Control and Freedom". Varying difficulty levels will provide that. In the unfolding story, there should be surprising events and discoveries to keep the play interesting. The challenges and the mastering phase support the Flow as the idea satisfies the two conditions; "Person is up to the activity" and "Person's subjective experience of time is altered" as Csikszentmihalyi states.

Game Story

Game story should put the player into flow starting from the game's package cover. The attributes of a good quality game story are listed as follows according to the evaluation results by Heuristic Checklist. Game story should promise an interesting storyline from the beginning. In order to achieve that, the game world should give a sense of living. Players should feel that world is going on while their character is around or not. If players are thinking about what will happen next, they feel anger, fear, reward or punishment then it means that they are going into the flow zone. By putting the player into an alternative world, the "Person's worries and concerns disappear" condition of the Csikszentmihalyi's Flow Theory is achieved. Again, the control feeling is important as players' choices affect the storyline in a fair and consistent way. If the player character and important non player characters have deep personalities it will be easier to create a realistic world.

2.4. Preparing the Test Version of a Game

The following are the steps for creating an ideal test version of any game. No game will be complete in testing phase, but you need to complete the prototypes for the testing levels. The followings are the required elements for the testable version of a game.

Isolate Technical Bugs

As the 5th heuristic: "Error Prevention" of Nielsen points out; Even the test version of your game should be bug free [9]. In order to achieve this, a technical gameplay testing should be done before testing the fun aspect. Major glitches, crashes, slow performance, high amount of unfinished / placeholder artwork, lack of sound and such other elements that distract players should be removed in the "fun testing" phase. These distractions will keep the player busy and the desired gameplay will be clouded for them. A rigid gameplay is a requirement for the flow state, which will result the fun we are looking for. Besides the technical integrity, artistic completeness feeling should be provided for some level. Of course you will need to use some place holder art for visuals, sound effects and music. Just try to keep them as close to the finished product. Even there are erroneous sections in the game, error handling should be done in order to get player back to game in a safe state without restarting the game. And this should be done as smoothly as it can be. This idea is supported by the Nielsen's 10th heuristic: "Help users recognize, diagnose, and recover from errors".

Design the Test Levels

As mentioned under Game Phases, there are three key game phases as compiled from the studies [10] and [12]. Each phase should be tested separately and consecutively for creating the whole game experience.

Tutorial Level: This level is important to orient the testers. This will be the where the player will learn the game controls, abilities, rules and the aim of the game. From the execution of the game software the player is faced with the initial menu. You will begin to give feedbacks and help tips to open the first level and start playing. Teaching the game can be done in various ways. You can provide a pre-recorded section of the game; show text based tips, or put a character to tell the player what to do for the first steps. However you do, be sure to have it in a way. And also, provide a friendly environment for this level. Do not put challenges in front of the player yet. Bring up motivating exercises for getting used to the controls. Be careful not to bore the player with over exercising with easy repetitive actions.

Playing Level: This level is where the player has learns all the basic controls and abilities. The experience in this phase will be dominant for the most of the game. You will be observing how the participant masters her/his skills. You can slightly include challenges in the level. Force the player to use varying abilities and actions. Your mission is to make the player use most of the controls and abilities of the game. Do not forget to put scenes that tell your scenario. Your story will be evaluated in this phase.

Mastering Level: This level is functional at the later steps of the tests. Once you need to complete the improvements on the "Playing Level". Here, the player is expected to have full control of the game's controls and abilities. With harder challenges, you will test the game's addiction level and replayability. This section is mostly preferred by the "hardcore gamer" type of participants. Make sure your game economics are visible and varying enough to evaluate.

3. METHODOLOGY AND PROCEDURES

Qualitative research methodology was utilized in this study. Qualitative research design is a research method used extensively by scientists and researchers studying human behavior and preferences. Human behavior is not well captured by quantitative methods. Qualitative methods are more helpful to study the variations of complex, human behavior in context. By using qualitative methods you can enrich research results with people's words and actions.

3.1. Data collection instruments

Two instruments were developed for data collection purpose.

Gamer Profile Survey

This survey includes questions to collect data about gamers to learn about each tester's profile on video gaming. User profile will affect the test result's ratio of interest to the targeted gameplay experience. As the profile matches the targeted audience of the game, it will become more important.

The Game Experience Survey

The second survey titled as Game Experience Questionnaire includes questions about the participants experience about the game. This survey includes questions under 4 domain (Game Interface, Game Mechanics, Gameplay, Game story) likert type The results will be inspected and refined in order to make direct propositions about enhancing the game. Likert type scale (1-5) Strongly Disagree(SD)- Strongly Agree(SA).

The questions were gathered and compiled from three sources. [3] and [2] are the ones explained in the previous Gameplay Testing Heuristics section. They are common ideas but they are not updated for today's video games. For that reason, articles of [10], [11], [12] from a third source, a game developer community web site called Gamasutra are used for enhancing and updating the questions. There are over fifty questions in the proposed question pool. The questions are divided in four main categories:

1. Game Interface: The user interface issues. Game feedbacks to player and input methods.
2. Game Mechanics: The software performance of the game.
3. Gameplay: The design of the game. Rules, awards, flow.
4. Story: For the long lasting entertainment aspect of the game.

4. APPLYING THE PROPOSED FRAMEWORK

Qualitative research methodology was utilized in this study. Qualitative research design is a research method used extensively by scientists and researchers studying human behavior and preferences. Human behavior is not well captured by quantitative methods. Qualitative methods are more helpful to study the variations of complex, human behavior in context. By using qualitative methods you can enrich research results with people's words and actions.

4.1. The Game

The compiled survey and evaluation methods are tested on a browser game. The name of the game is Sanal Labirent (Virtual Maze). It is a Silverlight based puzzle game where players race against time to find and route a path from left to right. A non player character enters a 5x5 grid of routers with randomly broken connections between. Player has the ability to rotate the routers for 90 degrees by clicking on them. When the NPC (Non-player Character) reaches a router, it continues to walk into the router's direction. If NPC walks on a broken link or out of the grid, the level is lost and it is started again. When the NPC reaches to the green node at the right, the level is won. There are different challenges in the preceding levels. The second level includes a key placed on a random router and it has to be grabbed before finishing the level. On the third level, the challenge is that the roads brake as the NPC walks on them, so they cannot go back and the maze must be solved in one go. Game provides information pages before each level. They are static pages with pictures and text explaining the rules of the game. There is a simple menu to start the game at first level and it does not have a saving system except that when player loses a level, game starts from the beginning of that level, not from the whole beginning. Visuals, sound effects and music are intended to be designed for an age group of 10-13. Game does not include a scoring system. Figure 3 is a screenshot of the game "Sanal Labirent". Player is playing the second level, trying to reach to the key. The router before the finishing node is locked.

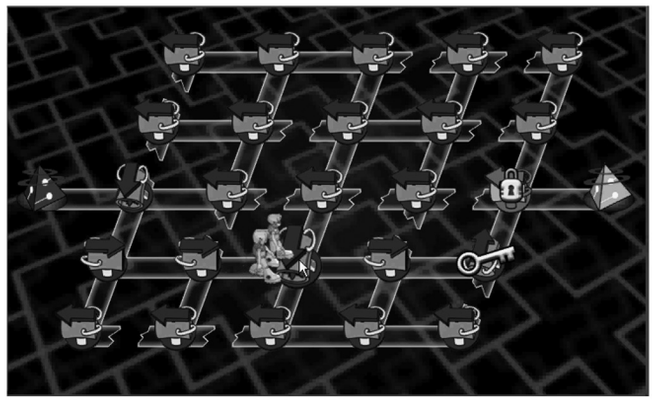

Figure 3. A screenshot from the "Sanal Labirent".

4.2. Participants

In this study data collected from three groups of students whose ages are varying from 7 to 13 from different schools. The first group was constructed by 10 children. The second group was constructed by 29 students and third group was 10 students.

In the first step of the tests, a survey was done for distinguishing the player profiles. Since the players were chosen as a narrow group, this survey included basic questions. Another useful approach is the "snowball sampling" as defined by [13]. The participants for the first step of the tests were found by starting a chain of e-mails in order to attract participants. The chain was started from a student in the target audience and he was asked to spread the message among his friends. Ten participants were achieved in a short time of one day. 60% of the participants indicated that they play video games more than once in a week. This value is mapped to the "casual gamer" category among the general gamer profiles, which was the game's target audience. There were not any participants who played games every day, meaning we did not have any one in the "hardcore gamer" category. The rest (40%) of the participants were distributed almost evenly in the remaining categories, which will be helping us to get feedback from the lightly experienced players. Since the participants were chosen with ages varying from 7 to 13, their gamin experience was limited to a maximum of 10 years. And it turned out to be an almost even distribution between gaming experience for half of their life span (60%) and since they were born (40%). Considering the ages of the participants, this situation indicates that all of them have more or less familiarity with video games.

As stated before, the age group of the participants is varying from 7 to 13. Since the tests were done with children, it is guessed that consistent results will be hard to achieve. They can easily be distracted during the "boring" survey filling process after playing the game.

4.3. Data Collection procedure

The answers to the questions are values varying from 1 to 5. The values indicate that a heuristic is achieved as the value is higher. These numerical results are collected in spread sheets and evaluated per question and evaluated per category of questions.

Only after running the reliability tests on the results, they are put into consideration. The results with reliability scores under the expected score are ignored. If there are so many results with low reliability a redesign of the test level and the survey is required.

A total score is calculated for each question by taking the average of the reliable answers. A total category average is calculated by taking the average of the each question's total score in related category. And lastly, a total game score is calculated by taking the average of all answers.

The gameplay survey is the main focusing point of this experiment. It includes questions for scoring the satisfaction of the heuristics and it is done after participants played the target game. Scoring was given by assigning points from 1 to 5 to each question. Copies of the surveys are included in the appendices section of this report.

Surveys were prepared and served as an online form. All participants did the test in their own homes and filled up the survey without any personal technical guidance. All instructions about the test were given by text at the beginning.

5. RESULTS

5.1. Results about the test itself

In some of the answers, questions after a certain point were left empty. This shows that some kids got bored and stopped answering after a certain time and even one of them started to give all 1 points which is the lowest answer for the questions, sabotaging the survey. Practically, 40% of the participants couldn't stand until the end of the test. This can be related directly to their age group, since a similar survey was done to an adult group with full answers given. Participants could have issues to understand the questions in the way they were meant.

5.2. First wave of results about the game experience

In order to link the qualitative and quantitative data, a multi-wave approach was taken as defined by [13]. Surveys are conducted in parallel with continuous development of the game design. The first survey wave was aimed to point out the major flaws in the game design and after taking it into consideration, game was improved and another wave of surveys were conducted. The preceding waves lead to minor revisions in order to polish the game further.

First, scores for each heuristics were calculated by taking average of all participants' answers to each heuristic. The empty answers were not counted. Then, the average of the scores for all heuristics was taken. That gave us the overall score of the game, which was 3.3 out of 5. This score indicated that the game satisfies most expectations but have parts that can be improved.

Then, the heuristics with lowest average scores were examined. The lowest scored heuristics were the "Player was given rewards" with a score of 2.13 (over 5) and "Player's success was awarded fairly" with a score of 2.33 (over 5). Interestingly, the two lowest heuristics were each other's validation questions. This means that they share common characteristics and having similar scores show that participants answered the survey honestly and validly.

In the subject of the improvement, a scoring system was proposed to give player the feeling of "reward". Since this game is a race against time, the scoring can be calculated by subtracting the time spent from a constant score and getting a higher score by completing the level in a short time. Another unsatisfied heuristic was the "Game activities were varied and pacing enough to keep player fatigue minimized" with a score of 2.75 (over 5). The score was little under the average, and some comments (4 out of 10) supported that the player abilities are not varying enough and game can get a bit repetitive and the levels are too

similar. In the long plan, a change in the themes of the levels is planned. The change can be made visually by changing the background and the road sprites.

A positive feedback is that the last level, where players are challenged with the unstable roads which break apart as the characters walk on them. Thus, the player has one shot to do the decisions, plan the path and set the routers. This was a stress period created intentionally to create a peek point in the game. The 50% feedback that agreed on this showed that we are in the right direction. Another serious looking problem is that the music is annoying. The game music is made of short looped, fast rhythmic samples and it has a higher volume according to the sound effects. The plan is to lower the music and slow its tempo.

5.3. Improvements on the game after the first wave

According to the results of the first wave there were a couple of improvements on the game. The music's volume was turned down and its tempo was slowed because it was found annoying. A timer is placed on the game interface which creates a sense of pressure to create excitement and the time left on the end of the level was calculated into a score to give player a feedback for achievement.

5.4. Second wave of results about the game experience

After making improvements on the game in the light of the feedback in the first wave, a second wave of tests were executed. This time with more participants of 29 a more detailed result was acquired. Most negative comments were about the lack of story in the game. Since the game is actually a small part of larger interactive software, this was expected. However, a plan for an intro in the next version of the game was made. 6 out of 18 girls participated in the tests indicated that they liked the girl character in the game. It is an interesting result that without any guidance or mentioning 1/3 of girls got the same idea worth for indicating. A tip can be concluded that having the same gender as the players helps game characters creating a bond. Sound effects still got the lowest score. The main reason was turned out to be irrelevant and sudden sounds not the volume of them. So a plan for changing the sound effects into calmer ones is planned for the next version.

5.5. Improvements on the game after the second wave

According to the results of the second wave there were additional improvements on the game. An intro is prepared and played at the beginning of the game telling about the background story. Some sound effects are replaced with more smooth ones in order to decrease the annoyance of sudden and loud sounds.

5.6. Third wave of results about the game experience

This time, the participants were a bit older than the previous ones. The participants in the third wave were around 13 years old. A total of 23 students participated in the test with 4 of them showed great patterns of boredom and sabotaged the result by giving all ones. About half of the participants found the game so childish; this was an acceptable result since the participants were a few years older than the game's target audience. The boredom on the game affected the surveys since the vertical reliability (reliability of individuals through whole test) of this wave was 56% according to the first method mentioned above. In the previous wave, it was 52%, we can conclude that more participants did the test from start to the end properly. Additionally, the horizontal reliability (reliability among the participants) did not mostly change (from 91% to 92%) according to the split half method.

The reliability patterns in the sub sections were 48%, 47%, 57% and 73% in order. The reliability increased at the end because while some participants were giving low scores because they were bored about the tests etc and the others giving low scores because they did not like the story, the results seemed to agree and the reliability with the agreement parameter resulted high. The comments for sound effects kept coming. This time it was focused on the game music and a single sound effect which was played when the router objects are turning. These two effects are decided to be switched to calmer versions in the next phase. The music can be totally changed to another one. The story contained in the intro was not liked by 7 (out of 23) participant. That is about 30% of the participants. Since this is an educative game, it is hard to maintain an interesting storyline with educational elements embedded.

CONCLUSION

The purpose of the study was to find an answer to the research question stated as: "What are the implicit heuristics in game design for providing the players a desired "flow" experience?". While finding an answer to the research question this study aimed to create a practical framework for gameplay testing. It was a guide for deciding survey questions and evaluating them by corresponding to a checklist prepared specialty for the target game. Additionally two tools were implemented in order to gather data to support the evaluation of survey results. The previous publicly known methods were heavily based on personal comments and experience, making them hard to standardize and universal. The checklist of the heuristics can be used as a tool as guide for designing a video game and as a first step of developing a gameplay testing survey for that video game. The provided checklist includes the main questions to be asked and they can be improved for examining the gameplay in more detail. The proposed steps created a sense of specialized path to be followed for the target game's genre and target audience. Study aimed to show how to create a detailed and solid test procedure instead of just giving a general purpose and shallow procedure. The depth of test results lead to detailed critics and the game evolved with bigger steps in each version. That resulted as an attempt for lowering the labor in methods such as RITE method's rapid prototyping by offering more careful evolution steps. The expected detail was acquired with the tests in the case study.

A tester answered that the game did not include any areas that got player stuck. However, the time logger's data about that game experience showed that the player did spent more time than the expected and the average. This shows that there is a great variance about the boredom limit between players. Some are motivated from the repetitive trials whereas others get bored. The test which was done with the children showed that the survey process should be worked on in order to be fun to do. Otherwise, participants are getting bored and we get an incomplete data about their experience. The solution was doing tests with such participants personally, within a form of conversation. The questionnaires' reliability was calculated by using social statistics methods resulting with an average of 80%. The base questions are given and guidelines for customizing the questionnaire for a future execution are told through this report. As the surveys were run in three waves, feedback from these executions contributed to have a more refined heuristic list.

The study also provided a more solid game designing environment by taking one step closer to satisfy the feeling of fun for the developed game in a shorter period. Methods forced the development team to look at the fun aspects rather than getting lost in the technical issues of the game. Another benefit of the study was that defining quantitative results rather than acting by personal instincts enabled the game testing procedure to be documented and evaluated with in a quality standard. That is verified by making use of the method in a real video game producing company and examining the results in video game development pipeline.

As the video game industry continues to develop, new revolutionary game ideas will be born; new platforms for gaming will be built. The heuristics should be kept updated as the industry evolves.

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Opinion of physicians on distance learning qualification courses

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ABSTRACT. The issue presents both theoretical and empirical data illustrating that distance learning may play an important role for continuous professional development of physicians. However, there are challenges and paradoxes that have to be overcome, and sometimes this is quite a difficult process. The purpose of this issue is to analyze and present theoretical and empirical findings about the ways that physicians interpret the distance learning for their continuous professional development. The concept of the distance learning is introduced in the first part of the article. The characteristics of research participants are revealed in the second part. The third part of the article describes the results of empiric research (aimed at finding out physician's attitude to distance learning of continuous professional development.

Keywords: *Distance learning, qualification courses, computer literacy, continuous medical education, physicians.*

Introduction

In the health sector, and especially medicine, odontology and nursing, distance learning was implemented later than in other fields due to their particularity and the set objectives in them. Great advancement of technologies and the increased need caused the fact that distance learning turned to be one of most significant alternatives for traditional learning methods, allocated to health care workers in order to renew information continuously [1].

Problem question of the research: Is continuous professional development acceptable for physicians' contemporary distance learning (internet based courses)?

The object of the study is distance education (internet based) courses for physicians' continuous professional development.

The study aims at revealing physician's attitude to distance learning of continuous professional development.

Methodology. Structuralism; it states that for the purpose of studying a complex object, it is possible to divide it into elements and functions, and, having analyzed those separately, the entire object may be interpreted through joining the analyzed parts into the whole.

Research methods. For this study there were used critical analysis of scientific literature and questionnaire survey.

There was little researched physicians' point of view concerning the qualification development in a distant way in Lithuania. After having graduated from the distance learning courses, the participants are only surveyed – there are provided course evaluation questionnaires. After having attended the distance learning courses, the workers in the Education Sector, usually express their point of view simply in different websites ([2], [3]).

Distance education qualification development courses are not a usual issue for Lithuanian physicians yet [4]. Thus it is very important to find out the physicians' who participated in the coursed held in distant way, point of view towards the distance education. That would enable the highlighting of the following: advantages and disadvantages of distance education courses; the significance of distance education courses for the physicians' continuous professional development; the basic difficulties which are faced by the physicians learning in the distance education courses; computer literacy, and the significance of foreign language knowledge and other factors for the distance learning courses.

According to F. Saba [5] "distance education in the postmodern systemic view is composed of many interrelated components and processes that include functions related to managing organizations and offering programs, providing funding and other social support for each enterprise, as well as designing, developing, distributing and evaluating courses." (55 p.) Following structuralism contemporary internet

based distance education can be analyzed as a system that consists of the following components: management systems of an entire organization, the instructional design process for creating courses, components that are responsible for dissemination of courses, evaluation of courses and programs, hardware and software technologies used [5].

At issue e-learning is analyzed as a study process, for efficient development and quality of which there are applied ICT. The very concept of e-learning is multidimensional due to a continuous change of its contents and development and creation of new generation ICT ([6], [7]). E-learning has an approach of the most general concept. In other words, this concept includes all learning forms and methods if only the study process is based on ICT. "E-learning is a generic term used to describe a wide range of applications of electronic technologies (TV, radio, CD-ROM, DVD, cell phone, Internet, etc.) in study environments, with a special emphasis on learning through the web" [6]. Therefore, summarizing the e-learning analysis, we can state that, contemporary internet based distance learning is a form of e-learning. According structuralism it is possible to investigate e-learning as a socio-cultural system which includes the elements: participants (teachers and students, IT professionals), technologies (ICT), processes, relationship/connections, material (information) [7]. Following the systematic approach by Moore and Kearsley [8] "distance education system consists of all the component processes that operate when teaching and learning at a distance occurs. It includes learning, teaching, communication, design, and management" (p. 9). Learning is an activity of student. Teaching is an activity of teacher. Summarizing ([5], [6], [7], [8]), it can be notices that analyzing the distance education as one of e-learning forms, that the key constituents of the structure components by Moore and Kearsley, can also already be mentioned by participants (teachers and students, IT professionals). Consequently, analyzing distance education as a structure, there can be researched students' (in this case the physicians', developing their skills in the distance education courses) approach towards the distance learning (as a student's activity).

1. RESEARCH PARTICIPANTS' CHARACTERISTICS

Totally 599 physcians from Lithuanian cities, rowns and villages developed their profesional skills in contemporary distance learning (internet based) courses. Some physicians learned in several courses. There were totally issued 845 qualification certificates. The survey was completed via email. The questionnaires were sent to those course participants, ho had indicated their email addresses (N = 480). There resturned and were completely filled 204 questionnaires (Table 1). There were not indicated any significant differences in comparison with the participants, who particapted and did not participate in the survey according to the age, gender and the place of residence (Table 1).

TABLE 1. COMPARISON OF THE ONES WHO PARTICIPATED AND DID NOT PARTICIPATE

The characteristic	Value	Participants		Not participants	
		N	*Percentage*	*N*	*Percentage*
Age	From 29 to 44 year	92	45,1	125	45,3
	More than 45 year	112	54,9	151	54,7
Gender	Female	149	73	208	75,4
	Male	55	27	68	24,6
Residential area	Vilnius	39	19,1	54	19,6
	Kaunas	39	19,1	64	23,2
	Klaipėda	17	8,3	15	5,4
	Other areas of Lithuania	109	53,4	143	51,8

2. OUTCOMES

2.1. Physicians' point of view concerning the organization and presentation of contemporary distance learning (internet based) courses

Selecting the courses, the respondents had a possibility to participate in more than one or several distance learning qualification development courses: Basics of Pedagogy and Communication, Children diseases, Computer Literacy, Social Psychical health, Internal disease, Obstetrics and Gynecology, Traumatology and Orthopedics. The physicians most frequently chose the courses of pedagogy and communication (62 percent), children disease (37 percent) and computer literacy (26 percent).

The respondents were asked what held qualification development courses they would like to participate in a distant way in future. The physicians most frequently indicated computer literacy courses being as most necessary ones (43.1 percent of respondents would choose them). It was determined that 8.3 of the surveyed physicians would not be willing to participate in the indicated courses.

For the participation in distance learning courses there is needed at least minimal computer literacy; thus during the research it was asked about the respondents; computer literacy skills. It was determined that more than a half of the physicians have mastered the basic software and skills for working with a computer – text editor (91.2 percent), browser (84.8 percent.), and email (77.9 percent). More than a half of the physicians have mastered the presentation software (58.3 percent) and calculator (52.5 percent). Despite these skills, only 13.2 percent of the respondents do not feel a gap in computer literacy in their professional activities, i.e. there can be made a presumption that they are not satisfied even with those skills which are quite satisfactory.

The material for studies was provided on „WebCT" browser framework that is one of the most popular for distance learning courses. Most respondents (75.5 percent) were satisfied with the following environment. Only for 2.5 percent of respondents it was inconvenient to browse.

Evaluating the previous distance learning experience it was indicated that these ones happened to be the first distance learning qualification development courses in their life (86.8 percent). Two thirds of respondents (66.7 percent) of respondents adapted the gained knowledge in their daily work.

The respondents were asked if they would agree to attend qualification development courses in a distant way if they were paid. Almost a half of the respondents (46 percent) did know if they would participate in paid distance learning qualification development courses.

The physicians, who participated in the survey, enumerated the advantages of distance learning courses and the most significant ones are the following: a possibility to learn not leaving work (93 percent), course convenience (89 percent) and a possibility to renew knowledge (85 percent).

32.4 of the researched faced some difficulties studying in a distant way. The physicians most frequently indicated the following difficulties: business at work and insufficient computer literacy (about 20 percent.).

The additional advantages of contemporary distance learning (internet based) courses, indicated by the physicians:

- Aid at the time planning;
- Foster active learning;
- Possibility to award some time when having it and there is no necessity to tune;
- The presented course material can be reviewed, there is used renewed knowledge, new methods or something what is necessary at work;
- Patient do not suffer due to such development;
- It is a convenient way to store the hours necessary for qualification and the obtainment of the license;
- Courses aid at the development of computer application skills;
- Possibility to communicate lively (virtual chats), and that provides the learning process with some attractiveness;

- It is possible to see, revise, there is no necessity to abstract and nobody disturbs sincere learning;
- In order to solve the tasks/assignments well it is necessary to look up for additional literature independently;
- Other colleagues join the learning process and there is benefit for everybody;
- Learning is interesting and prevents against falling behind new technologies.

Additional disadvantages of contemporary distance learning (internet based) courses indicated by the physicians:

- Presses brief course time, it is necessary to go it, and during work time it is sometimes a lot of other tasks/assignments, for example, even putting in order medical documentation;
- There is limited number of specialization courses (insufficient choice);
- If courses were in a foreign language, I would not be able to participate;
- Quite many courses are paid, their content of a narrow volume; consequently, there is no willing to pay for them quite a high price;
- There is not always favorable family situation (children).

90 percent of the physicians indicated that there did not arise any difficulties in registering in contemporary distance learning (internet based) courses. However they mentioned a few arisen difficulties:

- It was difficult to run necessary sub-software;
- Old hardware ("slow" processor);
- Problems related to insufficient computer literacy and no mastering at the beginning of the course;
- Questions concerning password entrance, registration/submission, etc.;
- Concerning application of computer;
- Difficult to connect to „WebCT" framework;
- Did not receive any response for a long time;
- Forgotten English language;
- Unknown environment, took a long time.

2.2. Evaluation of the physicians', present in different demographic and social groups, point of view on distance learning studies

The physicians evaluated the significance of contemporary distance learning (internet based) courses following Likert scale: from 1 (very important) to 5 (absolutely unimportant). More than a half of the participants considered the courses being very important apart from the courses on the basics of pedagogy and communication (27.1 percent).

The courses evaluation did not depend on the gender, age and work experience. The respondents with a greater work experience (>20 m.) in comparison with the ones with less work experience, evaluated the significance of computer literacy courses (respectively Likert scale means, 1.65 and 1.34; $p = 0.05$).

The physicians, working in the cities and other locations in Lithuania, similarly evaluated the significance of qualification development courses under professional point. The physicians in Kaunas, better evaluated computer literacy courses than the physicians in Vilnius (respectively Likert scale means 1.13 and 2.00; $p = 0.04$).

The courses advantages are related to the fact that they save a lot of time ($p = 0.03$) and that it is possible to learn not leaving family ($p = 0.03$) and they are related to the subjectively evaluated optimality of the courses duration (respectively, 76.5 and 71.7 percent).

During the enumeration of the contemporary distance learning (internet based) courses advantages there did not differ significantly statistically the senior or junior physicians'' answers.

The gap of computer literacy was topical dependently on the age: for senior ≥ 45 m. (33.0 percent) in comparison with junior 7.7 percent; (p < 0,001) and more experienced (among the employees with work experience of > 20 (29.9 percent) in comparison with less experienced 9.3 percent; p < 0,001), for the respondents it was a significant obstacle for learning in a distant way. Insufficient computer literacy as a disadvantage caused some difficulties while registering to the contemporary distance learning (internet based) courses online (the problems arose for 25.6 percent illiterate in comparison to 6.1 percent literate; p < 0,001). It also disturbed the browsing in the framework where there is presented the material, necessary for studies (respectively, 42.1 and 20.0 percent; p = 0.004), and to work with the basic software: text editor (respectively, 30.8 and 3.6 percent; p < 0,001), calculator (respectively, 82.1 and 39.4 percent; p < 0,001), presentation software (respectively, 76.9 and 33.3 percent; p < 0,001), email respectively (respectively, 43.6 and 17.0 percent; p < 0,001); browser (respectively, 33.3 and 10,9 percent; p < 0.001).

Limited foreign language knowledge to learn in a distant way disturbed more women than men (respectively, 16.8 and 5.5 percent; p = 0.04), and also disturbed senior respondents (22.0 percent in comparison with junior ones 6.6 percent; p = 0,003) and more experienced (21.6 percent in comparison with 6.5 percent among less experienced; p = 0,002). Besides, limited foreign language knowledge was an obstacle to browse in a framework, where there is presented the material necessary for studies (p = 0.003), and to work with presentation software (x2 = 9.16; lls = 1; p = 0.002).

2.3. The factors related to the assessment of contemporary distance learning (internet based) courses

Evaluating the studies quality aspects according to the obtained questionnaire outcomes, it can be noticed that the held courses satisfied 93.6 percent of respondents' expectations. Besides, the satisfaction with different quality aspects in all cases exceeded 60 percent, and in most cases 80 percent.

TABLE 2. RESPONDENTS SATISFACTION WITH STUDIES QUALITY ASPECTS

Studies quality aspect	Responded positively in percentage.
Courses volume	91,2
Courses evaluation system	87,7
Theoretical material	87,3
Video lectures	60,8
Self-control questions	87,3
Courses vocabulary	74,0
Courses calendar	80,8

Having evaluated the respondents' answers concerning the studies quality aspects it was determined that the evaluations concerning the fact if the courses or the courses volume, evaluation system, theoretical material, video lectures, self-control tests, courses vocabulary, courses calendar and chat forum satisfied the participants' expectations did not depend on the gender, age and the previous respondents' qualification development experience and the computer literacy level.

CONCLUSION

Qualification development courses are necessary for physicians, and especially computer literacy courses. The greatest problem learning in a distant way is insufficient computer literacy and business at work. Most frequently mentioned advantages of contemporary distance learning (internet based) courses – possibility to learn not leaving work place, course convenience and possibility to renew knowledge. Following the course participants' point of view, distance learning should be applied wider in the education system. Contemporary distance learning (internet based) courses are a relevant and attractive way to develop

qualification for physicians, and consequently, most physicians(98.5 percent) are likely to recommend the qualification development in a distant way for colleagues.

The courses meet participants' expectations. The courses volume, evaluation system, theoretical material, video lectures, self-control tests, courses vocabulary, courses calendar and chat forum are relevant for participants. Positive evaluation of all courses is related to the fact that during courses it is possible to learn only the issues which are needed individually and there is provided the material necessary for the courses. The physicians' inaptitude to work with the key software is not related to a good evaluation of courses.

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The Role of Blended Learning in Adult's Math Learning

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ABSTRACT. The paper presents the role of blended learning in adult education. The problem is that adult learners are different from youth (pupils, students) because most of them have already had some learning experience in the past. Also adult learners think from other perspective and usually are more motivated, prefer active dedicated studies.

Keywords: *adults, math, education, blended learning.*

Introduction

It is important to emphasize the learning aspirations of adults because this forms the foundation of teaching principles. Key points are listed as manage to accomplish work faster & better, gain knowledge about concerned topics, subjects, gain mandatory basic knowledge that is required for daily work tasks, get a qualification certificate, assurance of not losing a job, employer requirements to take the learning course, more possibilities to find a new & better job, change profession, meet new people, start own business.

In addition, there are some general needs for studies that adult learners participate in. Basic aspects are: active learning. Despite the fact that adult learners are busy individuals they want to be engaged in active learning. Lessons should be interesting, practical and applicable with effective presentations. Adult learners have limited time in class and they want to get the most out of the class time. Furthermore adult learners are more experienced and expect quality presentations. Working adults are pressed for time, they are time conscious and therefore value punctuality and well-paced classes. Adult learners want their instructors to communicate clearly their expectations for the course and specific assignments by sharing timely and relevant resources such as upload lecture materials at least three days before class, summarize what was discussed during learning activities/online discussions so that there is a closure, let the materials be available throughout the entire period of the course etc. Provide relevant feedback, ensure timely & detailed feedback summarize comments to give an overview of what to improve on approachability & encouragement. Adult learners want their instructors to understand their challenges and appreciated instructors who were approachable and patient.

So in order to adapt mentioned adult learners needs and characteristics to a blended learning model, the role of technology in the teaching process is described in the next chapter. Moreover ICT importance & challenges for adult learners are identified.

1. ROLE OF TECHNOLOGY IN DEVELOPING ADULT LEARNERS MATH/NUMERACY KNOWLEDGE & SKILLS

A lot of different aspects that apply to various studies (math, information technologies etc.) need to be analysed when exploring relationships between adult learners and information communication technologies. Firstly, there are many challenges for adult learning in learning with ICT technologies. Main themes: most adults were taught in a traditional and passive classroom, so ICT is probably a new way of managing the learning process. Nowadays ICT changes so rapidly that even though adult learners have some knowledge about ICT it could be outdated and not suitable for the offered studies. As a result additional learning is required as memory decreases with age, it gets more difficult to assimilate the required learning material. In addition, if understanding how various ICT tools work is required then the workload gets much bigger.

Some adults could be afraid of using ICT & consider extra work & money involved in studies, not only adult learners, but instructors/tutors also face challenges in conducting a more robust and modern learning

course. Basic key points are: Instructors should adapt and change as they learn how to use new medium, instructors, instructional designers and other professionals working in the design of online environments for adults must understand adult learning theory, especially in terms of its relationship to distance or online learning, in addition to the learning material itself, instructors should have a good understanding of the online environment (Moodle etc.) that is being used in the learning process. Other part of this chapter covers the importance of ICT in developing learning knowledge, aspects of encouraging adult to use technologies and how they can facilitate adult learning process.

1.1. Selecting the importance of ICT in developing learners knowledge and skills

Nowadays, in the fast moving and changing world informational communicational technologies play a significant role in education, industry and business? Adult learners are no exception: they need to adapt to a more modern working environment, improve their ICT skills. General points are: ICT becomes essential as contemporary education system is focused on preparing learners for daily life & problem solving, education should be adapted to volatile circumstances in a fast moving world: follow the changes of new and upcoming ICT, Modern economy encourages global competition & education should not be limited to a traditional school environment, the popularity of ICT change the way how people communicate, find information & gain knowledge (computers, internet, radio, TV in various forms), appropriate & competent usage of ICT improves education system. Nowadays this process is almost inevitable, more specific points about the importance of ICT in the learning process (studies) are: learning can be interactive & based on communication if ICT are used. This way a wider & more motivated learning environment in an education institution & beyond could be created. Learners solve problems communicating or working together. ICT usage allows learning to be applied according to individual needs, learning content (what do we learn?) & methods (where & how do we learn?). Learning can be done anywhere, using a computer, mobile phone etc. In this situation it is important to make individual tasks for learners with special needs (blind, deaf or very talented ones). There is no need to teach all learners at once as ICT can control the process. This is very convenient for adult learners who have a job or look after their children. In addition, there is a subset of educational institutions in the world that have not applied (or just starting) ICT in classes. To tackle this problem, topic about ICT & institution integration should be discussed. Especially: teaching about information communication technologies, using information communication technologies in various lessons or lectures, applying newest technological solutions into the management of educational institution, creating a virtual learning environment.

Another important thing about ICT is that it has a lot of useful features related to continuous learning: flexibility in respect of time & place (learning at home, using a virtual learning environment or distance learning), flexibility in respect of learning material (courses are prepared for example according to organization needs), easy access to information & other people, convenient communication with other people using online resources, new approach to organizing learning (individualization of the process, better preparation & control of the learning material).

Despite many advantages of informational communicational technologies in adult learning, it is necessary to encourage adults to use ICT and show how they can facilitate the learning process.

1.2. How to encourage adults to learn with technologies

Technologies are infiltrating all aspects of life and eventually even the most unsociable individuals will need to learn the basics. All the while, adults face two distinct disadvantages: they tend to have fear and little experience with technologies, and even the healthiest among them show declines in cognitive and motor function that can interfere with their ability to use technologies [8].

Also lack of confidence is a major factor in older adults' ability to become experienced with computer technologies. Learning new things definitely takes more time as you get older. Also some evidence to suggest that adults require specific procedural training to learn to use computer technologies [11]. Psychology and motivation are often overlooked factors, who suggest that older people weigh benefits heavily when deciding whether to adopt new technologies.

Primarily adults should not be afraid of learning by using technologies. Teachers should encourage and reassure learners. Technologies can be used easily and do not need to be afraid. There are many technologies adapted and simplify specially for adults. But need to realize that every single thing that we want to learn requires effort, as well as technologies. Need to understand that technologies can facilitate the learning process. It is important encourage adults learning by using technologies:

- not to be afraid to use technologies for learning;
- realize that technologies can facilitate learning;
- are simplified technologies for older adults;
- technologies can be useful not only for learning.

1.3 How technologies can facilitate adults learning?

Advances in technology have always transformed the way people are educated. From the abacus that made teaching math easier millennia ago, to the word processor that changed the way research papers are written and presented, humanity's technological progress has impacted education.

Though technological change has shaped education from the beginning, the digital revolution has certainly increased the speed at which education is transformed. In the past twenty years or so, there have been changes that few people ever dreamed of [7].

Just consider the following ways that information technology, the Internet and other developments have reshaped the way education is attained, measured and delivered. The way people learn is changing. Recent research reveals that 42% of adults surveyed said they are much more likely to use the internet for learning than they were a year ago and this is likely to become more common through the use of smartphones and other mobile devices.

Advances in technology have made this easier. Adults can access learning at any time and almost anywhere, using audio, video and text content from broadcasters, education providers or their own peers on social media. The tools they've used to do this have changed too, with around one third of web users now accessing the web through a mobile device, such a tablet or smartphone.

Learning experience that aims to adults is directly related to changes in life, which leads to the desire or need to learn. Adults basically want to get involved in learning before, after, or even change the course of their lives. Once they realize that change is inevitable, adults engage in any learning activity that promises "to help them cope with the changes" [10]. Adults are motivated to learn due primarily to the fact that they have to use what knowledge or skills which are sought. Learning is a means to an end, not an end in itself. Technologies can be a tool to learn a variety of things more easily [9]. The training process is inconceivable without modern technologies which not only speeds up the training process, but also improves the absorption of the subject taught, helps to structure better absorb the information.

Older, working adults are now able to go back to school while maintaining a career and a family. Online classrooms also tend to be a much more economical option for adults who want to go back to school. It's also true that most online classrooms provide the same opportunities to learn as a seated class would.

2. APPROACH TO BLENDED LEARNING. MODELS & USE CASES

This chapter focuses on applying blended learning models in practice, analysing blended learning use cases in education. Blending learning models are described on basis of the insight institute K-12 classification [3]. It includes identification of basic model structure (rotation, flex, self-blended, enriched-virtual) and usage scenario examples.

One critical part of blended learning models is that they involve "some element of learner control of time, place, path & pace":

Time: Learning is no longer restricted to the education institution day or year.

Place: Learning is no longer restricted to the walls of the classroom.

Path: Learning is no longer restricted to the pedagogy used by the teacher.

Pace: Learning is no longer restricted to the pace of an entire classroom of learners.

Figure 1 shows blended learning model structure. Generally, there are three main parts: "Brick-and-mortar", "Online learning" and "Blended learning". Brick-and-mortar learning refers to a traditional institution that might involve technologies ("Technology-rich institution"). Online learning includes informal and full-time learning whereas blended learning component – rotation, flex, self-blended and enriched-virtual models.

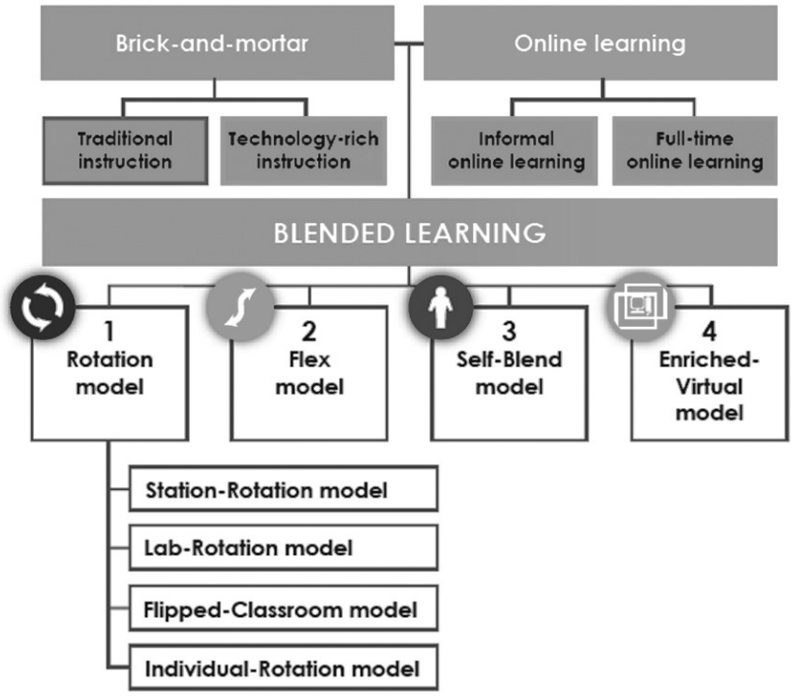

Figure 1. Blended learning model structure.

2.1. Rotation Model

Rotation model is divided into four sub-models which have some similarities and differences. The key similarity of models is that all include some part of learning online with a computer and another part – in a traditional way.

Station rotation model: learners rotate on a fixed schedule or at the teacher's discretion. Rotation includes at least one station for online learning. Other stations might include activities such as small-group or full-class instruction, group projects, individual tutoring, and pencil-and-paper assignments (figure 3).

Example: throughout the day the teacher rotates learners among online learning, small-group instruction, and individual assignments.

Lab rotation model when learners rotate among locations on the brick-and-mortar campus, at least one of these spaces is a learning lab for online learning, while the additional classroom(s) house other learning modalities, different from the Station-Rotation model because students rotate among locations on the campus instead of staying in one classroom for the blended course or subject (figure 3).

Example: Learners rotate out of their classrooms to a learning lab for two hours each day to further their instruction in math and reading through online learning.

Flipped-classroom model: Learners rotate on a fixed schedule between face-to-face teacher-guided practice on campus during the standard school day and online delivery of content and instruction of the same subject from a remote location (often home) after school.

Example: Learners use Internet-connected devices after school at the location of their choice to watch 10 to 15 minute asynchronous instruction videos and complete comprehension questions on Moodle. At education institution they practice and apply their learning with a face-to-face teacher.

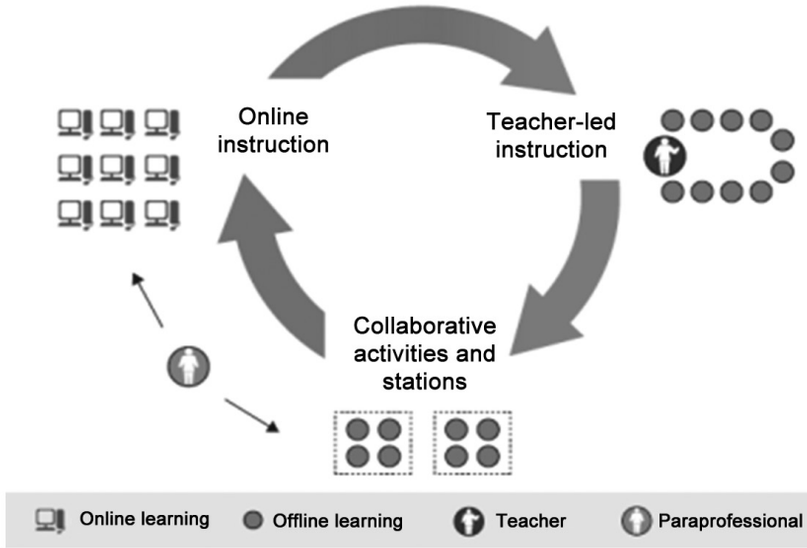

Figure 2. Station rotation model.

Individual-Rotation model: Students rotate on an individually customized, fixed schedule among learning modalities, at least one of which is online learning. An algorithm or teacher(s) sets individual student schedules (figure 5).

Example: Assigns each student a specific schedule that rotates them between online learning in the learning centre and offline learning. Each rotation lasts 35 minutes.

2.2. Flex Model

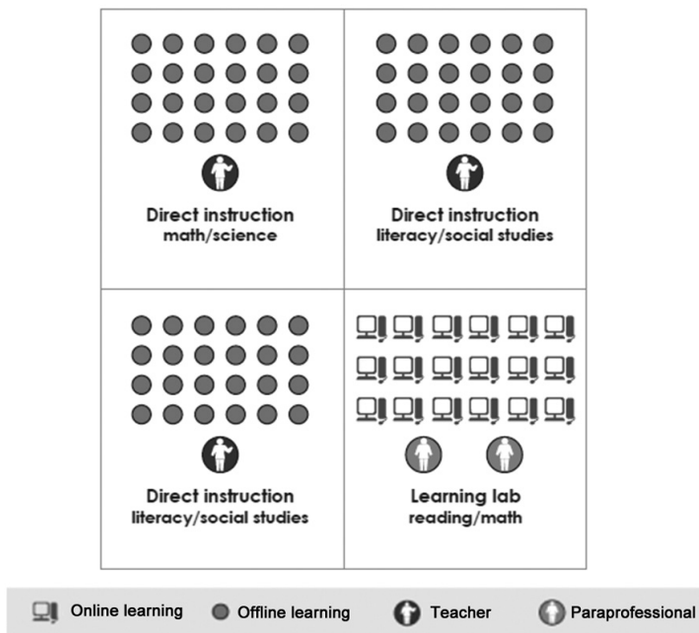

Figure 3. Lab rotation model.

Flex Model when content and instruction are delivered primarily by the Internet, students move on an individually customized, fluid schedule among learning modalities and the teacher is on-site, the teacher or other adults provide face-to-face support on a flexible and adaptive as-needed basis through activities such as small-group instruction, group projects, and individual tutoring, some implementations have substantial face-to-face support, while others have minimal.

Example: face-to-face teachers use a data dashboard to offer targeted interventions and supplementation throughout the day for core courses (variations with elected online courses).

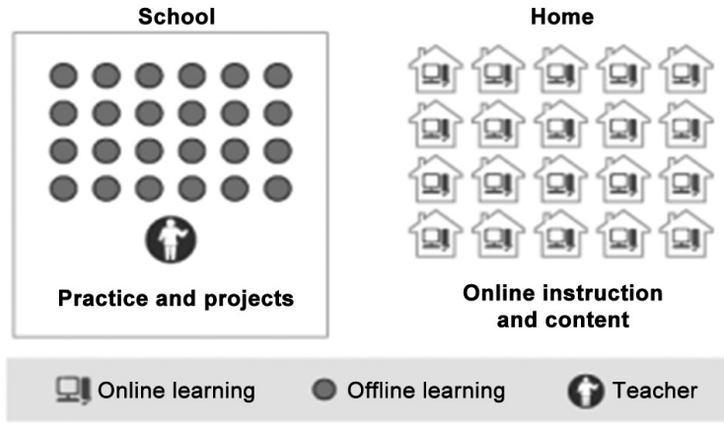

Figure 4. Flipped-classroom model.

2.3. Self-Blend Model

Self-Blend Model: students choose to take one or more courses entirely online to supplement their traditional courses and the teacher-of-record is the online teacher

Example: learners has the option of taking one or more online courses, all learners complete a cyber-orientation course prior to enrolment, courses are asynchronous and learners can work on them any time

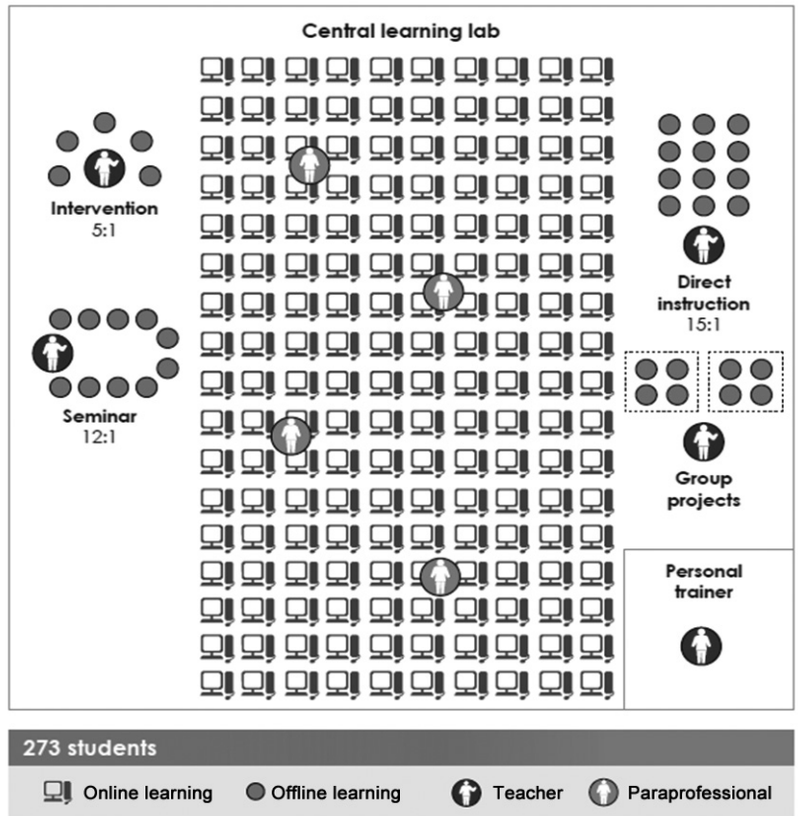

Figure 5. Individual Rotation model.

during the day, learners can work on their online courses at school, but they are also free to complete the courses remotely if they prefer.

2.4. Enriched-Virtual Model

Enriched-Virtual Model: Whole-school experience in which within each course (e.g. math), learners divide their time between attending a brick-and-mortar campus and learning remotely using online delivery of content and instruction.

Example: Learners meet face-to-face with teachers for their first course meeting at a brick-and mortar location. They can complete the rest of their course work remotely, if they prefer, as long as they maintain some specified point average in the program.

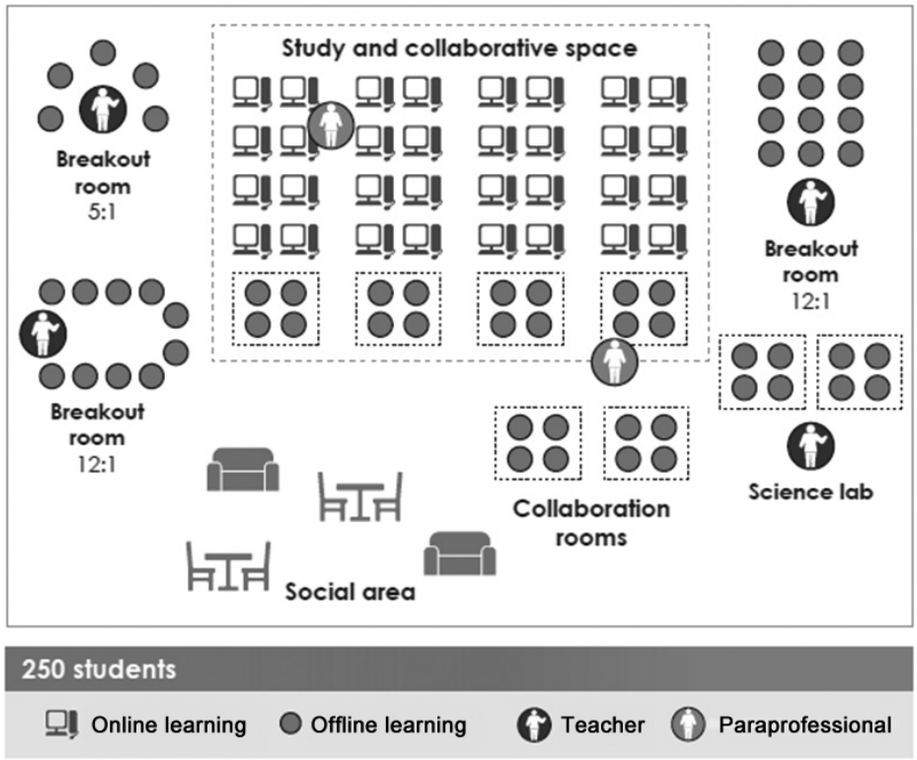

Figure 6. Flex model.

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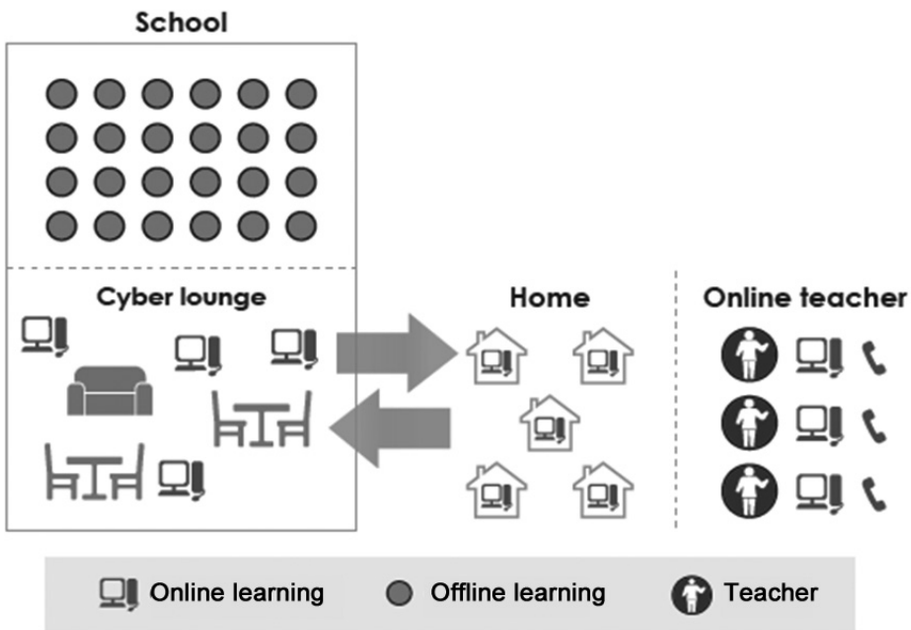

Figure 7. Self-Blend Model.

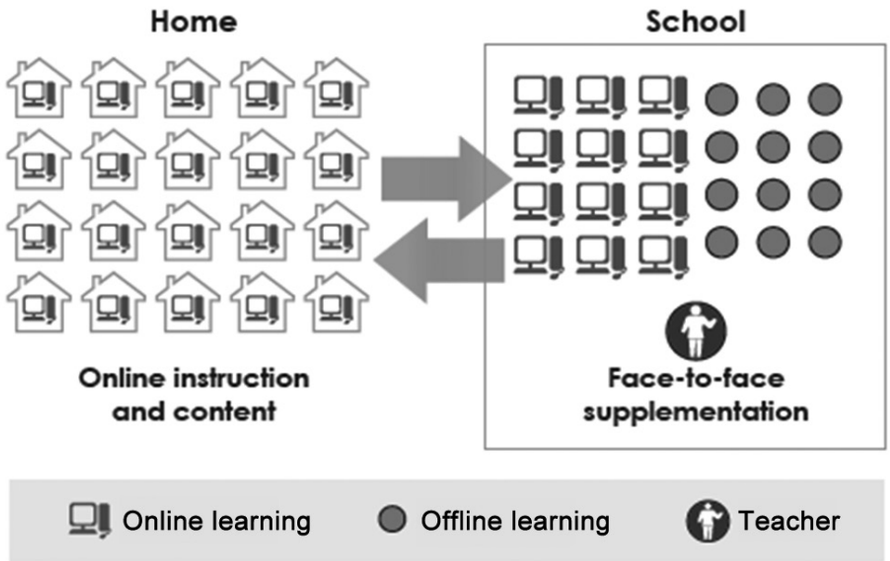

Figure 8. Enriched-Virtual Model.

CONCLUSIONS

Primarily adults should not be afraid of learning by using innovative technologies. Teachers should encourage and reassure learners. Technologies can be used easily and do not need to be afraid. There are many technologies adapted and simplify specially for adults. But need to realize that every single thing that we want to learn requires effort, as well as technologies.

Technologies are infiltrating all aspects of life and eventually even the most unsociable individuals will need to learn the basics. All the while, adults face two distinct disadvantages: they tend to have fear and little experience with technologies, and even the healthiest among them show declines in cognitive and motor function that can interfere with their ability to use technologies.

Technologies can be a tool to learn a variety of things more easily [9]. The training process is inconceivable without modern technologies which not only speeds up the training process, but also improves the absorption of the subject taught, helps to structure better absorb the information.

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Using Moodle: Teachers' Perspective: a Cross-Country Exploratory Study

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ABSTRACT. Learning Management Systems are now commonly used by many teachers for their e-learning courses or as a support for traditional classroom courses. Moodle seems to be the most used LMS in European schools and training companies. This study is a cross-country exploratory study that tries to understand the view of teachers about LMS, Moodle and online tools in education.

Keywords: *e-learning, learning, teaching, ICT, LMS, Moodle, platforms.*

Introduction

Authors are discussing that we must talk in ICT language [1]. This is discussed at a conference stroked obvious. If we must have a common known language to speak with foreign people, it may seem obvious that teachers should speak a common language with students. And this language is growing different every day and using different channels like ICT, mobile, social. To better communicate with student's teachers should try to use the same tools students are familiar with like the ones they use to communicate with each other, with friends and with family. "Our students live a part of their lives in "alternative spaces" – Facebook, YouTube, Xbox Live etc. And their communication and creation expectations have altered. As educators we can, and must, respond to this – the use of ICT, and in particular Web 2.0 tools, favours and supports interaction and collaboration among students and enables new means of communicating and interacting both in synchronous and asynchronous ways (1)." Other authors Kotzer and Elran are presenting the research that teaching in an E-Learning environment can contribute to the ability to teach, the ability to learn and most important to bridge between two main components in the classroom, the teacher and the learner (2).

On the other hand, ICT can also help teachers with their work, making some tasks easier. Learning management systems (LMS) are an example of an ICT tool that can help teachers. But the results of using LMS depends largely on the teacher, they can vary from very plain to quite elaborate, depending not only on the teachers' commitment to informational content, clarity and aesthetic sense, but also on their readiness to explore new teaching tools and to offer their students new ways of learning (3).

This study aims at understanding the view of the teachers from the involved countries about the use of ICT, LMS and online tools in the teaching and learning process. Objectives are: to present the tools and environments used in education and to provide conclusions.

RESEARCH RESULTS

This exploratory study was conducted with a group of 110 teachers from six different regions in five countries: Italy, Lithuania, Poland, Portugal and Turkey (Istanbul and Ankara):

Country	Italy	Lithuania	Poland	Portugal	Turkey (Istanbul)	Turkey (Ankara)	Total
Teachers	20	15	15	20	20	20	**110**

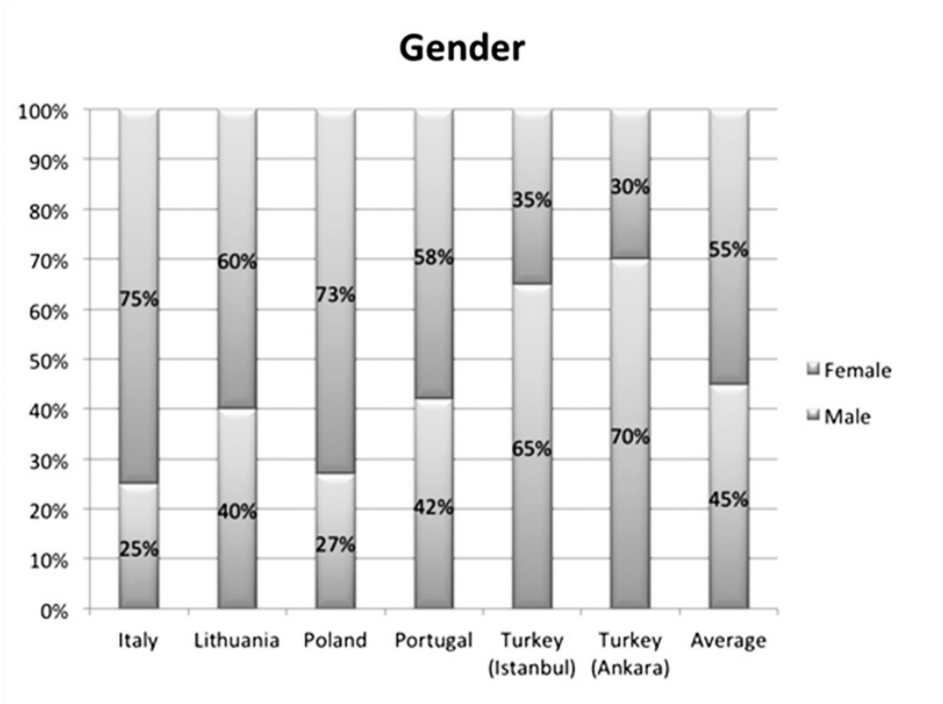


Figure 1. Gender.

Partners said that the distribution of gender of teachers that participated in the questionnaires was representative of the distribution of the teachers in their countries. We can see that in Turkey male teachers represent more than 65%, while in the other countries female teachers are the majority.

Figure 2. Age.

Only 25% of teachers are up to 35 years old, and more than 50% are 41 years old and older. In Portugal and Italy the group of teachers older than 41 represents more than 70%, while in Lithuania this group only represents around 10%. Poland and Turkey are near the average of 50%.

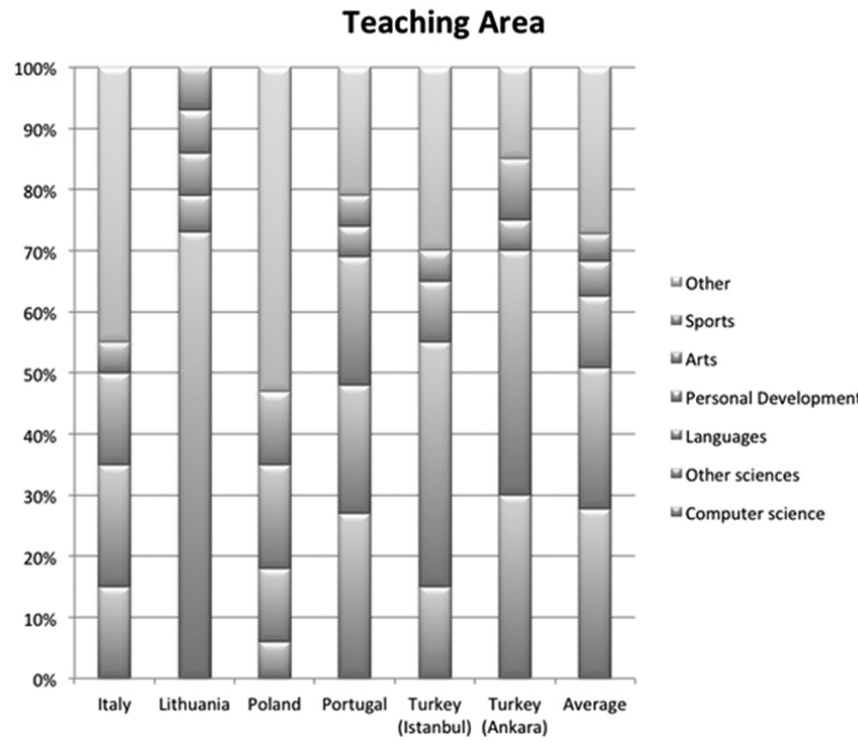


Figure 3. Teaching Area.

In figure 3 we can see the teaching areas of the teachers that participated in the study. Computer science is the teaching area of 30% of all teachers, but there is large variance in this variable across countries from minimum values of 6% in Poland to a maximum of 73% in Lithuania. It may be interest also to analyse the cumulative "computer science" plus "other science", representing near 20% in Poland, around 30% in Italy, around 50% in Portugal and Istanbul, 70% in Ankara and 80% in Lithuania. It's not an objective of this study but it would be interesting to analyse the correlation between teaching areas, namely computer science and other sciences, and the use of LMS.

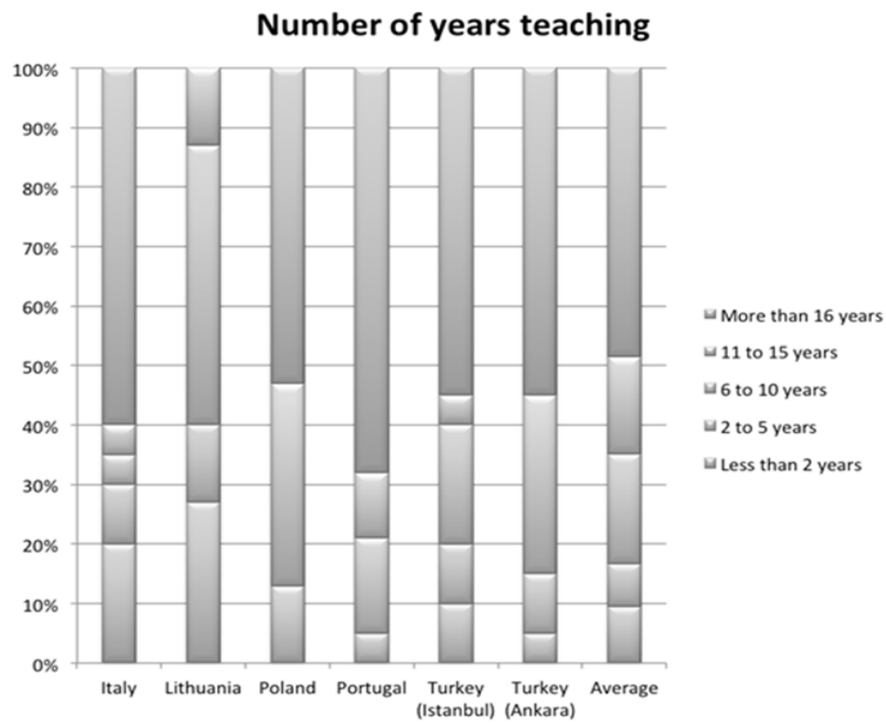


Figure 4. Numbers of years teaching.

In figure 4 we can see that about 50% of the teachers who participated in the study had more than 16 years of experience teaching. Per country we can see that the group of teachers with more than 16 years of experience represented more than 50% in every country with the exception of Lithuania where all the teachers had less than 15 years' experience.

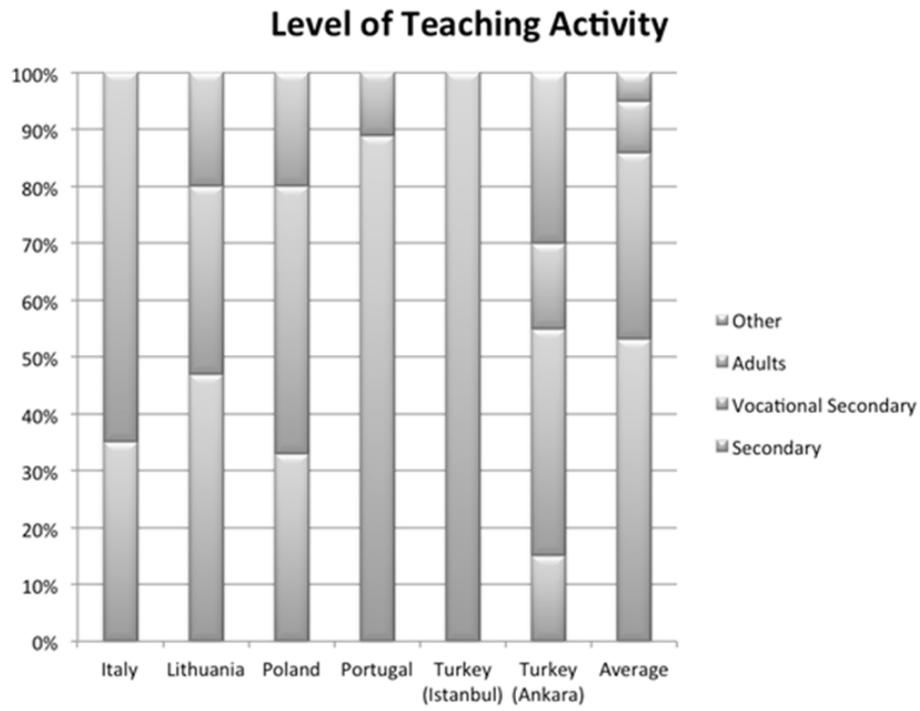


Figure 5. Level of teaching.

Secondary and Vocational Secondary was the level of teaching of about 85% of the teachers that participated in the study. These two levels represented from a minimum of about 50% in Ankara (Turkey) to a maximum 100% in Italy, Portugal and Istanbul (Turkey).

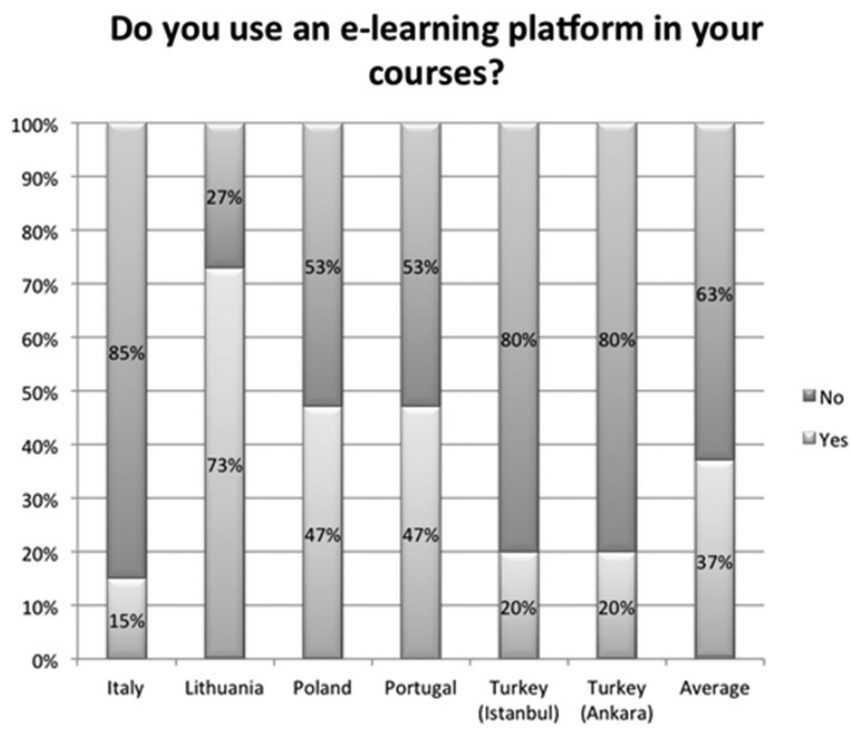
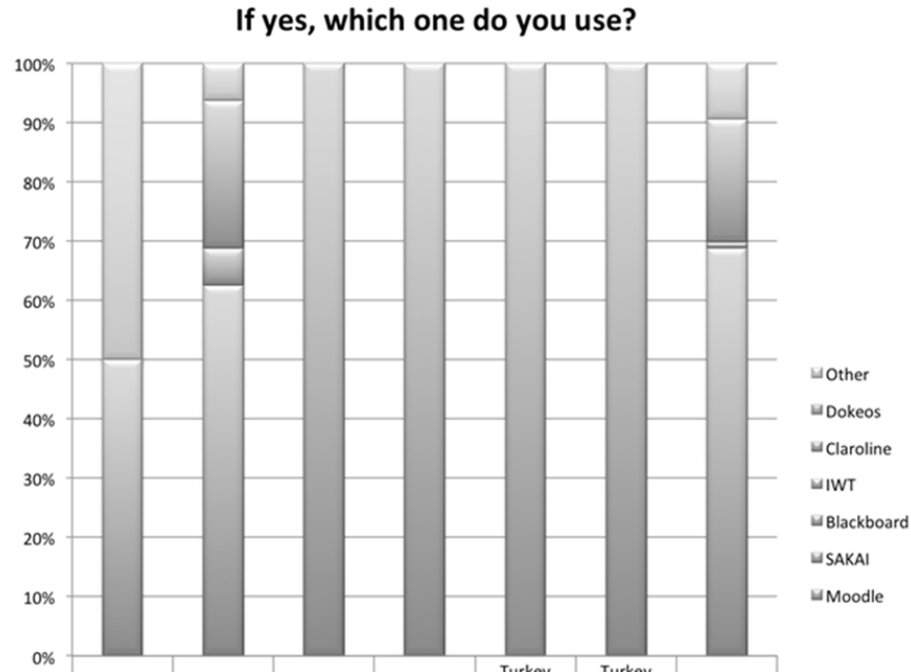


Figure 6. Do you use an e-learning platform?

From the total of teachers participating in the study, 37% use e-learning platforms in their courses. A country analysis shows a minimum value of 15% in Italy and a maximum value of 73% in Poland. The two regions of Turkey have the same value of 20% and Poland and Portugal are 10 perceptual points above the average with a percentage value of 47%. Although we have not done correlational analysis, it's interesting to look at the maximum value of 73% in Lithuania and take in consideration that the group of Lithuanian teachers participating in the study are the youngest (only 10% are older than 41 years) and around 70% teach computer science area. Again, these could be interesting themes for future studies, the correlation between the use of LMS and the age of teacher and area of teaching.



	Italy	Lithuania	Poland	Portugal	Turkey (Istanbul)	Turkey (Ankara)	Average
Other	50,00%	6,25%	0,00%	0,00%	0,00%	0,00%	9%
Dokeos	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0%
Claroline	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0%
IWT	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0%
Blackboard	0,00%	25,00%	0,00%	0,00%	100,00%	0,00%	21%
SAKAI	0,00%	6,25%	0,00%	0,00%	0,00%	0,00%	1%
Moodle	50,00%	62,50%	100,00%	100,00%	0,00%	100,00%	69%

Figure 7. Which LMS?

Moodle is used by 69% of the teachers in our study, and the second LMS more used is Blackboard with 21% of respondents. Moodle is used by 100% of teachers in Poland, Portugal and Ankara (Turkey). Blackboard is used by teachers from Lithuania and Istanbul (Turkey). One teacher from Lithuania said he used SAKAI, being the only teacher from all countries.

From the group of teachers that participated in our study, 61% have attended an online course. We may notice that the highest percentage is 100% from Lithuania and looking at Figure 6 we can also notice that teachers from Lithuania have the highest percentage (73%) of teachers that use e-learning platforms in their courses. On the other hand, we can also notice that teachers from Italy have the second highest percentage (65%, together with Poland) of teachers that have attended online courses, but looking at Figure 6 we see that Italian teachers have the lowest (15%) percentage of use of e-learning platforms in their courses. It could be also interesting to see if this last observation is an outlier in a correlation correspondence between attendance of online courses and the use of e-learning platforms in the teacher course, or if this correlation does not exist.

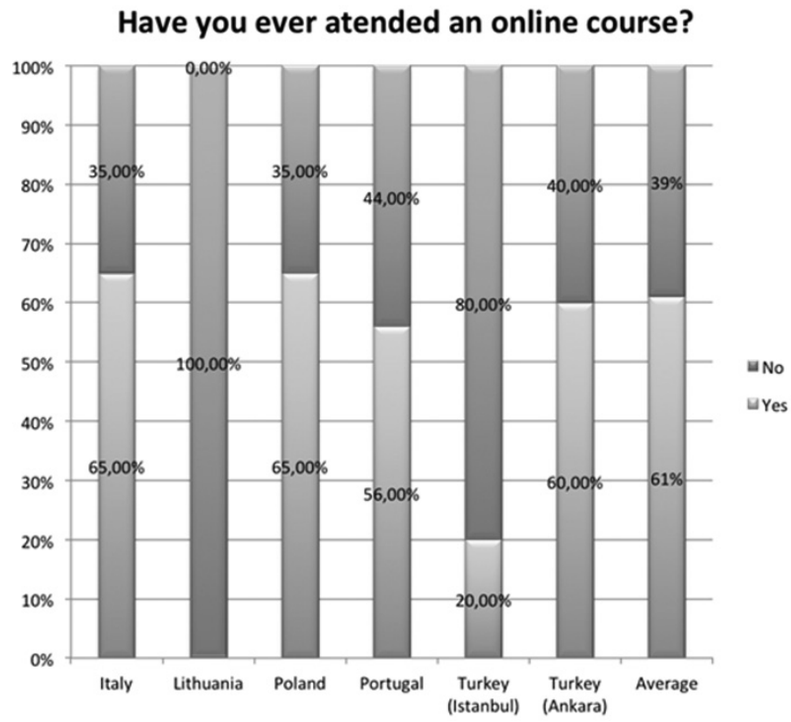


Figure 8. Have you atended an online course?

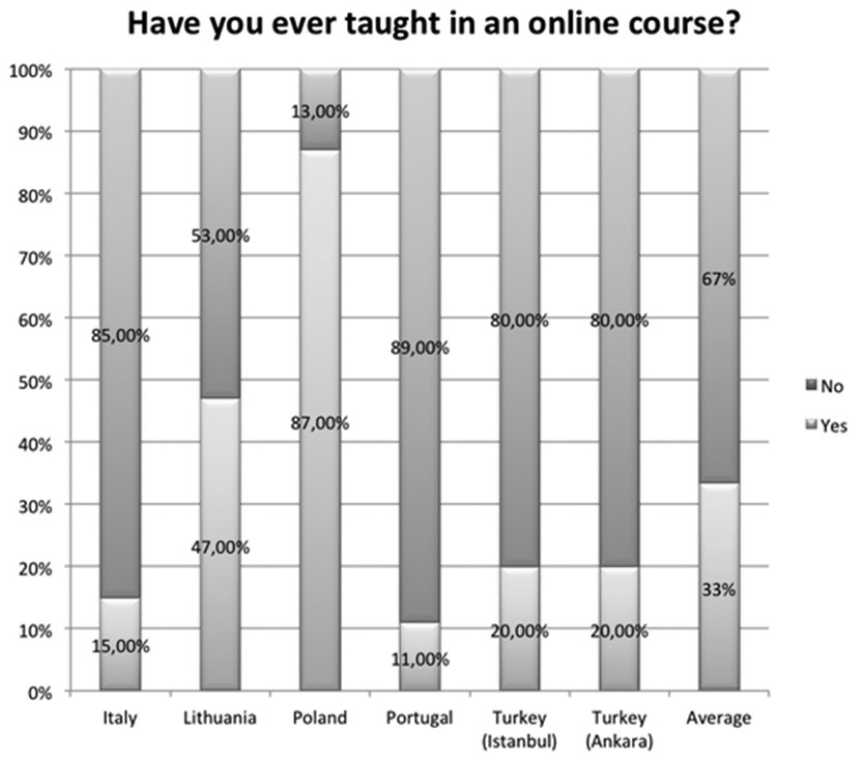
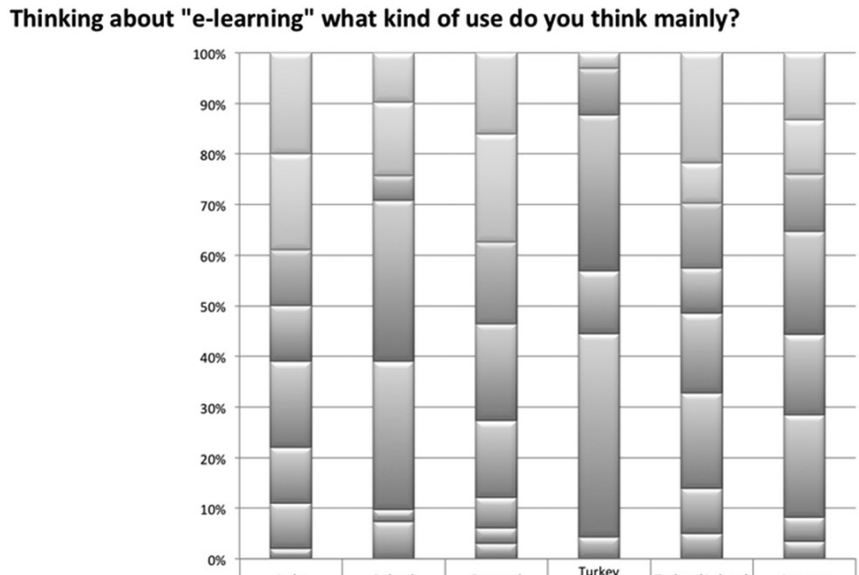


Figure 9. Have you tauhgt in an online course?

One third (33%) of the participants have taught in an online course. The percentages vary from a minimum of 11% in Portugal to a maximum of 87% in Poland.

The most referenced characteristics of e-learning (referred by 20% of all teachers) are "Publication of Texts and images on a website" and "Use of wiki Systems for a collaborative building of documents". These two characteristics were referred by 50% and 65% of teachers that participated in the study conducted by the



	Italy	Poland	Portugal	Turkey (Istanbul)	Turkey (Ankara)	Average
Management of forum or chat	20,00%	4,00%	16,00%	5,00%	22,00%	13%
Using software to self-produce audio / video lessons	19,00%	6,00%	21,00%	0,00%	8,00%	11%
Using videoconferencing systems between remote classrooms	11,00%	2,00%	16,00%	15,00%	13,00%	11%
Publication of Texts and images on a website	11,00%	13,00%	19,00%	50,00%	9,00%	20%
Management of self-assessment test online	17,00%	12,00%	15,00%	20,00%	16,00%	16%
Use of wiki Systems for a collaborative building of documents	11,00%	1,00%	6,00%	65,00%	19,00%	20%
Use of Systems for podcasting	9,00%	3,00%	3,00%	0,00%	9,00%	5%
Do not know	2,00%	0,00%	3,00%	7,00%	5,00%	3%

Figure 10. Thinking about e-learning.

partner from Istanbul (Turkey). "Online self-assessment" is the third characteristics most referred, by 16% of all teachers, and by 20% of teachers from Istanbul group, followed by "Forum or chat". So these seem to be the tools of Learning Management Systems that teachers value the most: 1) Publication of text and images; 2) Wiki pages, for collaborative documents; 3) Self-assessment activities; 4) Forum and chat tools.

A vast majority (89%) of the teachers consider online tools are important or very important, varying from a minimum of 80% in Turkey to a 100% maximum in Lithuania. "Very important" is referred by 44% of all teachers, varying from a minimum of 25% in Italy and Ankara (Turkey) to a maximum of 87% in Lithuania.

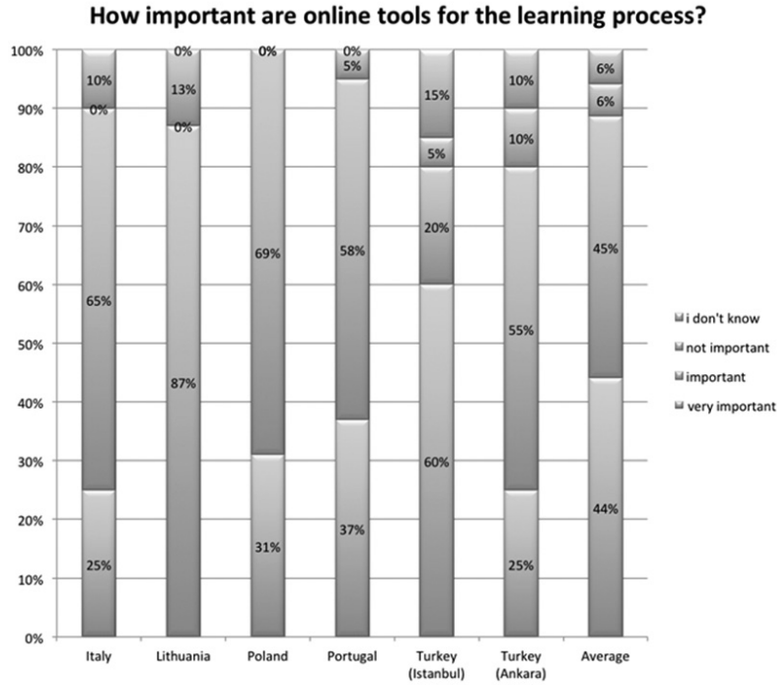


Figure 11. How important are online tools.

CONCLUSIONS

Online tools are considered to be important and very important by the vast majority of the teachers that participated in our study, and variance is small across countries. From the group of teachers that participated in our study, 61% have attended an online course. A number of 33% of the teachers had already taught in an online course, with percentages varying from a minimum of 11% in Portugal to a maximum of 87% in Poland. Moodle is used by 69% of the teachers in our study, and the second LMS more used is Blackboard with 21% of respondents. Moodle is used by 100% of teachers in Poland, Portugal and Ankara (Turkey). Based on our study, the following seem to be the tools of Learning Management Systems that teachers value the most: 1) Publication of text and images; 2) Wiki pages, for collaborative documents; 3) Self-assessment activities; 4) Forum and chat tools. Considering this is an exploratory study, we have pointed some analysis that we find could be interesting to follow, namely trying to identify the correlation between some of the variables that we have analysed.

ACKNOWLEDGEMENTS

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Computer games as a tool for improvement of graphical education

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ABSTRACT. The article discusses issues concerning educational computer games, focusing on the two questions: why are they necessary, and how can they improve the learning process. The article describes several computer game models which can be implemented for various educational tasks. A certain game, created to make the study of graphical subjects easier and more interesting, is used to provide examples.

Keywords: *graphical competence, engineering education, learning games, engineering graphic, learning games.*

Introduction

The last few decades have given rise to a new generation whose childhood and teenage years have been dramatically different from their predecessors. This generation has been raised surrounded by numerous IT-gadgets, which have influenced their thinking patterns as compared to the previous generations which were raised without mobile phones, computers etc. The generation in question has been given various names, such as Digital Natives, Games Generation, Millennial Generation and many others. Not only are their thinking patterns different – their whole lifestyles, preferred activities, means of communication and, of course, education have undergone major changes.

Below there are ten of the main cognitive style changes that M. Prensky has observed in the Games Generation, all of which raise a number of important and difficult challenges for education, training, and business in general:

1. Twitch speed vs. conventional speed.
2. Parallel processing vs. linear processing.
3. Random access vs. step-by-step.
4. Graphics first vs. text first.
5. Connected vs. standalone.
6. Active vs. passive.
7. Play vs. work.
8. Payoff vs. patience.
9. Fantasy vs. reality.
10. Technology-as-friend vs. technology-as-foe.

How do these changes influence the acquisition of graphical subjects, and how can they be used to improve graphical competence of engineers in subjects such as geometry for artists, engineering graphics and drafting? The first three points already imply that information should be provided in a dynamic, constantly changing, fast-paced way. This may be achieved not only by means of multimedia, but also by implementing elements of traditional education. These include freehand sketching, drafting by hand on paper, making 2D drafts in CAD, 3D modeling in CAD and making physical paper models. Combining different methods allows students to acquire information from various environments – physical and digital, two-dimensional and three-dimensional, perceive the information with their eyes and ears, by touching and smelling (the smell of paint and glue). This creates a highly individual, multifaceted volume of knowledge, as well as the result of its application. The fourth point puts an emphasis on the sense of purpose and cause-effect relations. The student wishes to know what benefits they will receive – a mark, a bonus, exemption from exams etc. The fifth point supports graphical subjects, since they focus on the creation of a picture and the resulting picture as such. Points 7-10 are more related to students' individual activities – such as individual projects, research assignments, competitions etc. These entail searching for information on the Internet, working

and studying in teams. All of these elements have already been incorporated into the study process of Riga Technical University's graphical subjects for engineers (Dobelis, Veide, Leja, 2006). Yet the sixth point – games – is still absent.

Point six – juxtaposition of work and play – addresses the fact that the generation in question is more likely to acquire information through interaction which is not forced upon them – through happiness, games, enquiry – rather than through a complicated study process which implies hard work (Csikszentmihalyi, 1991). This is why computer games offer a chance to make the learning process more active, enjoyable and diverse. There are many educational simulations and games across the world. Which games in particular should be chosen to teach graphical subjects? Is this option even necessary? What do students think about it? In the academic year 2010/11 a survey was conducted among students of the Architecture and Civil Engineering faculties of the Riga Technical University (150 respondents) concerning computer games and their effect on the study process. The answers to one of the questions, "Do you think that computer games would enhance the study process?" are as follows:

- 49% - No,
- 24% - Yes,
- 25% - I don't know,
- 2% - no response.

Students who have had no experience with games in this subject cannot formulate an honest opinion, therefore the answer "I don't know" may be regarded as the only non-biased one. Therefore, the issue can only be clarified by actually creating a game and testing it in the study environment. At the moment, a game suitable for this purpose already exists. What, then, are the principles behind the creation of this and other games?

1. EDUCATIONAL GAMES AND SIMULATIONS

Simulation is a model of a certain real-life system. A simulated environment reacts in a dynamic and consistent way to a user's actions (Quinn, 2005). There are two types of simulation:

- operational – aimed to train the performance of a certain action.
- conceptual – aimed to teach conceptual knowledge and solving problems.

A game may include elements of simulation; however, a game also possesses specific elements of its own. These are:

- aim;
- rules;
- specific context.

In order for a game to be useful in terms of education, it should unite the positive features of gaming and education. Educational content should be enhanced with the appeal of games and their ability to engage participants. What makes games and simulations appealing to the user? (Mayer, 2005)

- Challenge (testing one's strength) – the difficulty level should not be too low or too high. An overly difficult game would be impossible to play. An easy game, on the other hand, would prove to be boring.
- Control – the player should feel that they are in control of the game. Every action results in consequences.
- Curiosity – what happens if I perform a certain action?
- Fantasy – the opportunity to experience an artificial environment.

What makes a game unappealing to users?

- A poorly designed interface, low quality graphics/sound/input control.
- Inappropriate difficulty level.
- Inappropriate pace (too slow).

What issues may arise when making an educational computer game?

- The aims of the game and the education process may not coincide
- Too many challenges, fantasy and control elements may drive a student's attention away from the main learning aim
- Twitching elements (jerking, jumping) in a game do not provide enough time for thought, if time is one of the evaluating criteria
- A highly realistic game loaded with detail results in an overload of one's memory and drives one's attention away from the main point
- Highly inquisitive games with many activities, but not enough knowledge provided. Sometimes students get carried away with such games but do not learn new facts, which results in time wasted.

Thus, games and simulations should focus on the main aim of the learning process – acquisition of knowledge – instead of being attractive in other ways. (Mayer, 2005) advises to follow empirically proven game/simulation principles and also provides technical advice on game creation.

1. A game type appropriate for the aims of education. It is highly important to know how various game types work and how their taxonomy corresponds to the taxonomy of education (Winters, 2006), in order to place the main aim – training skills and knowledge – into the gaming environment. For example:
    a. Question and answer (Jeopardy) games are suitable for acquisition of verbal information and concrete concepts.
    b. Arcade games train the speed of reaction, automatism and visual processes.
    c. Adventure games facilitate solving problems and proving hypotheses.
    d. Action games – coordination and reflex:
    - Military
    - Driving, flying
    - Sports
    - 3D shooting (navigation skills)

    e. board games with strategy elements
    f. strategy games – planning, navigation, negotiation
    g. fantasy role-play games
    h. multiplayer games, e.g. Massively Multiplayer Online Role-Playing Games
    i. combined-type games
2. Knowledge should determine progress in a game. The main points of an educational material should also become the main points in achieving the goal of a game. Which features of a game/simulation facilitate the learning process? These are usually the features which activate cognition processes related to the learning material and at the same time do not cause the short term memory to overload.
3. After a correct answer has been provided, the student should think about it in more detail, or should be asked to justify or explain the answer. It is important that only correct answers should be explained.
4. The interface should be as simple as possible, without any unnecessary elements. Graphical images should only contain information relevant to the study subject. Elements of fantasy should be applied in moderation.
5. Optimization of mental workload:
    a. Increasing difficulty levels.
    b. Minimized interface design.
    c. "Training wheels" – only part of the input keys are active at a given moment.

d. "Faded worked examples" – consequential acquisition of authority from the game's agent.

e. Pace – optimized to allow for thinking time.

f. Instructions and hints necessary for playing.

2. SPECIFICS OF THE GRAPHICAL OBJECTS

The key aspects for such subjects as engineering graphics, descriptive geometry and drawing are of the following:

1. Spatial thinking
2. Visualization
3. Constructive thinking
4. Perception and processing of the information
5. Different solutions for the same task
6. The optimum choice of options
7. Knowledge of the standards and ability to use them
8. Graphical culture

Three-dimensional thinking, visualization and constructive thinking should be trained. This means that problems requiring these skills should be solved over and over again (Kotarska-Bozena, 2008) (Meyers, 2000). At the moment students of Riga Technical University do not have enough time in their graphical subject classes to train these skills as much as necessary in an auditorium, therefore an individual training session in the time and space comfortable for the student would be a good solution; besides, this kind of training does not demand the presence of a teacher. However, this requires motivation – either this training should be obligatory (with control required), or it should be pleasant – therefore it could be done with the help of a game. The latter also insures control of the results within the game. Feedback is provided instantly, and the participation of a lecturer is not required. As concerns the time and space issue, the most convenient means of communication is the mobile phone. Students spend a great amount of time traveling from one place to another and often spend the time playing games. Why not let them be educational games?

The international project eBig3 focuses on the possibility of using the most wide-spread technical equipment – television, PCs with an Internet connection and mobile phones – in e-learning. The strong points of each of these devices should be used and united to provide an optimized environment and means for education (Kapenieks, Zuga, Stale, Jirgensons, 2012) (Zuga, Slaidins, Kapenieks, Strazds, 2006). (Jirgensons,2012). The benefit of a mobile phone within the education process is its constant accessibility; however, its disadvantage is that the learning material should be divided into small fragments. Nevertheless, an educational game can fit perfectly on a mobile phone and can be used in any circumstances. If this game is made to be attractive enough, it could provide a great opportunity to train three-dimensional thinking, visualization and constructive thinking skills. These three skills are essential for graphical education of engineers and architects and should be acquired even before the learning of professional information. Every single skill requires different tasks and, therefore, different games. Actually, all these games can be developed without information technologies, which have been done for centuries. Still, this has no appeal to the modern "digital" generation, therefore their language and their technologies, which they have known since early childhood, should be used for successful education (Suki, Norazah Mohd, Norbyah Mohd Suki, 2011), (Azevedo, 2002). Games would serve as an "exercise machine" available at any given moment.

3. THE MODEL OF A GAME

Every educational aim requires a different game model.

A game model suitable for training three-dimensional thinking is shown in Figure 1. In this game a student is shown a 3D model which can be rotated and viewed from all sides. Then, the model becomes fixed

according to the three projection planes, and a fixed 3D image appears – as an axonometric projection. The next step is three principal views of the object in orthogonal projection. The student's task is to label the surfaces of the object in different views according to the markings on the image of the model. The model itself remains rotatable. In the last part of the game, the student should fill in a table, indicating with symbols the spatial layout of the object's elements in relation to the principal view planes.

The same game may be reversed – in this case, the student must mark surfaces on the model's fixed image according to the markings on the principal views. The educational aim of this game is to develop the student's ability to transfer back and forth from a spatial model to a flat image, i.e. the draft. Objects change according to the various difficulty levels of the game. On the lowest level, objects consist of projection planes and level planes. In the next levels the number of planes and the difficulty of objects increase, and oblique planes appear. Rotation surfaces also appear in higher levels. In this case the placement of rotation axes in relation to principal projection planes has to be recorded in the placement table.

The aim of this game is to mark all the surfaces correctly and to fill in the table. Points are given for correct answers. If the student makes mistakes, they should either search for them (to regain points), or if they don't, the mistakes will be highlighted (this results in points taken away). Time is accounted for, but only for the student's own information. Timing is not essential in getting to the next level as long as the answer is correct. The student's level of three-dimensional thinking is controlled by PSVT:R (The Purdue Spatial Visualization Test: Visualisation of Rotations) before and after the game (Leopold, Gorska, Sorby, 2001).

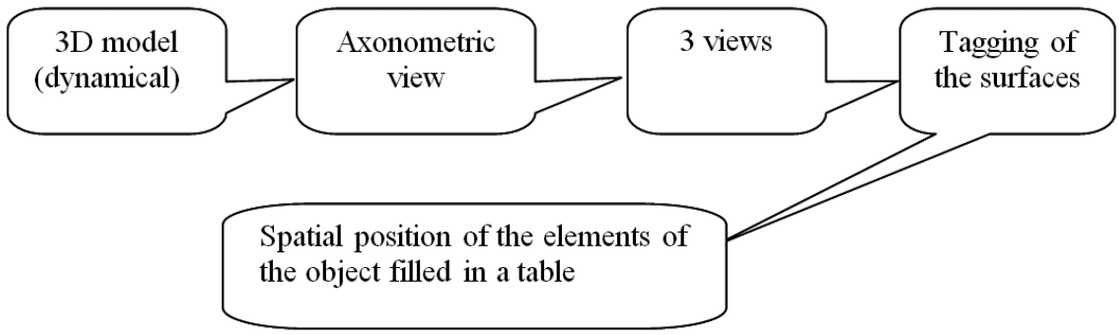

Figure 1. The model of a game for development of the spatial ability.

The student's points and rating are shown in the game.

Game models for visualization skill development are shown in Figure 2. Visualization is required to generate within one's own inner space a 3D model from a flat draft, which could be mentally rotated, viewed from all sides, transformed, dissected by a plane, imagined while overlapping other objects etc.

This type of game begins with three principal views of an object (Fig. 2.a). The correct model should be chosen from the offered ones. If the right model is chosen, a fourth possible view of this object has to be chosen from the offered options. In the next stage a placement symbol of a cutting plane is displayed and the correct section has to be chosen. An opposite problem is displayed in Figure 2.b. Here a model and section are displayed, and the correct cutting plane placement has to be found. A more complicated option is displayed in Figure 2.c, where 3 object models and 9 principal views are provided. They have to be combined in the correct sequence according to the principal view placement next to every model.

A game model for constructive thinking development is displayed in Figure 3. Constructive thinking enables the student to model objects from primitive ones and, vice versa, to determine what basic forms were used to create a certain spatial object. It is best to start with the simplest things – two-dimensional objects, i.e. flat outlines. The student is shown a flat object, which has to be modeled from the provided parametric primitives. On the first level these are rectangles, triangles and circles. Every object has its own coordinate system and centre. In this game, size matters. The sizes can be changed – the primitives are parametric. A modeling space with its own global coordinate system (joint for all objects) is also provided. The object to be constructed is provided with all measurements, which have to be exactly the same. The modeling process implements Boolean operations – conjunction, subtraction and splitting. Whenever

Boolean operations are used, the outlines do not overlay each other, and only the resulting outline remains. On the lower levels simpler forms are modelled; further on the forms become more complicated, and other primitives, such as hexagons, are added. The same task performed in a three-dimensional space is much more difficult. In this case the primitives are spatial objects – prisms, cylinders, cones, pyramids and spheres, and there are three coordinate axes. While the modeling task is performed, the student also has to fill in a table of performed actions. This provides training not only for constructive thinking, but also for modeling and programming skills.

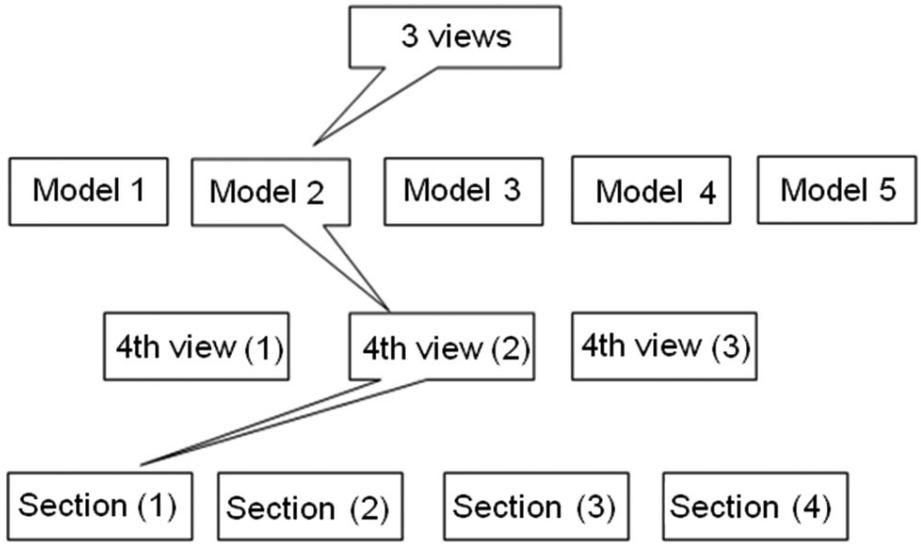

Figure 2.a. The model of a game for development of spatial visualization ability (1).

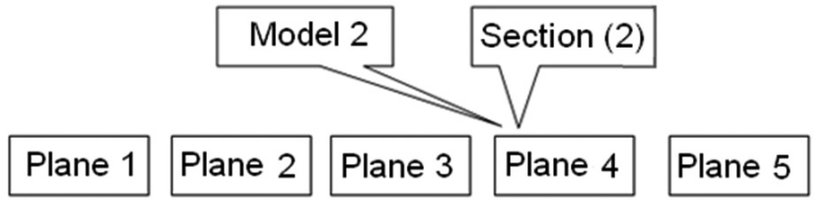

Figure 2.b. The model of a game for development of spatial visualization ability (2).

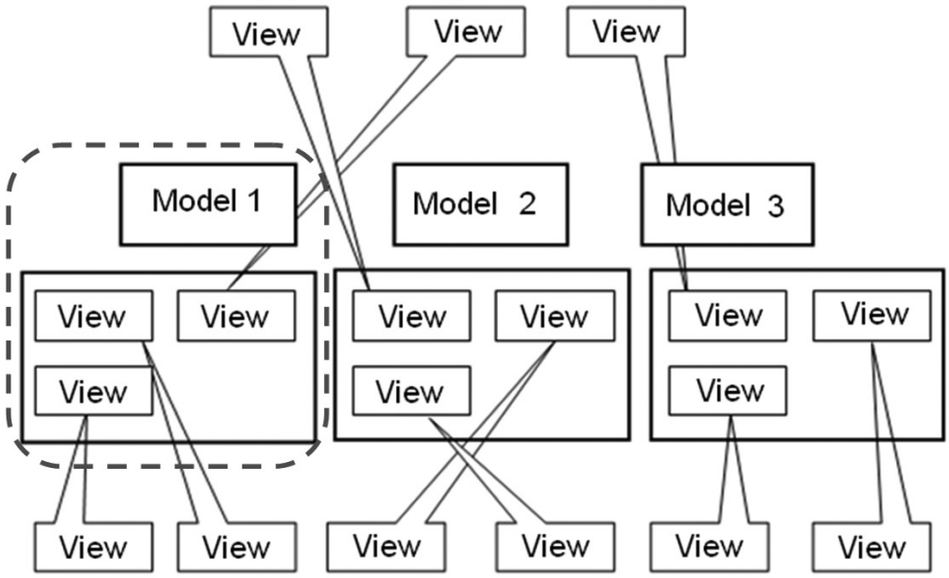

Figure 2.c. Visualization of the Model 1.

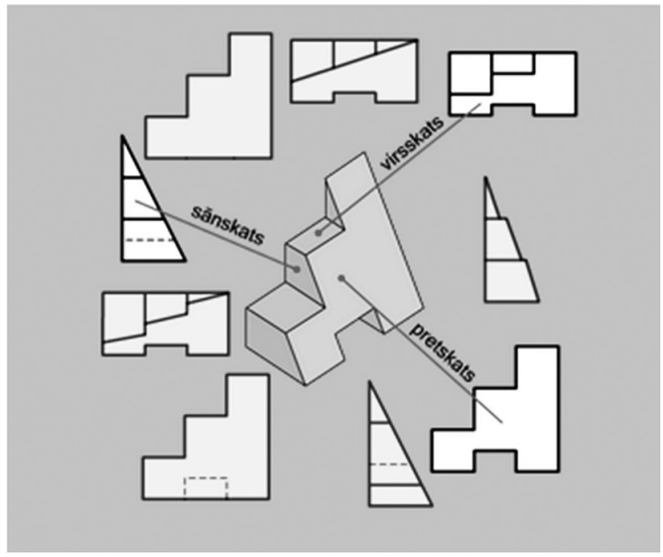

Figure 2.c.c. Visualization of the Model 1 from Figure 2.c

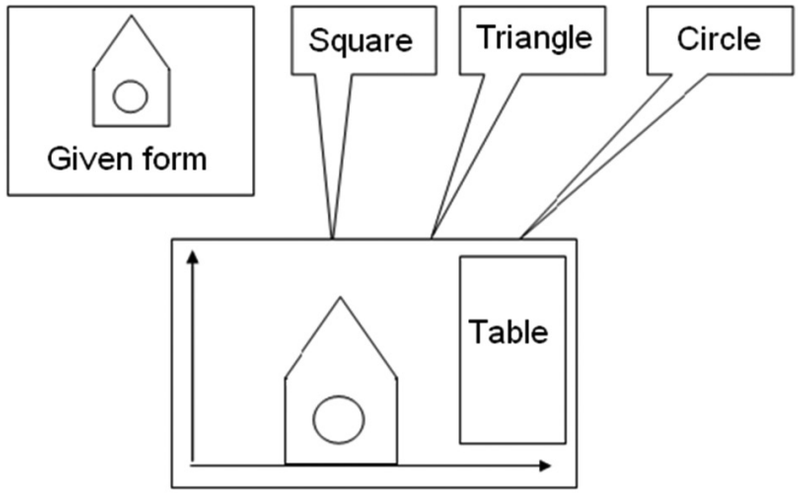

Figure 3. The model of a game for development of constructive thinking.

CONCLUSIONS

1. Teaching graphical subjects can be made more attractive by using multimedia as well as various environments – both physical and digital.
2. Not only the presentation of information can be adapted to the changes in the young people's way of thinking; the same can be done regarding means of training.
3. In this case teaching would be conducted with a computer game which serves as an "exercise machine" for specific engineering-focused skills.
4. Not only knowledge, but also certain qualities and skills get trained.
5. Each educational aim requires a separate game model focusing on specific tasks.

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The Role of Virtual Learning Environment in the ICT Based Study Process

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ABSTRACT. When applied ICT to education, we hold implicit within this definition that learning can occur asynchronously and at distance – the traditional classroom environment is not a pre-requisite for delivery and receipt of learning. Further, we hold that even though the traditional classroom may still be the focal point of teaching and learning for much of the time, the practices and actions within that environment must change and that ICT is both the driver and the enabler for this change.
The paper presents a research on the role of virtual learning environment in the ICT based study. Totally 26 respondents were invited to answer the interview questionnaire. Male there were 15 persons and female – 11 persons. Female are becoming more active when we speak about information communication technologies they are interested more and more and are happy to be involved to IT based activities.

Keywords: *virtual environment, teachers, students, platforms.*

Introduction

ICT is now becoming fully implemented in all aspects of our lives – from purchasing decisions based on peer-review and feedback to the "always-on" news and communication channels of Twitter and Facebook. The impact is also emerging in the classroom (or perhaps we should say the "Learning Space" or "educational environment"). The expectations of our students have changed, they no longer expect (and did they ever enjoy?) all teaching to be didactic, led from the front and one-to-many. They expect and, in our opinion, learn more readily through "interactive and bi-directional communication systems".

Our students live a part of their lives in "alternative spaces" – Facebook, YouTube, Xbox Live etc. And their communication and creation expectations have altered.

As educators we can, and must, respond to this – the use of ICT, and in particular Web 2.0 tools, favours and supports interaction and collaboration among students and enables new means of communicating and interacting both in real and asynchronous time.

Internet enabled ICT also provides access to "all the world's knowledge" in an infinite resource library that can be tapped into, explored, exploited and shared.

Information communication technologies are the whole of digital approaches and tools which allow creating, collecting, storing, transforming and disseminating the information. It is needed to emphasize that the purpose of information that is transferred using these technologies is to define, communicate, collaborate, share information, and all of this is ensured by various ICT tools. ICT has an impact on nearly every aspect of our lives - from working to socialising, from learning to playing. With regard to educational context, the purpose of ICT could be comprehended widely as a general learning, cooperative learning, reflection, etc. The digital age has transformed the way young people communicate, network, seek help, access information and learn. Teachers must identify that young people are now an online population and access is through a variety of means such as computers, TV and mobile phones.

1. RESEARCH RESULTS ON VIRTUAL LEARNING ENVIRONMENT

The present work aims to investigate the use of Moodle E-Learning Platforms in Educational Institutions to support the learning and teaching. The following data result from the administration of questionnaires to students.

Young Computers Users School (JKM) at Kaunas University of Technology has 10 years' experience working using virtual learning environment Moodle as well as organizing study process online with tutor support and material development as well.

Totally 26 respondents were invited to answer the interview questionnaire. Male there were 15 persons and female – 11 persons. Female are becoming more active when we speak about information communication technologies they are interested more and more and are happy to be involved to IT based activities.

There are discussed questions on internet access is very high speed in Lithuania and it is very important to every child taking studies at school level. We found that every person have a computer and access to the internet.

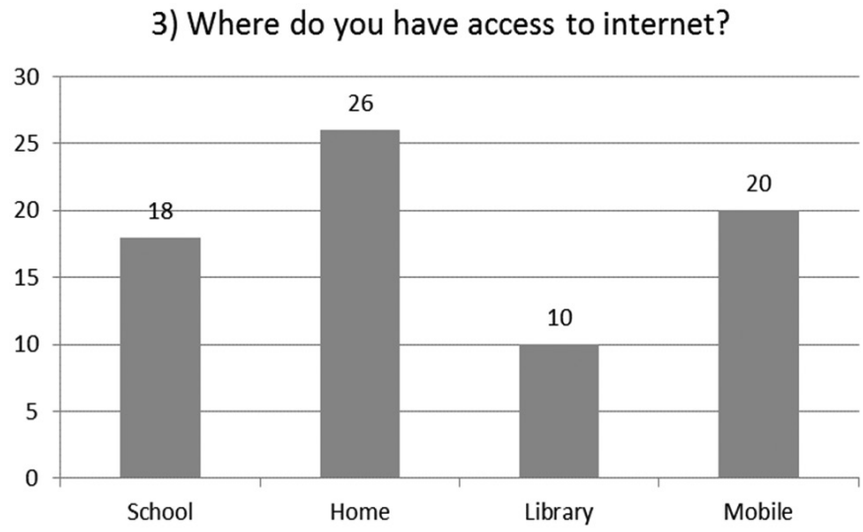

Figure 1. Internet access.

The figure 2 shows how many hours' children are spending time in the internet. 16 out of the 26 respondents answered that they are spending from 4 to 6 hours per day, the other group 6 persons are spending from 7 to 9 hours per day and 2 persons provided information about spending more than 10 hours per day. This is very bad indicator influencing on the health of respondents.

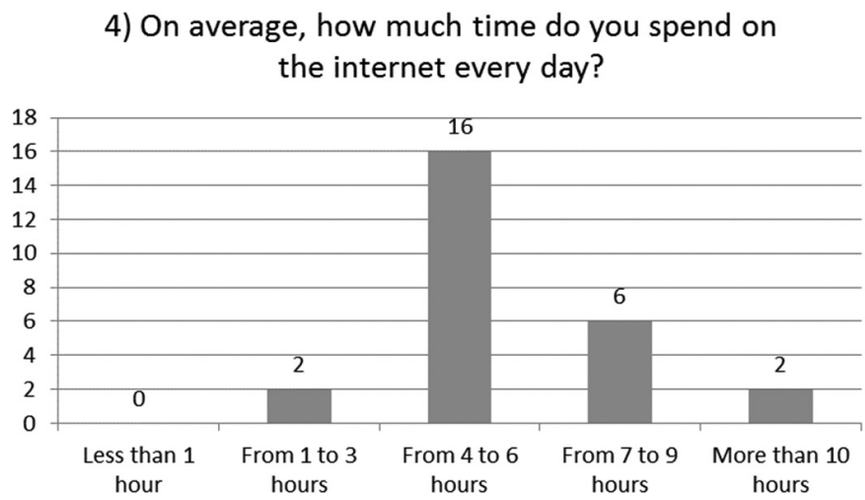

Figure 2. Time spent in a day.

The respondents in the figure 3 are presenting the percentage of time spent for each chosen activity: Social networks and chat 7 respondents are in the frames of 30 percent and 1 in the frames of 100 percent. Reading newspapers selected in the frames of 10 till 20 percent. There is interesting position for updating your blog 15 respondents answered in the frames of 0 percent. Mailbox selected 10 respondents in the frames of 10 percent and 2 respondents in the frames of 100 percent. Navigation of e-commerce sites and on-line purchases selected 8 respondents for 0 and 8 respondents for 10 percent. Research, study, and similar activities to support learning selected 6 for 0 and 6 for 30 percent. YouTube and online videos selected 5 respondents for 10 percent and 5 respondents for 80 percent. Search for information on the web is selected by 7 respondents in the frames of 20 percent. Online games selected by 11 respondents for 0 percent.

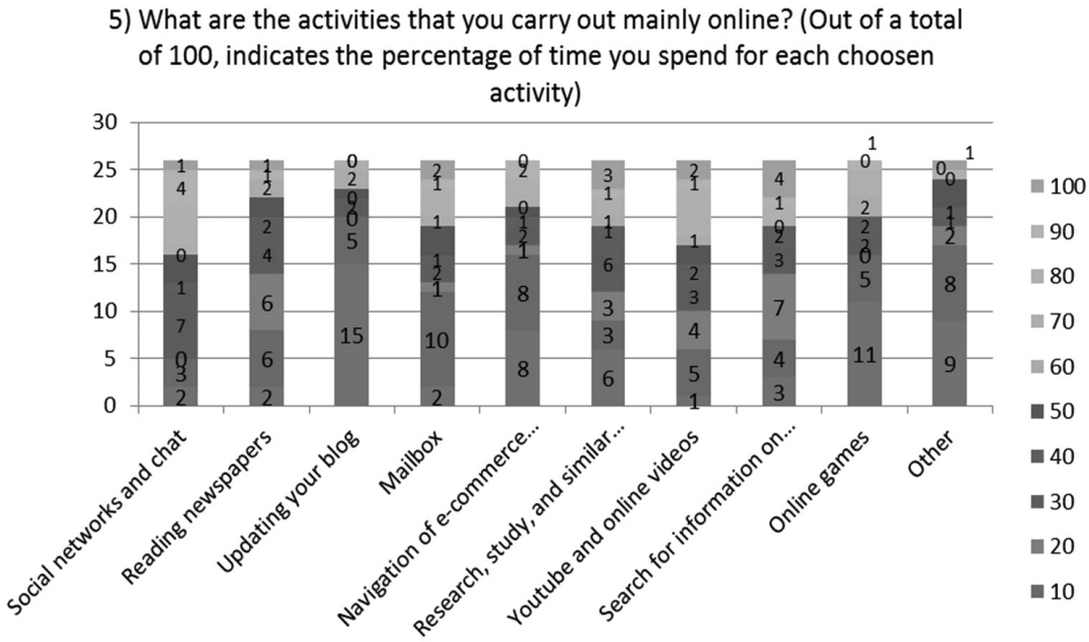

Figure 3. Carried out learning activities.

2. E-LEARNING PLATFORM

E-learning refers to the use of electronic media and information and communication technologies (ICT) in education. E-learning is broadly inclusive of all forms of educational technology in learning and teaching. E-learning is inclusive of, and is broadly synonymous with multimedia learning, technology-enhanced learning (TEL), computer-based instruction (CBI), computer-based training (CBT), computer-assisted instruction or computer-aided instruction (CAI), internet-based training (IBT), web-based training(WBT), online education, virtual education, virtual learning environments (VLE) (which are also called learning platforms), m-learning, and digital educational collaboration. These alternative names emphasize a particular aspect, component or delivery method. E-learning includes numerous types of media that deliver text, audio, images, animation, and streaming video, and includes technology applications and processes such as audio or video tape, satellite TV, CD-ROM, and computer-based learning, as well as local intranet/ extranet and web-based learning. Information and communication systems, whether free-standing or based on either local networks or the Internet in networked learning, underlies many e-learning processes.

A virtual learning environment (VLE), or learning platform, is an e-learning education system based on the web that models conventional in-person education by providing equivalent virtual access to classes, class content, tests, homework, grades, assessments, and other external resources such as academic or museum website links. It is also a social space where students and teacher can interact through threaded discussions or chat. It typically uses Web 2.0 tools for 2-way interaction, and includes a content management system.

Virtual learning can take place synchronously or asynchronously. In synchronous systems, participants meet in “real time”, and teachers conduct live classes in virtual classrooms. Students can communicate through a microphone, chat rights, or by writing on the board. In asynchronous learning, which is sometimes called “self-paced” learning, students are expected to complete lessons and assignments independently through the system. Asynchronous courses have deadlines just as synchronous courses do, but each student is learning at his own pace.

A virtual learning environment can also include students and teachers “meeting” online through a synchronous web-based application. The teacher is able to present lessons through video, PowerPoint, or chatting. The students are able to talk with other students and the teacher, as well as collaborate with each other, answer questions, or pose questions. They can use the tools available through the application to virtually raise their hand, send messages, or answer questions on the screen given by the teacher or student presenter (Vikipedia).

In the figure 4 there are selected main features of e-learning such as a possibility attending online courses (7 respondents), using self-learning (9 respondents), using open source programs and applications (5 respondents), using online platforms (9 respondents), making google personal encyclopedia (3 respondents), manage forums, receive feedback in real-time (2 respondents).

Speaking about e-learning in your educational life up to now. 8 respondents keep that it is important and 8 respondents keep it very important.

Answering to the question how important are the following features to make sure that an educational activity in E-learning has success, 8 respondents answered that important Support the interaction between

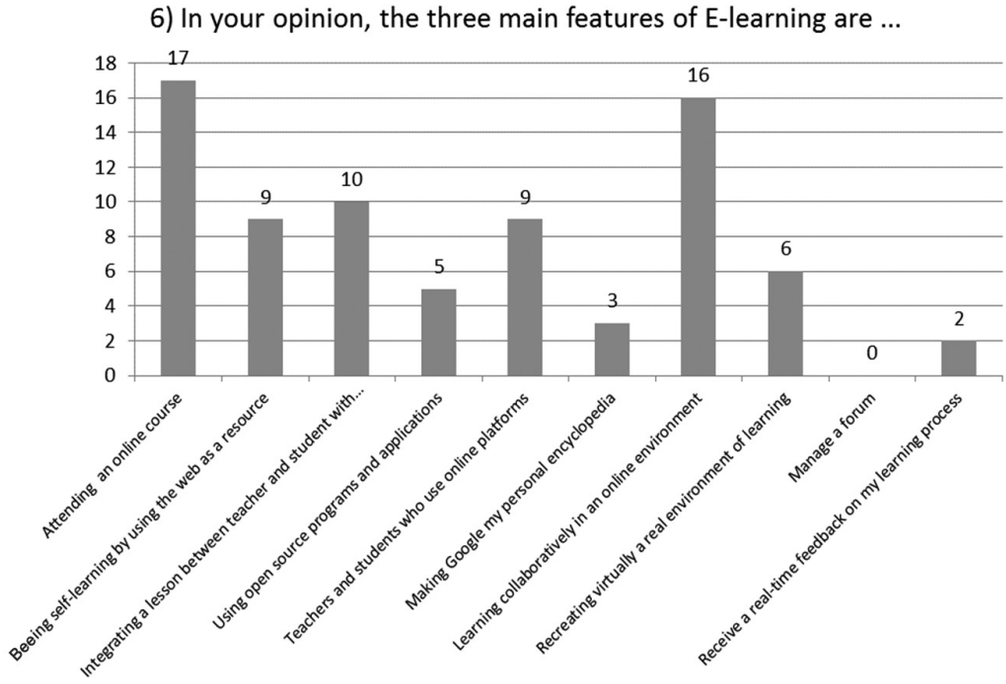

Figure 4. Opinion on the main features of e-Learning.

students; 5 respondents answered that important support the interaction between student and teacher; 6 respondents answered that important developing cognitive processes (memory, attention, understanding, reasoning, problem solving); some importance declared 8 respondents ensuring an emotional and relational communication; 9 respondents presented that very important is knowing how to use technology; 9 respondents keep that very important is accessing to online resources; 11 respondents keep that being self-learning without restrictions of time and space is very important as well; 8 respondents declared that important is receiving an assessment of the level of learning acquired; 8 respondents keep that is very important ensuring quality in learning and guaranteeing easy navigation, the platform needs to be user-friendly; 7 respondents declared that is important to organize the contents of a course to suit your educational goals and needs and 5 respondents declared important accessing a platform through mobile devices (eg, tablet, smartphone).

The next question is about opinion on the three main conditions that impede the use of an E-learning environment 10 respondents mentioned high risk of distraction, 8 respondents mentioned connection problems and low emotional involvement.

All the features of e-learning is evaluated in a very high score for example use and like it very much: videoconference – 9 respondents, Wikipedia – 10 respondents, Search engines – 13 respondents, YouTube – 12 respondents, Online exercises- 9 respondents, E-book – 9 respondents, Forums and chat- 10 respondents, E-mail and E-learning platforms – 13 respondents as well as Social network – 11 respondents.

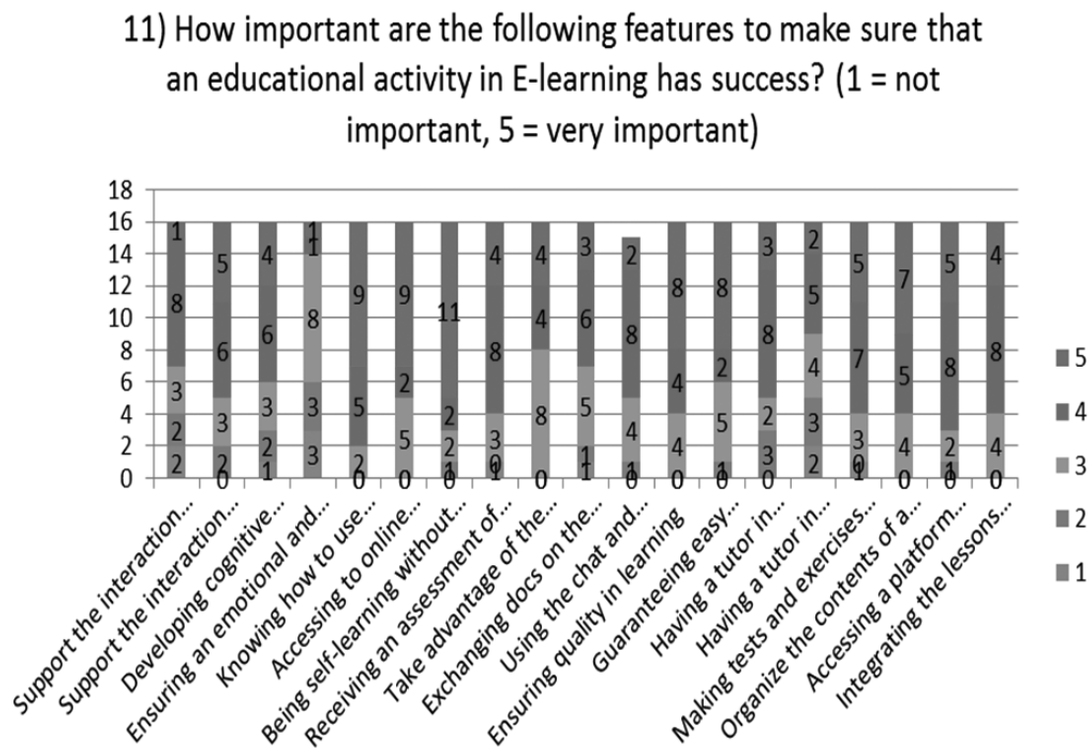

Figure 5. Features on e-learning success.

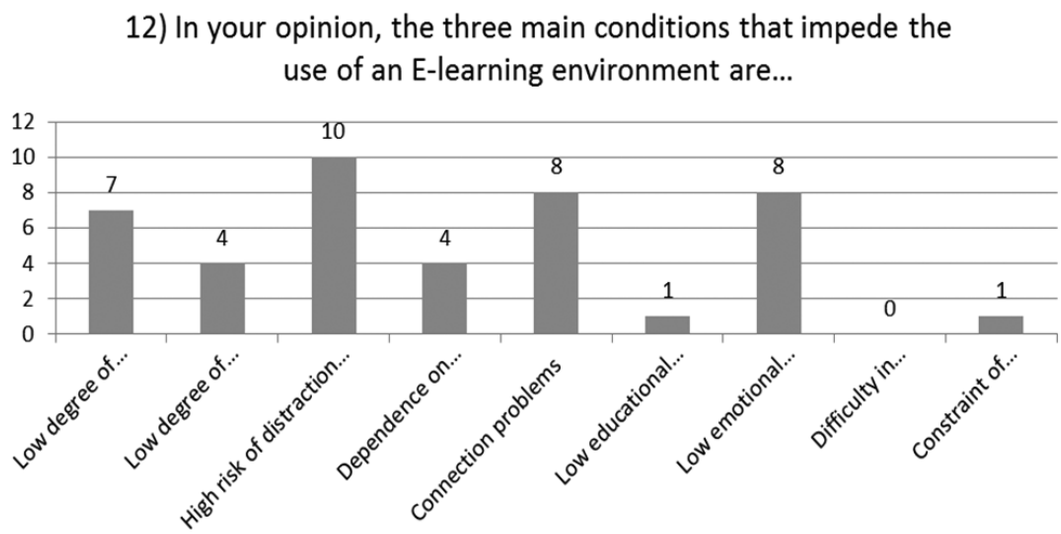

Figure 6. Main conditions that impede the use of e-Learning.

ACKNOWLEDGMENT

The paper is developed in the frames of the research developed during the implementation of the project Moodle E-Learning Platforms and Technologies, Project No. LLP-LdV-PRT-2012-LT-0316.

CONCLUSIONS

ICT is now becoming fully implemented in all aspects of our lives – from purchasing decisions based on peer-review and feedback to the "always-on" news and communication channels of Twitter and Facebook.

Our students live a part of their lives in "alternative spaces" – Facebook, YouTube, Xbox Live etc. And their

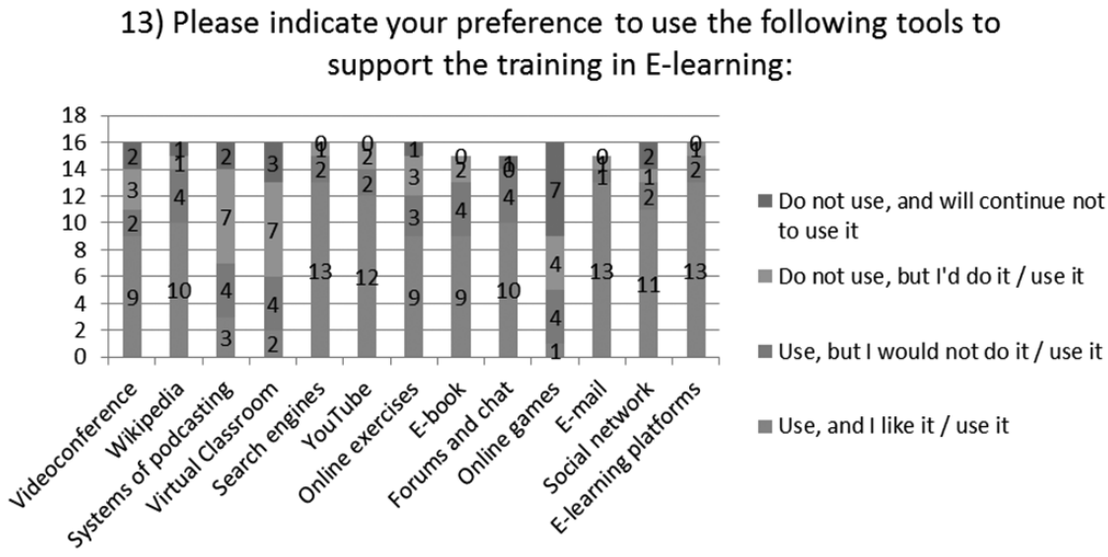

Figure 7. Tools to support e-Learning.

communication and creation expectations have altered.

Internet enabled ICT also provides access to "all the world's knowledge" in an infinite resource library that can be tapped into, explored, exploited and shared.

Information communication technologies are the whole of digital approaches and tools which allow creating, collecting, storing, transforming and disseminating the information.

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Innovation as a challenge for the traditional University: case of IT in study process

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ABSTRACT. It is aimed in this paper to present the perspective of students, teachers and representatives of administration (based on theoretical and empirical findings) on the cooperation in virtual environments in the context of the 'innovation-resistant' organizations. Two theoretical models are presented: one of them emphasizes (and provides arguments for that) the dynamic and approach that universities have for technologies. Another one points out certain hesitance towards application of technologies in study process. Findings from an empirical data (from one of the Lithuanian universities- x) show that the community is of this x university is quite positive towards the application of technologies for studies, however, a full and productive application still remains to be achieved.

Keywords: *innovations; e-learning; digital natives; digital immigrants; virtual collaboration, communication and teamwork environment.*

Introduction

According to M. C. Christensen, H., J. Eyring [1] traditions are important at the University and researches "must understand not only current realities, especially the threat of competitive disruption, but also how universities have evolved over the past several hundred years. Even more than most organizations, traditional universities are products of their history" [1]. A community at any university is comprised of researchers, students, teachers, and representatives of administration, also of support units, including IT professionals. Therefore dominant perspective of all groups on the realities and changes of a tradition at university is important. Advancements in IT are probably the most evident in this context, especially, as they have an important and obvious impact on- then- further advancements in science and technology. Therefore the question B.Fischer formulates: whether there is anyone still believing that traditional auditorium based study process will dominate in the future is almost void. Author himself envisages future as a glass-kaleidoscope, with a great number of teaching/learning nodes; which consist of what we used to call curriculum, however , which is being related to a learner (or used), with an adherence to an individual learning styles [2]. However, author also admits- and authors of this paper agree- that this genre is neither cheap, nor easy. It might be fascinated though; however, it requires creativity, insights, the team that has an ambition to implement it should be dedicated and ready for a complicated array of activities. And the most important factor here is the fact that cooperation and contributions of all representatives of the community are essential. When the business world is rapidly changing and using continuously developing ICT, according to A.L.Davidson and D.Waddington [3], universities are establishments technologically resistant to the admission of new paradigms. Admission policy of innovations plays a significant role at universities, i.e. may slow the growth and changes as well as may accelerate them. One of the key obstacles related to the successful implementation of ICT at a lot of European universities is the fact that the managerial do not support and determine relevant ICT priorities [4].

Problem question of the research: Innovation as a challenge for the traditional University: slow the growth of changes or accelerate them?

The object of the study is virtual collaboration, communication and teamwork environment (VCCTE) at a university.

The study aims at revealing students', teachers' and administration's perspective on VCCTE at the University.

Methodology. Pragmatism; according to which it is necessary to seek for an optimal result under the lowest expenditure. Structuralism; it states that for a purpose of studying a complex object, it is possible to divide it into elements and functions, and, having analyzed those separately, the entire object may be interpreted through joining the analyzed parts into the whole.

Research methods. Critical analysis of scientific literature and documents and questionnaire survey were used for this study.

1. INNOVATIONS IN TRADITIONAL UNIVERSITY

Some universities are quite conservative about the way study process is organized, and innovations are discrete rather than integral part of activities [5]. Surely, there are a number of exceptions, and namely, universities that offer on-line courses or even on-line study program's, moreover, there are universities, activities of which are exclusively on-line based. S.Popenici and S.Kerr [6], having analyzed developments of universities globally, present new risks that universities have to face. Strangely enough, the application of technologies, including the ones used to support MOOC (Massive Open Online Course), are enlisted among the risks [6].

At a traditional university, which with an accepted degree of accuracy may be called "innovation resistant" [3] organization, a number (or even a majority) of teachers and students have either heard or even tried out technologies for organizing teaching and learning. However, still in many cases, application of technologies for studies represents rather a discrete phenomenon that an established practices. In order to transform a discrete phenomenon into an established practice, at least a half of a community should be participating in the process. Analysis of references shows that in most cases participants of teaching/learning process understand possible positive influences and even effectiveness of technologies on teaching and learning ([7], [8], [9]). However, as in almost any other sphere of human activity, in this sphere also, the theory is more developed than the practice. There are still organizations that do not apply web 2.0 provisions for teaching/learning; also, teaching is organized based on pre-constructivist paradigms [10]. Surely, there are also many outstanding positive examples of productive and rewarding practices of implementing technologies into a traditional study process ([11], [9], [12]). On the other hand, some of them are exactly that: illustration of an outstanding example rather than an example of regular practice. Universities apply technologies into a study process based on a tradition of hundreds of years. T. Berger [13] notes that due to this fact it is a challenge and a certain revolution for some universities to implement technologies for studies, as the attempt requires changes in organizational culture and sometimes even the need to withstand open or covert opposition of its members and stake holders.

Culture (therefore organizational culture also) is based on a number of innate norms and values, and these are reproduced from a generation to a generation via a teaching and learning interaction. Therefore, with a number and assortment of IT applications for teaching and learning, this interaction inevitably is changed to some extent. Therefore, inevitably, culture is being changed to some extent. Therefore we may with a significant degree of accuracy state that we are witnessing the change of culture, and namely, probably an information or knowledge culture is emerging under our very eye.

A. Ausra [14] states that probably for the first time in human history information and scientific knowledge became both the engine for development of a contemporary society, and one of the main (if not the main), products of economies. The way information is handled and to what extent and how effectively it is being transformed into knowledge (of an individual) and the way then that knowledge is transformed back to information (for usage of wider communities and circles of customers) defines the effectiveness and competitiveness of societies. Therefore competence of information handling: ability to search and critically appraise, filter and synthesize information becomes one of the key elements for the success in both professional and even personal walks of life. As [14] put it bluntly - a person should learn to manage information in order to avoid being ruled by information.

The youth born in 1980s and later by some authors are called Digital natives (or Net generation) (further on: "d-natives") ([15], [16]). Today these young people are young professionals, students and pupils who spend a lot of their time online. Modern web technologies enter daily life and broaden its boundaries [17]. "D-natives" are willing to apply modern technologies of web in many fields of life and certainly at university. Therefore to monitor patterns of using technologies (and information, accessed that way) is of extreme importance in order to build prognosis for the future developments of organizations' and even human societies. Even several years ago, as empirical findings revealed, at least 50% of adolescents in the USA were active bloggers [18].

The number of publications on "d-natives" are not yet numerous in Lithuanian language, however, the ones available, and available globally, emphasize the features of a contemporary young person (the one born after 1980) - and namely, that such person is a multi-tasker, as Talbot put it [17].

An effective implementation of technologies in study process serves as an evidence that organization is dynamic and orientated towards creation of a positive environment both at micro and at macro levels. In a way implementation and application of IT in study process serves as an evidence about an organization striving towards holistic management, because in most cases the study process is addressed as the last one, with other processes (management: administration, budgeting; supporting students' activities other than studies, also supporting research activities) receiving attention in the first place. Theorists note that there is no one pattern for the way IT is applied to studies; however, some general characteristics may be identified. And the fact that in most cases study process (supporting teaching and learning interactions) is addressed the last is one of those characteristics. One of the reasons for this tendency is the complex interactions of teachers and students, and also, a complexity of needs of teachers and students. Also, a university has its own organizational goals that not in all cases coincide with the needs and expectations of teachers and students, and in many cases, of other staff members. Moreover, a universal methodology for identifying needs does not exist. Therefore the complexity only increases, and therefore, it may take much longer than it was initially planned to implement some ideas and IT opportunities ([7], [19]). In many cases the domino effect is used: that is, a university F, uses an example of university J, because the approach university J applied turned out to be a success for that university J. However – and that is an important point for a focused reflection – what worked for university J, may not work for university F, as in university F quite a different set of factors works. Then the failure or at least a lower level of success in its own turn may generate disappointment and in extreme cases: resistance for further actions [11]. The complexity of factors and of circumstances serve as an explanation for a process of applying IT in studies being more difficult and longer than anticipated. In summary it can be assumed that the introduction of ICT into the learning process makes the complex task of not only the lack of methodology (or methodologies variety), but the actors and heterogeneity of the groups. It is possible to identify "d-natives" and "d-immigrants" for all groups of actors of study process today.

Process of application of VCCTE is based on analyzing e-learning as a socio-cultural system, which is comprised of a set of elements: technologies (ICT); processes, interactions; contents (information); participants (teachers, students, ICT professionals). In this case interests of all the actors of the learning and teaching process must be taken into account, these interests being rather different. For students it is important to have a possibility to participate in the study process, to use modern learning tools and to acquire quality knowledge. Student's activities involve search for information, generation of new information and development of other elements of a competence of handling information. Teachers and administration at a university must ensure the necessary conditions for meeting students' needs, but they have their own interests as well, and these interests shouldn't be ignored. Technology based teaching and learning (e.g., development of study materials) is directly related to an increased workload for teachers; therefore this particular group of organization are concerned about the workload and its compensation. Administration is interested in study infrastructure support and costs of organizing study process. Also an organizational context of a certain university should be considered: what are its needs; who are its clients; what is the experience in using ICT. Therefore IT professionals should be flexible and able to communicate about the software, its customization characteristics and provide a support.

Moore's [20] diffusion model divides the adopters of innovations into five categories. Technology Enthusiasts like to play with new technology, even if nobody else around is using it (as E.M.Rogers [21] notes, normally one may expect to have up to 2.5 % of members of organization, who share the enthusiasm). Early Adopters communicate with Technology Enthusiasts and are rather easily convinced to apply new technology in their activities (one may expect to have 13.5 % of such people in any organization [21]. However, these two categories of adopters are the minority. In order to move to a really large-scale adoption, Pragmatists (or Early Majority) should be persuaded to join (34 % [21]). They are much more risk-averse than Early Adopters, and would adopt innovation if they see examples of other Pragmatists. Therefore, there is a kind of "chasm" between the Early Adopters and Pragmatists, which has to be bridged somehow. If this bridging would be successful and Pragmatists start to adopt, they do that en masse, creating a "tornado" effect. After that, Conservatives (or Late Majority, 34 % [21]) are starting to adopt, driven by the fear to be at competitive disadvantage, and much later, Laggards (16 % [21]) come in. Similar tendencies may be observed also at universities, especially, from the perspective of applying IT for studies. There are teachers and students at universities who start new activities, initiate new practices and apply technological solutions that merely hit the market. And there are also teachers and students who have to be

encouraged twice for trying out new things ([22], [23]). The successful cases, that we observe, are usually implemented by technology enthusiasts or visionaries, but the pragmatists, representing the mass users, are not taking over, as sometimes measures are not taken to bridge the "chasm". G. A. Moore [20] also suggests a solution to the "chasm-crossing" problem. He suggests to build a "whole" product, a bundled innovative solution for a particular vertical segment (in this case university). The "bowling alley" principle is used in this solution, both user segments and products being added one-by-one, carefully replicating and expanding each successful application. As in all social system, a role of an individual (that is, individual teacher; individual student) may not be underestimated for the success of the whole process [9].

2. EMPIRICAL STUDY ON PERSPECTIVES OF UNIVERSITY TEACHERS, STUDENTS AND ADMINISTRATION ON IMPLEMENTATION OF VIRTUAL ENVIRONMENTS FOR COOPERATION AND COMMUNICATION IN STUDIES

A study was carried out in x Lithuanian university, during September- October, 2013, after a year from a moment of introduction of virtual environment. The research sample consisted of 104 students, 73 teachers, 55 administration staff. The age of the students, who participated varied from 19 to 26, the age of the university teachers, who participated in a survey, varied from 30 to 64 and the age of the administration staff - varied from 22 to 62.

If a concept of "d-natives" is to be used, we may state that sample consisted of both d-natives and d-immigrants. We can see that the professors, associate professors and lecturers (Fig. 1) participated in the survey more intensively than assistants. Therefore, it can be assumed that professors, associate professors and lecturers are more receptive to innovation than assistants; however, such assumption is just indicative and by no means should be considered without further analysis. At x university 14% of professors, 21 % of associated professors, 27% of lecturers and 38% of assistants are employed.

TABLE 1. INTRANET FUNCTIONS, WHICH TEACHERS.

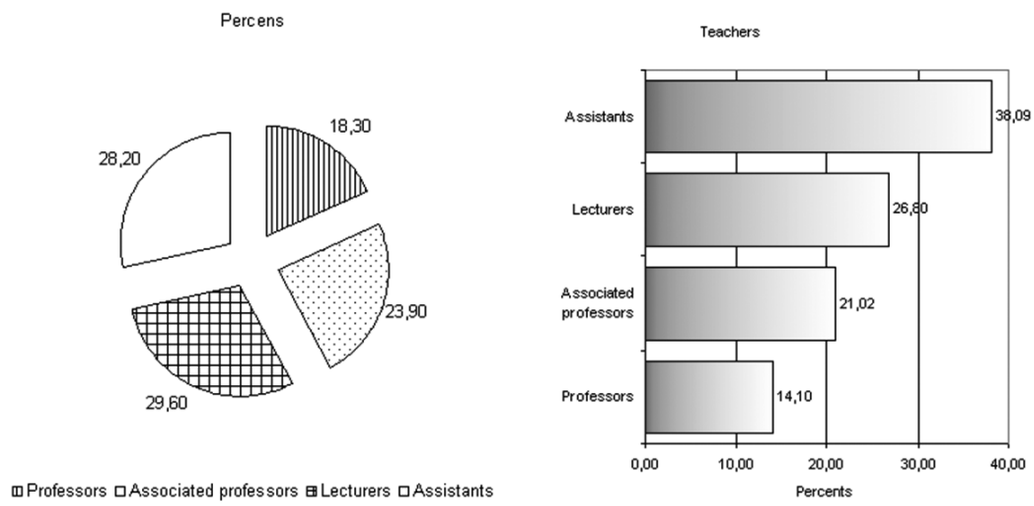

Figure 1. The frequency of teachers' (the aspect of position at x university) – on the left. Representation of teachers (the aspect of position at x university) in a sample – on the right.

3. STUDENTS AND ADMINISTRATIVE STAFF KNOW AND USE

More than a fifth of teachers use office e-mail constantly, almost a third participates in discussions in intranet, and slightly more than one third publish study materials on-line. Here it is worth mentioning that in Lithuania there is still some lack of teaching/learning materials specifically for study topics and also more general information is missing (Fig. 2).

This fact has a rational explanation. Lithuania is a small country, with less than 3 mln. people, therefore the possibilities and resources to develop an up-to-date and qualitative set of educational resources, especially, open educational resources is difficult if not impossible to achieve. As the body of knowledge changes and

K1: E-mail; K2: Calendars; K3: Collaboration tools; K4: Learning material storage and sharing; K5: Instant messaging;	K6: Files sharing; K7: Profiles; K8: Workspaces; K9: University discussions; K10: Contacts (address book, easy to connect with people fast).

increases so fast, it is of utmost importance to constantly monitor on-line resources, to update them. Economical effectiveness becomes a crucial factor in the process, and, as also the experience and data of an international team show, it is interrelated with the expectations for the quality of experiences in studies (2013-4107 /001-001, Nr. 543239-LLP-1-2013-1-LV-KA2-KA2NW; LangOER Network).

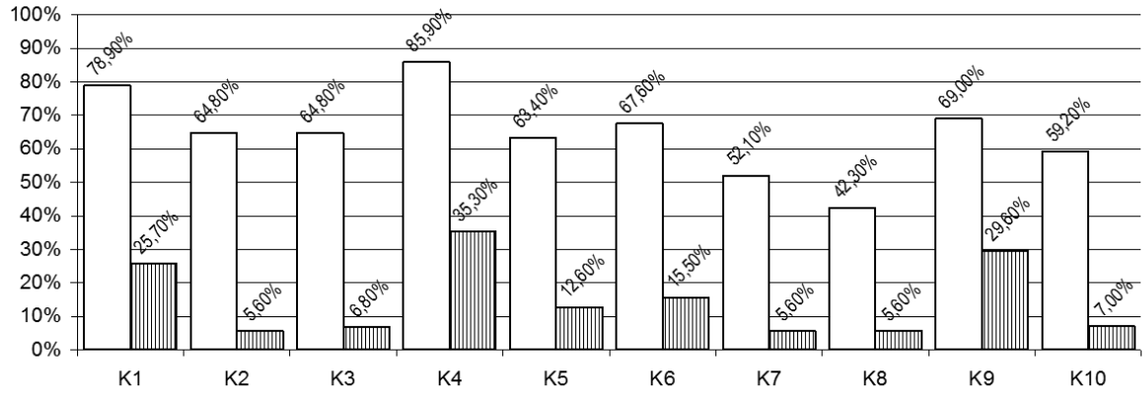

Figure 2. University teachers know about functions of intranet (VCCTE), however, only some of them actually use the functions directly for study process.

Fig. 3 illustrates data about students' activity in VCCTE. There K4 codes down-loading Learning material. All the other codes mean the same activities as in Fig. 2 and Table 1. Findings show that a third of students use university's e-mail, one fifth uses calendars and participates in university discussions; 9 out of 10 students download study – materials.

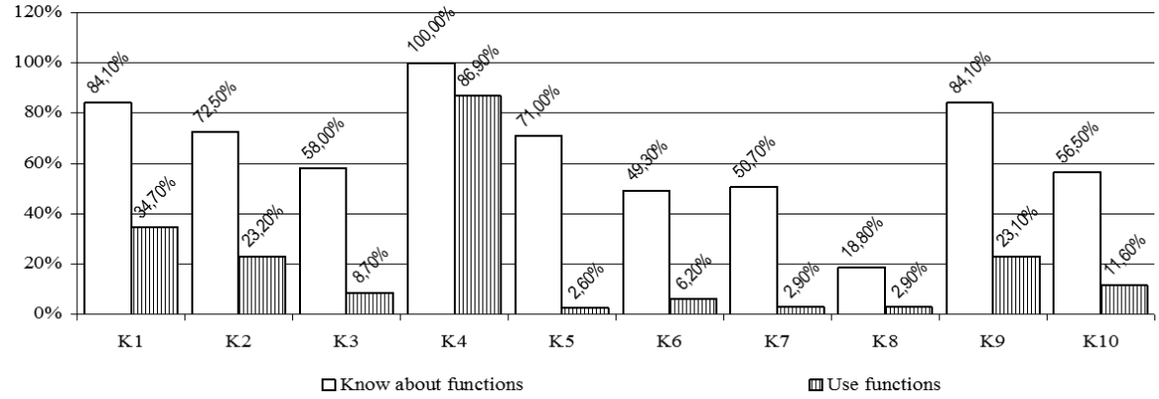

Figure 3. University students know about functions of intranet (VCCTE), however, only some of them actually use the functions directly for study process

Administration (Fig. 4) was asked the same questions as teachers (Fig. 2). More than a third of administrators use university's e-mail, a fifth uses intranet for organizing joint activities; and a half participates in intranet-based discussions (Fig. 4).

In summing up we may state that though teachers', students' and administrations' activity in intranet (VCCTE) differs to some extent and depends on different needs of these groups, the level of difference is not high (Fig. 5). Therefore it was not possible to identify the difference between perspectives that "d-natives" and "d-immigrants" have. Students want to download study materials; teachers and administrators are more interested in discussions using intranet (VCCTE).

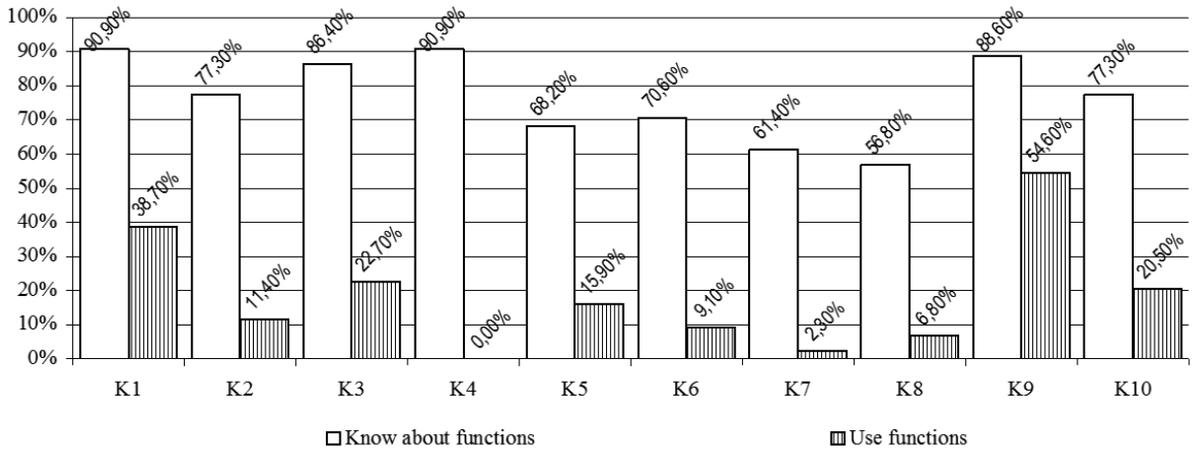

Figure 4. University administration know about functions of intranet (VCCTE), however, only some of them actually use the functions directly for study process.

All of the members of a survey were asked to evaluate their own activity with a question:"Do you think that you are applying VCCTE opportunities for Your purposes sufficiently?" 8 out of 10 students think that they do not use opportunities sufficiently; 7 out of 10 teachers also thought they may be using opportunities more. 8 out of 10 administrators reported the same. Therefore this dimension both by d-natives and d-immigrants was assessed similarly.

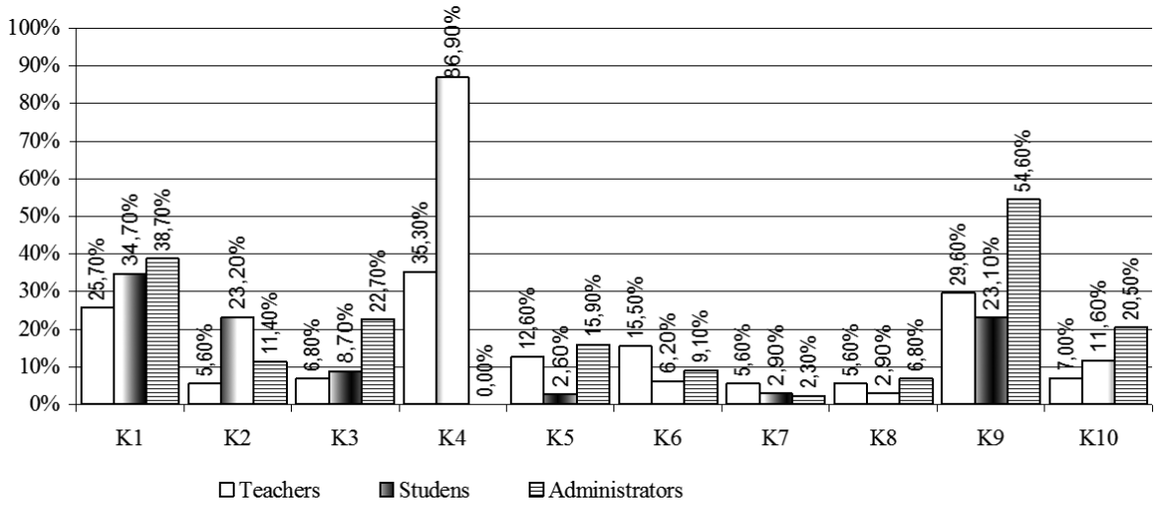

Figure 5. Comparison of answers of teachers, students and representatives of administration on the tools and functions of intranet (VCCTE) they use.

CONCLUSIONS

- A lot of students, university teachers and administrators are aware of the VCCTE functions; however it is constantly used by a significantly lower number. Students, university teachers and administrators tend to learn about VCCTE functions independently.
- D-natives and d-immigrants have quite a similar profile of perspective on tools and functions they know and tools and functions they use.
- An empiric quantitative methodology based survey provides just a sketch of a profile, and a more in-depth analysis, also, a qualitative methodology based study is needed in order to answer the question about why there is still a significant gap between the knowledge about (some tools and functions of intranet), and actually using them in study process.

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E-learning Process in Non Formal Adult Education

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ABSTRACT. In order to ensure life-long learning possibilities, appropriate high-quality teaching and learning services have to be provided and proper conditions have to be created encouraging personal development among different age and interest groups. Adult education is one of the decisive elements in enhancing fast education system progress and it can provide a variety of benefits: train the abilities needed for life and professional work, increase integrality and political stability of the society, encourage active citizenship, reduce social differentiation, improve employment possibilities, etc. Recently, an increasing attention has been given to non-formal education as a specific area of adult education. Non-formal adult education provides more flexible conditions for learning. This is a very important alternative for people who try to combine their employment in the labour market or other activities and the need for life-long learning. The idea of life-long learning can be implemented by applying e-learning. The paper deals with the ICT competence of adult educators and the possibilities of e-learning in non-formal adult education.

Keywords: *Non-formal adult education, competence, information and computer technology (ICT), e-learning, lifelong learning (LLL), skills.*

Introduction

The importance of life-long learning for the future of Europe has been acknowledged at the highest level: LLL is the main factor in enhancing citizenship, strengthening social unity and increasing employment. The Life-long Learning Memorandum (2001) stresses that at present it is vital for every person to learn how to learn and how to make use of the abundant information, since this would lead to the development of technological skills in the information society. In this society, everyone – from ordinary citizens to different level managers - have a possibility to use modern information technologies and national/global digital information resources. One of the main principles of Lithuania‘s education policy is to provide equal rights to all the citizens to get education, independent of the place of residence, gender, social origin or beliefs [5].

The present-day paradigm of life-long learning [9] embraces all the areas of human education, formal, non-formal and non-formal self-studies, and also seeks to provide possibilities for life-long learning.

In order to achieve these goals, a flexible system of life-long learning should be created, accessible to all. Non-formal adult education is the most convenient and easily accessible form of education which can help people to acquire new competences or refresh the existing ones. This is of great importance for learners and public at large, as well as for the teaching staff. Adult educators should play an important part in bringing life-long learning into reality [2]. Thus, educators should be highly interested in adjusting to changes, accepting innovations and joining the process of life-long learning. Putting life-long learning into practice can be facilitated by e-learning/teaching.

The aim of the paper is to define the importance of e-learning in non-formal adult education.

The objectives are:

1. To present an overview of e-learning possibilities in non-formal adult education.
2. To evaluate adult educators‘ e-learning abilities.

Research methods: analysis of literature resources and documents; a survey, methods of descriptive statistics.

1. WAYS OF IMPLEMENTING E-LEARNING IN NON-FORMAL ADULT EDUCATION

Non-formal education has been entering different spheres of our society: cultural, social and political life. People stay in the labour market for a longer time. Employers expect not only professional knowledge, but also general abilities and skills required in various situations. Non-formal education is flexible and therefore easily responds to social and personal demands, helps a person to acquire necessary knowledge and to become an active citizen. Non-formal education is also of great importance because in addition to

the fast-rising population emigration, the low level of education, especially that of non-formal education, makes one of the biggest problems in the country's economic competitiveness: non-educated employees are less productive and less open to innovations, while jobless people who do not study have difficulties in finding their place in the economic life of the country [6].

New technologies have been increasingly applied in non-formal adult education. More attention is given to information-communication technologies (ICT) as a factor increasing the efficiency of the learning/teaching process. Application of information technologies is replacing traditional methodologies, conventional teaching methods, and is becoming an important tool in life-long learning, introduction of innovations and learner-oriented teaching approach. Information technologies help to create a new learning environment with a variety of information resources and communication forms, to apply active teaching methods and to teach how to work independently.

Development of ICT and the Internet services have provided access to electronic resources all over the world, immediate expert's support for the learner, and learners' communication regardless of time and space. Therefore distance learning and e-learning are gaining wider application. It is a significant alternative for those who try to combine their employment in the labour market or some other occupation and their life-long learning needs [23].

E-learning is application of multimedia technologies and the Internet for improving the learning quality by providing accessibility to information and services as well as improving distance communication and cooperation (European Commission, from e-learning initiative). Electronic teaching as an innovative teaching approach is a combination of teaching and information accessible anywhere and anytime, provided to the learners by electronic means [3]. E-learning is an interactive learning process. Its advantage is that it extends the learner's learning possibilities, encourages the learner's activity in choosing the place and time, opens wide possibilities for new teaching and learning experiences, creates a complete dialogue between the learner and the provider of teaching services, and improves the quality of learning [16].

The oldest way of e-learning is self-study based on learning without a teacher: the learning materials are used and the knowledge is checked independently [1].

Social software has led to a new concept of e-learning – Computer Supported Collaborative Learning (CSCL) – which means learning from each other, collaboration, open access to resources, thus providing new technological possibilities in education of the information society. Learners are provided the necessary learning conditions and support needed for the learning activities. In this teaching/learning, teachers are facilitators and creators of the learning environments [10].

With the introduction of information technologies in the area of distance learning, electronic learning courses were developed and provided. The term e-learning means that the process of distance learning is enriched and enhanced with digital and communication technologies [19]. The inherent characteristics of distance learning are flexibility, self-study and support in learning. The essence of distance learning is openness and possibility to free the teacher and learner from the limitations of time and place. The character of studies also changes: they are more individualized, the teacher is a facilitator and a methodological guide [5].

The present-day distance learning is similar to virtual learning. Virtual learning is that when the whole learning process is transfered to the virtual space, i.e., the medium shaped by the information society technologies and often identified as the Internet [7].

The number of teaching and training institutions applying e-learning is increasing. This leads to the necessity to develop new methodologies and to implement the methods and means of blended learning. Blended learning is a combination of different teaching aspects (technologies, activities, events) which creates an optimal learning/teaching programme for a specific audience. It is one of the lately introduced tendencies of higher education. Blended learning combines the best features of traditional and distance learning/teaching. It is based on the idea that distance learning is considered not as an organisational form, but a method integrated into traditional organisational forms.

Learners choose e-learning because it gives a possibility to plan their time in a more flexible way, they can learn what is interesting and useful for them, in a convenient place and at a preferable pace, thus developing their abilities and skills. Those with higher education and over 24 years of age prefer self-studies. Everyone can join distance studies, but they are especially convenient for those who have specific

needs and cannot study in a traditional environment. Almost two thirds of distance education learners are quite optimistic about the development of distance learning/teaching [22].

Research carried out in ten large organizations [3] has shown that in majority of the organizations (eight out of ten) self-study is encouraged, and in half of them distance and e-learning are applied. The greatest potential for distance learning customers lies in the private sector which seeks professional training or requalification possibilities [5].

2. E-LEARNING TENDENCIES

One of the main measures encouraging the development of distance learning/teaching was the Government Investment Project LieDM (Lithuanian Network of Distance Learning) 1998-2005, covering the whole territory of Lithuania. LieDM provides services to academic and non-formal education institutions, courses for unemployed, training disabled people and other social groups. The LieDM network improves life-long learning conditions, gives Lithuanian citizens a possibility to improve their qualification, to develop skills regardless of the place of residence, social status or nationality [22].

In Lithuania, the development of e-learning and distance education is also encouraged by the support of the European Union projects. It can be responsibly claimed that each educational and research institution has participated or is participating in Life-long Learning projects, which provide possibilities to share learning/teaching experiences on the international scale, to develop new products or methodologies [15]. Special attention in Lithuania is given to initiating projects in rural areas in order to reduce social differentiation; the programme "Unlimited possibilities" aims at training disabled people's skills of using information technologies [17].

In 2006-2010, the level of using the Internet banking services has grown considerably (by 24 %). Research findings [5] show that in Lithuania rural people experience the greatest impact of the Internet in the following areas: information search (86%), learning (62%), work (62%). All the public sector websites comply with the technical standards of accessibility to the disabled. According to the data [12] of 2011 63.7 % of the population used the Internet. Other services provided by the information society technologies were used as follows: sending/receiving e-mail messages – 57.3 %, calling, participation in video conferences – 51. 7 %, using accommodation and travel services – 54.7 %, job search – 56.7 %, Internet banking – 41 %.

The Strategy of Life-long Learning contains a plan for the years 2009–2012 to create a storage of e-learning programmes and objects for adult education, where the publicly accessible non-formal education programmes could be stored. To reach this goal, in 2010 the Training Development Centre started a project funded by the EU "Storage of adult education programmes and objects – means of electronic learning services". Its aim is to create electronic possibilities for all the interested citizens to develop their personal skills, to acquire knowledge needed for professional activities [23].

In Lithuania there are 1200 public Internet access points. Those are centres for the community to have free access to e-services for research, social, personal, economic or leisure purposes. The most popular public electronic services are those related to income declaration, employment, e-banking, public procurement, library information search [11].

At present, the research and studies programme of Virtual University of Lithuania is under way. It consists of four interrelated objectives: promotion of e-learning processes in the virtual environment, development of e-learning infrastructure in Lithuania, development of an integrated Lithuanian research and studies information space, and development of Lithuanian research and studies planning, management and self-service infrastructure [11].

It should be noted, however, that not all the social groups have equal possibilities to participate in non-formal adult education. More attention is given to certain groups (teachers, public servants), who are given continuing financing which is legally regulated, the teaching service providers are accredited, and their teaching programmes undergo quality assessment. Financing of other groups is not consistent [23].

3. ADULT EDUCATORS AND THEIR SKILLS IN E-LEARNING PROCESS

Information technologies open new possibilities for science and education. Information and communication technologies, the changing demands and attitudes of the society cause changes in the traditional concept of education, relations between learners and teachers, and raise new requirements for all the participants in education [21].

To ensure life-long learning possibilities, appropriate high-quality teaching and learning services have to be provided and proper conditions have to be created encouraging personal development among different age and interest groups. Life-long learning is important both for those who are studying, public at large, and for people working in the education system.

Recently, a number of studies have been carried out to find out how adults evaluate the changes in adult education, what their needs are, and what obstacles they come across in their studies [20]. The analysis of the research findings showed what aspects should be improved, namely, flexibility of the programmes, teachers‘ competence and application of innovative methods. When integrating ICT into the educational process, both formal and non-formal, the role of the teacher, adult educator, is of prime importance. Therefore, adult educators ought to do their best to bring life-long learning to reality [2], they ought to adjust to changes and accept innovations.

The qualitative content analysis in Universities of Applied Science [14] allowed the author to diagnose the main obstacles for integrating ICT into the education system: the lecturer's pedagogical competence, the lack of ICT skills among lecturers and students, poor lecturers' skills in preparing methodological materials and presenting them in various environments, insufficient students' skills in selecting and evaluating information, presenting it ethically and communicating online, insufficient attention to the infrastructure and support for the lecturers.

An increasing number of educational institutions has been applying e-learning/teaching, thus the adult educators‘ need to use it in practice is also growing. New learning systems require not only training adult educators how to use e-learning platforms, but also improving the e-learning materials and resources. Traditional teaching resources have to be re-evaluated and adapted so that they could be integrated into flexible, rich and functional learning/teaching materials, acceptable and accessible (on the Internet) new technologies and standards [18].

There are no clear recommendations how elements of e-learning and distance education could be applied in continuing adult learning in order to ensure the quality of the learning/teaching content and to meet the learners‘ needs. Teachers lack knowledge and abilities to prepare high-quality learning materials [19]. Adult educators, who are mostly lecturers at formal educational institutions, also apply ICT in their activities, but they do not make use of all the possibilities provided by modern technologies because they lack skills in this area:

Non state supported educational institutions acknowledge the importance of e-learning, but they admit they are still in the initial stage of e-learning development. Two thirds of non-university higher education lecturers use e-learning technologies in their courses. However, only one sixth of university lecturers use e-learning technologies in their teaching process [5].

Recently, e-mentoring has been gaining popularity. Mentoring is considered to be one of the ways of improving the educational system and learning results [8]. In the context of life-long learning, mentoring acquires a new meaning: it means all the functions of a mentor's activities, the main of them being a caring attitude, cooperation and positive relations with the learner. Successful mentoring results in good learning and growth [13]. This can be achieved through e-mentoring projects which mainly aim at improving mentoring abilities and developing ICT skills.

The partnership of the EU project "E- mentoring: new abilities and competences for new job" (2011-2013) united well experienced adult educators-experts and adult educators-learners of different areas from six EU countries and the USA. In the EU project "Lead-In: Mentoring for Adult Education Leaders"(2011-2013) six different adult education institutions from EU countries were involved. The results of the projects – e-mentoring models – defined the ways of ICT application in the mentoring process, which could lead to

better learning possibilities and provide more mentoring and e-learning skills. The method of blended mentoring was used.

Most of adult educators work at several institutions: higher education and non-formal adult education institutions. These were the findings of the study carried out in 2010, during which candidates were selected (evaluating their motivation and ICT skills) for participating in the two above mentioned e-learning projects: only nine out of 52 participants - adult educators worked only at one institution. The biggest proportion were lecturers from higher and vocational schools (71.2%), followed by teaching staff from various training centres (21.1%) and non-governmental organizations (7.7%). 26.9% of the respondents were lecturers – members of the Adult Education Association of Lithuania, 15.4 % - lecturers from non-governmental organisations and non-formal education foundations, 17.3% - managers or administrators of educational institutions, 40.4% - lecturers of higher schools.

The adult educators named the following motivating factors why they would like to participate in e-learning: career and professional possibilities (71.6%), personal interest (70.1%), e-learning flexibility (62.7%). The least motivating were: administrative support (21.1%) and the fact that the learning/teaching achievements are not sufficiently evaluated.

The results of the project "Research and Development Platform for Adult Training of Key Competences" No.VP1-3.1-SMM-07-K-03-073, coordinated by Vytautas Magnus University, (Fig. 1) have shown that the As shown in Fig. 1, the most frequently used resources by the adult educators are: Internet resources (78.9 %), e-mail (86.5 %), materials uploaded on the Internet (65.4 %). The e-library references are used either "frequently" or "rarely" (40.4 %). However, even 86.5 % of adult educators do not use e-learning courses, 57.7 % do not use the MOODLE platform, and rarely make use of social networks (44.2 %), or do not use them at all (34.6 %).

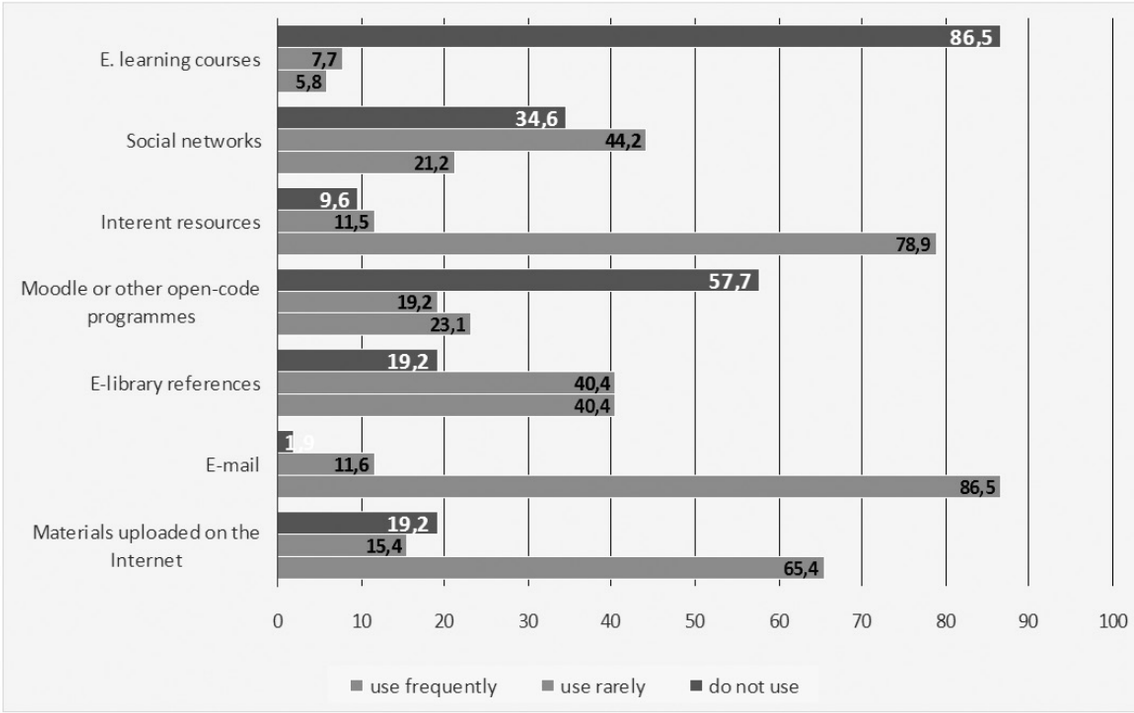

Figure 1. Using e-learning resources in learning process (%)

For comparison, the respondents were asked how adult educators get information about e-learning and how they would like to improve their knowledge (Fig. 2). Mostly they acquire knowledge during on-job training (36.5%) and qualification courses (30,8%), self-study (15.4%) and blended learning (3.8%). Some respondents would like to study about e-learning in distance courses (13.4%) and through blended learning (23%). A bigger percentage would prefer studying in qualification courses (30.8%) and in-job training (21.1%) it was important because qualification certificates are issued.

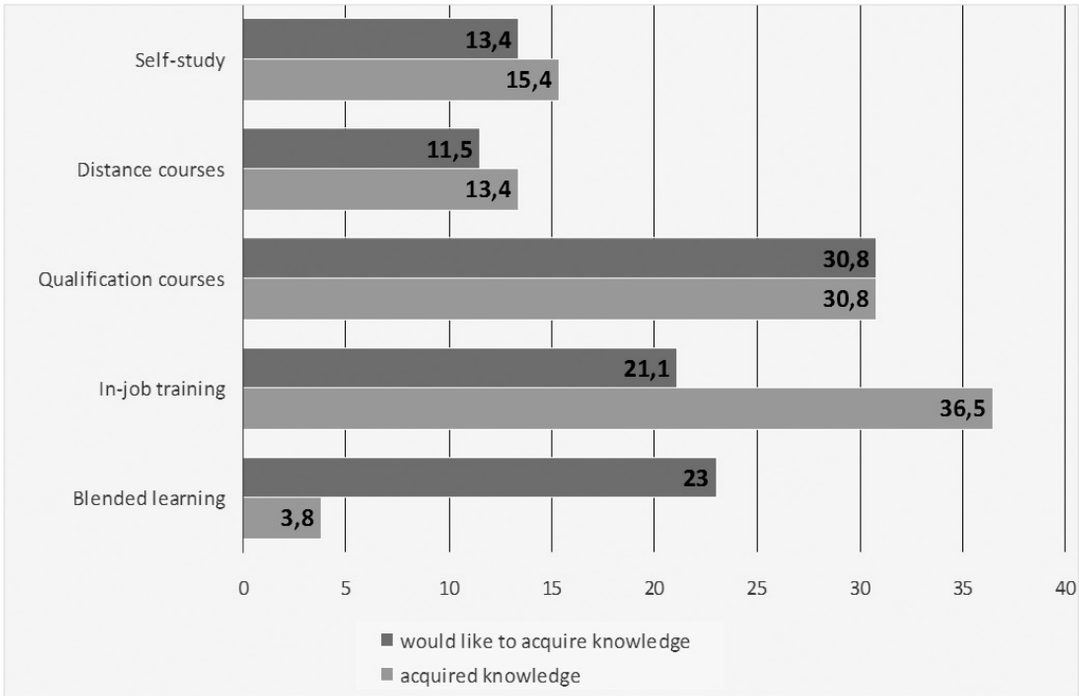

Figure 2. How respondents acquire knowledge about e-learning and how they would like to improve it (%)

CONCLUSIONS

Application of e-learning in non-formal adult education provides flexible conditions for life-long learning, for satisfying cognition needs, improving the obtained qualification and acquiring new additional qualifications, on-the-job learning, free planning of learning time, place and pace. E-learning is especially convenient for people with specific needs who for certain reasons cannot study in a traditional environment

Fast growth of ICT and the experience of distance learning/teaching are the basic prerequisites for the development of e-learning. The distance learning network LieDM, the network of public access points (VIPT) have been developed. The development of e-learning is also fostered by the support of different EU programmes.

ICT application is vital for lecturers and adult educators in their professional activities. However, their ICT skills are not sufficient, and they wish to develop them. The main obstacle in integrating ICT into the education system is the lack of the lecturers ICT skills. Adult educators must possess new high-quality competence, closely related to the abilities to apply ICT in the learning/teaching process. These abilities can be efficiently trained in the process of e-mentoring through blended learning.

The performed research have shown that the factors motivating adult educators to participate in e-learning are: career and professional prospects, personal interest, flexibility of e-learning. The least motivating factors are the administrative support and insufficient evaluation of learning/teaching achievements. Adult educators most frequently make use of Internet resources, e-mail, materials uploaded on the Internet. The least used are e-learning courses and the Moodle. Adult educators mostly get new knowledge during on-the-job training, qualification courses. However, they would like to acquire or improve their knowledge in distance learning courses and by blended learning.

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Enhancing Teaching Materials Using a Clinical Decision Support System for Online Medical Learning

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ABSTRACT. The application of a Clinical decision support system on creation of visual materials for an online medical learning is discussed in this work. An additional function of a Clinical decision support system on creating decision trees is presented to enhance student understanding of complicated medical research data. As an example the eye disease data set (2146x33) was used to help identify risk factors that are related to a rare pseudoexfoliation syndrome. The method on creating clinical decision support trees is presented. Six decision trees are used in online learning course materials on diagnostics of eye diseases and treatment.

Keywords: *online medical learning, clinical decision support, decision tree, data mining.*

Introduction

Visual aids have been used in learning for centuries. Learning through pictures, graphs, or other media helps students remember facts and ideas better. Unfortunately, traditional teaching methods often forget the power of visuals. In fact, research data is often presented through a linear text, and the interpretation of the findings and its variables is often quite complex. Our brains are not trained to interpret linear data effectively. Hyerle such presentation of text-related material in linear fashion called "linear wall of text." This "wall of text" whether in written or spoken format, according to the researcher, limits the ways students can access and process information simply because the brains do not think in "text" [1]. Furthermore, Hyerle along many neuroscientists believe that we receive our information through the eyes and organize visual information in a hierarchical ordering [2]. Therefore, presenting information in a visual format is one of the most essential tasks of an effective teacher.

Visual representation of information is even more important in online format where the instructor is often less available to interpret data, explain information, or give examples. Studies have demonstrated that although student satisfaction with learning was slightly greater in face-to-face format, no difference existed in the quality of learning and students' achievement; learning style preferences did not influence academic success in online or face-to face format [3, 4]. Nevertheless, an effective use of visual trees may enhance learning and understanding of complicated data.

As an example, students in Medical faculty in Lithuanian University of Health Sciences (LUHS) are exposed to huge amounts of research data and facts throughout many years of their studies. There are several courses created in LUHS Moodle in different clinical fields. One of the courses focuses on diagnostics of eye diseases and treatment. The course contains innovative teaching materials created using a Clinical decision support system. Clinical decision support systems are firstly used to process large amounts of data to gain important parameters and discover new relations. However, in this study a Clinical decision support system with possibility to create visual materials was used and an example of a construction of one clinical decision tree is analyzed and presented.

1. INSTRUMENTS AND METHODS

1.1. Decision Support in Medicine and Clinical Data Evaluation

Decision support in medicine is a routine clinical data processing on a range of systems. However, it is more complicated in medicine than in other areas because of medical terms, semantic relations, and amount of data. Decision support software usually uses data mining methods. These methods are useful while analyzing particular task to gain important parameters and new knowledge [5, 6]. The term data mining refers to a usage of a variety of techniques to process large amounts of information to discover knowledge useful in decision making. This covers a number of various techniques: learning by classification rules, clustering, neural networks, and so on. Clinical decision support is easily applied if using the right tools.

They quickly define the most useful data, organize it into a structure, and discover new relations.

In this study, we present one example of the application of a Clinical decision support system on an eye disease data set. One of the systems capabilities is to constructs decision trees witch can later be analyzed visually. To illustrate the method eye disease data set was used. Data was collected in the Hospital of Lithuanian University of Health Sciences. The data set (2146x33) consists of risk factors related to a rare pseudoexfoliation syndrome (PEX). PEX is characterized by the pathologic production and accumulation of an abnormal fibrillar extra-cellular material in the anterior structures of the eye and various extra ocular tissues [7]. Pseudoexfoliation material can be seen by a slit lamp examination as grayish-white deposits on anterior capsule of the lens, iris or posterior surface of the cornea. Causes, development mechanisms, and exact chemical composition of the pseudoexfoliations remain unknown. Recent studies showed that it is a condition of worldwide significance and apart from long-known intraocular manifestations PEX has been shown to be a systemic process [8, 9].

1.2. Evaluation of Data Using a Clinical Decision Support System

A Clinical decision support system is designed to research data of e-health records in various medical fields it is also capable to process large amounts of data and extracts most important information. In this study, its additional function is used to construct clinical decision trees. This possibility makes the system serve as a tool in creating learning materials. Clinical decision support system is implemented using the .NET technology with .NET Visual C # programming language. The system consists of a number of data mining algorithms; performance of these algorithms and other information is stored into a database. The performance of algorithms is estimated using sensitivity (%) and specificity (%) parameters. Data mining algorithms included in the system are implemented using Weka open source license software [10].

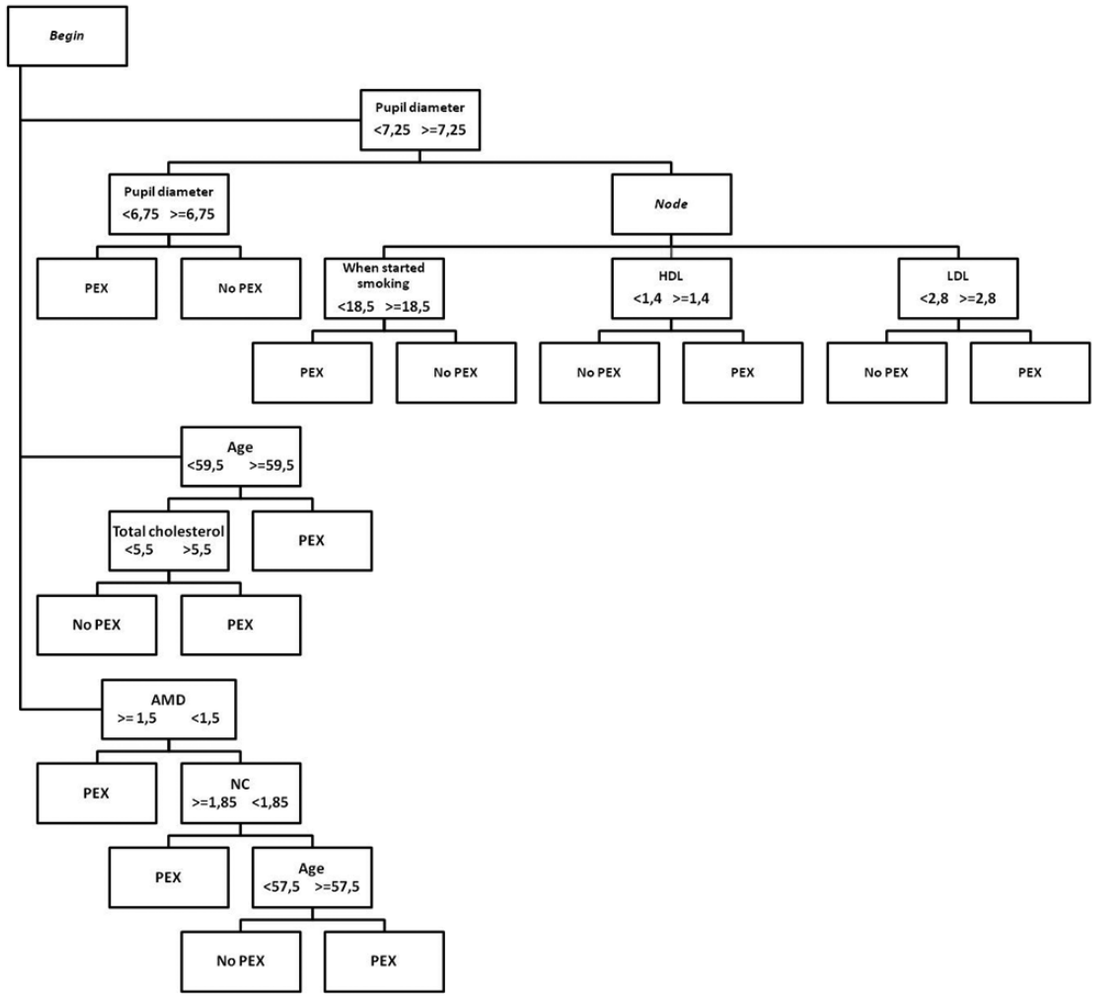

Figure 1. A decision tree produced with Clinical decision support system on pseudoexfoliation syndrome. Here: HDL – high density lipoprotein cholesterol level, LDL – low density lipoprotein cholesterol level, AMD – age-related macular degeneration, NC - nuclear color scale (parameter on LOCS III)

The systems database is used for storing algorithms operating results, information entered by an investigator, results of algorithms performance and characteristics of used data sets. The system automatically provides a reliable clinical decision, based on the highest results of algorithms performance [11].

2. RESULTS

The data set and Clinical decision support system described above were used to construct a decision tree on risk factors related to PEX. A PEX decision tree that achieved the highest system performance result (sensitivity and specificity) is presented in figure 1.

System performance sensitivity and specificity results gained using the decision tree presented in Figure 1 is accordingly 92% and 65%. The clinical decision support tree is easily analyzed and replaces a lot of complicated text. The tree reveals that PEX is diagnosed by three main conditions: Pupil diameter, Age and age-related macular degeneration (AMD). If Pupil diameter is less than 6,75 and either When started smoking is less than 18,5, or high density lipoprotein cholesterol level (HDL) is more or equals to 1,4, or low density lipoprotein cholesterol level (LDL) is more or equals to 2,8 it is likely the patient has PEX. If we continue writing the same analysis about Age and AMD we would end up in a lot of understandable text. It is complicated to read, use in diagnosis and remember such information. Visualizing such complicated data is very valuable not only in diagnosis and treatment, but firstly in learning process. The online course materials on diagnostics of eye diseases and treatment are enriched with such decision trees with guides on how to use them efficiently. There are five more clinical decision trees created and used in course materials established using the above method.

CONCLUSIONS

This study presents an additional function of a Clinical decision support system on creation of visual materials for an online course. As an example a rare condition of PEX was taken and illustrated the processes performed to build a clinical decision tree. A Clinical decision support system was used on real e-health data set. A valuable clinical decision tree that gained high sensitivity (92%) and specificity (65%) is presented. The decision tree summarizes and visualizes complicated data and presents it in an easily understandable form. Six clinical decision trees are created and used in online course materials on diagnostics of eye diseases and treatment established using a Clinical decision support system. While studying the course materials the students didn't have any difficulty in understanding the trees or didn't have any negative feedback. However, no particular studies on this topic have yet been made. Anyway, the creation and usage of clinical decision trees in online course materials will be recommended for other online clinical courses taught in LUHS.

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E. studijų rengimo savianalizės metmenys

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SANTRUMPA. Studijų kokybės gerinimo srityje dažnai susiduriama su kokybės reikalavimų ir rodiklių poreikiu, kurie padėtų pasirengti kokybiškoms studijoms bei būtų patogūs teikiamo proceso vertinimui. Vykdomo projekto ,,LieDM tinklo plėtra" rėmuose darbo grupė atliko įvairių mokymosi / studijų kokybės reikalavimus ir kriterijus aprašančių dokumentų bei priemonių analizę, įvertino savo patirtį bei poreikius ir parengė metodines rekomendacijas.

Raktiniai žodžiai: *kokybė, studijų kokybė, e. mokymasis, QuickScan įrankis.*

Įvadas

Dėmesys studijų kokybei, kuris į diskusijas įtraukia ir plačiąją visuomenę, rodo, jog aukštosios mokyklos vis dažniau susiduria su jų veiklos, konkurencingumo, socialinio vaidmens vertinimais; stebime šių vertinimų įvairovę. Aukštosioms mokykloms iškyla naujų tikslų, susijusių su kokybės užtikrinimu. Šioje srityje ne tik aukštųjų mokyklų akademinės bendruomenės, tačiau ir įvairių šalių institucijos, asociacijos, judėjimai, fondai inicijuoja bei siūlo rekomendacijas kokybės vertinimui ir gerinimui.

Dėmesys aukštojo mokslo kokybei turi įvairius motyvus: EADTU (European Association of Distance Teaching Universities) organizacijos teigimu, kokybės užtikrinimo reikšmė padidėjo, augant studentų ir akademinio personalo mobilumui, didėjant aukštojo mokslo globalizacijai. Su tuo susiję ir strateginiai interesai aukštojo mokslo srityje, e. mokymasis tapo viena pagrindinių priemonių tarpvalstybiniame aukštajame moksle [3].

Visuotinai kalbant apie e. studijų kokybės užtikrinimą, studijų organizatoriams, studijų programų koordinatoriams, dėstytojams ir kitiems dirbantiesiems šioje srityje svarbu suvokti ir patį kokybės užtikrinimo procesą, ir gerai žinoti atskirus proceso elementus, susijusius su jų kasdienine veikla, kuriuos galėtų analizuoti, vertinti ir, esant reikalui, gerinti.

Straipsnyje kalbama apie studijų kokybės užtikrinimo aktualijas bei pristatomi darbo rezultatai ekspertų grupės, kuri analizavo e. studijų kokybės savianalizės ir vertinimo situaciją, apžvelgė įvairius mokslinius darbus ir praktinius siūlymus. Ekspertų grupę sudarė įvairių Lietuvos aukštųjų mokyklų – universitetų ir kolegijų – atstovai, turintys didelę patirtį e. studijų ir nuotolinių studijų srityje. Šio straipsnio tikslas – apžvelgti aspektus, susijusius su požiūriu į kokybę bei studijų kokybės užtikrinimą, ir pristatyti medžiagą, kurią e. studijų savianalizei ir kokybės vertinimui parengė projekto ,,LieDM tinklo plėtra" darbo grupė. Metodologija – remtasi mokslinės literatūros bei dokumentų sistemine analize ir tikslinės grupės parengtos e. studijoms skirtos metodinės medžiagos analize.

1. DĖMESYS E. STUDIJŲ KOKYBĖS PROCESAMS

Kokybės užtikrinimo procesas – sudėtinga veiksmų visuma, susieta ir su esama studijų infrastruktūra, ir su sąryšiais tarp įvairių studijų objektų bei subjektų, o taip pat ir su pokyčiais. Iššaukti pokyčiai keičia aukštųjų mokyklų kokybės užtikrinimo proceso valdymą, nustatytus standartus bei veiklos praktikoje priimtas normas, anksčiau priimti ir naudoti kokybės rodikliai ar kriterijai dažnai nebetinka. Iškyla klausimas, kaip kokybės procesą valdyti, į ką orientuotis situacijose, kuriose institucijos nariai tampa atsakingais už proceso, jo struktūrinės dalies, žingsnio, elemento ar pan. valdymą.

ISO 9000:2000 kokybės apibrėžimas akcentuoja: kokybė – tai atitikimas reikalavimams. T. y. kieno nors kokybė priklauso nuo visumos neatskiriamų savybių ir reikalavimų bei to, kaip jie vienas kitą atitinka. Kokybės užtikrinimas – veiklų seka, siekiant įsitikinti, kad kokybės reikalavimai bus užtikrinti [4]. Kokybės sistema tai „rinkinys tarpusavyje susijusių komponentų, kurie veikia kartu, siekiant įvykdyti sistemos tikslus" [2].

Pati kokybės sąvoka yra kintanti ir įvairiai traktuojama. Mokslinėje literatūroje bandoma išgryninti sąvoką, tačiau susidūrus su požiūrių įvairove, dažnai apsiribojama nagrinėjama sritimi, siekiant šį uždavinį supaprastinti ir kokybės sampratą geriau suvokti bent nagrinėjamos srities klausimų apimtyje [9].

Nuo kokybės analizės pereinant prie studijų kokybės sąvokų, taip pat susiduriama su neapibrėžtumu. Plačiai diskutuojama apie tai, jog aukštojo mokslo kokybės valdymas yra sudėtingas uždavinys. Becket ir Brookes, apžvelgę įvairių autorių darbus, išskiria dvi priežastis [1]: pirma, sąvoka ,,kokybė" turi skirtingas reikšmes skirtingoms suinteresuotosioms šalims. Aukštajame moksle veikia vidaus ir išorės suinteresuotosios šalys, kurios gali turėti skirtingus ar net prieštaringus kokybės apibrėžimus. Nenuostabu, jog šioje kokybės sąvokos neapibrėžtumo išdavoje kokybės matavimas ir valdymas esąs ginčytinas. Antroji priežastis, kodėl kokybę aukštajame moksle yra sunku valdyti, tai, pasak autorių, sudėtingas paties švietimo produkto pobūdis. Kadangi švietimas laikomas sistema, tuomet šioje sistemoje yra įvediniai, transformavimo procesai ir išvediniai. Diskutuojama dėl švietimo sistemos išvedinių, kurie gali būti materialūs, nematerialūs arba pridėtinės vertės, pavyzdžiui, tyrimų rezultatai, užimtumas, darbo užmokestis ir pasitenkinimas [1].

Šie požymiai ir aukštojo mokslo kompleksiškumas lemia, kad kokybę vertinti ir gerinti yra sudėtinga. Aukštajame moksle dažnai taikomi įvairūs iš pramonės perimti kokybės vadybos modeliai (žr. lentelę), kurie turi savo racionalumą ir savitumą.

LENTELĖ. KOKYBĖS VADYBOS MODELIAI (PAGAL BECKET IR BROOKES, 2008)

Modelis	Apibūdinimas
VKV (*TQM*)	Visapusiškas valdymo metodas, kuris reikalauja įnašo iš visų organizacijos dalyvių, siekiant ilgalaikės naudos taip pat ir visai visuomenei.
EFQM (Europos Kokybės vadybos fondo) tobulumo modelis (*EFQM excellence model*)	Ne norminio pobūdžio aktai, nustatantys devynis kriterijus (orientavimasis į rezultatus, orientavimasis į klientus, nuolatinis mokymasis ir t. t.), naudoti tinka bet kuriai organizacijai, norinčiai įvertinti tobulumo siekių pažangą.
Subalansuota apskaita arba subalansuotų rodiklių sistema (*Balanced scorecard*)	Veiklos / strateginio valdymo sistema, kuri pagrįsta keturiomis matavimo sritimis: finansų; klientų; įmonės vidaus proceso; mokymosi ir augimo.
Malcolm Baldridge apdovanojimas (*Malcolm Baldridge award*)	Dviejų lygmenų kokybės modelis, kuris gali būti naudojamas, siekiant pagerinti veiklą. Septyni kategorijų kriterijai: lyderystė; strateginis planavimas; dėmesys klientams ir rinkoms; matavimas, analizė ir žinių valdymas; žmogiškųjų išteklių valdymas; procesų valdymas; veiklos rezultatai.
ISO 9000 serijos (*ISO 9000 series*)	Tarptautiniai standartai, apimantys kokybės vadybos sistemas. Susiję su nuolatiniu gerinimu taikant prevencinius veiksmus. Tai į klientus orientuoti kokybės gerinimo veiksmai ir reikalavimai, siekiant pagerinti klientų pasitenkinimą ir pasiekti nuolatinį tobulinimą.
Verslo procesų pertvarkymas (*Business process re-engineering*)	Sistema, skirta pertvarkyti ir pagerinti verslo procesus, sistemas ir struktūras. Tai susiję su penkių komponentų pokyčiais: strategijos, procesų, technologijos, organizavimo ir kultūros.
SERVQUAL	Priemonė, skirta matuoti vartotojų paslaugų kokybės suvokimą (,,suvoktą kokybę") ir lūkesčius penkiais aspektais: patikimumo, materialinės vertės, reagavimo, užtikrinimo ir empatijos; ir nustatyti, kur yra spragų.

Be lentelėje paminėtų bendrųjų kokybės standartų, gali būti kuriami specifiniai kokybės reikalavimai. Aukščiau pateiktas ISO apibrėžimas teigia, jog kokybė – tai atitikimas nustatytiems reikalavimams. Aukštosios mokyklos, išoriniai kokybės vertinimo centrai, aukštųjų mokyklų reitingų sudarytojai nustato tam tikrus kriterijus, pagal kuriuos vertinama, kokiu laipsniu nagrinėjamas objektas atitinka jų nustatytus reikalavimus. Kita vertus, siekiant kokybės, svarbu, jog kokybės proceso valdymas būtų aiškus ir palaikomas institucijos kokybės kultūros, o ,,kiekvieno universiteto valdymo iššūkiu tampa kriterijų, kurie sustiprintų vidinę kokybės kultūrą, bet ne ją reguliuotų, sukūrimas" [7].

Akivaizdu, jok kiekvienas pokytis lengviau įgyvendinamas, kai veikiantys faktoriai ir sprendimo būdai yra aiškūs. Nors dokumentų apie studijų kokybės užtikrinimą parengta nemažai (pvz., Standards and Guidelines for Quality Assurance in the European Higher Education Area, 2009) [8], sprendimą priimančiam aukštųjų mokyklų personalui dažniau yra svarbu ne iniciatyvos, o rekomendacijos, kaip vertinti ir kaip gerinti kokybės procesus, t. y. kokybės užtikrinimo proceso vykdytojams yra svarbūs konkretūs gerinimo

žingsniai ir priemonės. E. studijų kokybei apibūdinti iš esmės tinka tie patys reikalavimai, kurie taikomi tradiciniam švietimui. Tačiau nuotolis studijose bei informacijos komunikacijos technologijų (KIT) naudojimo būtinumas verčia atkreipti dėmesį į e. studijų kokybės reikalavimų, rodiklių bei kriterijų specifiškumą, o tai liečia ir rekomendacijas e. studijų kokybės procesų gerinimui.

2. METODINĖ MEDŽIAGA E. STUDIJŲ RENGIMO SAVIANALIZEI

Vykdant Lietuvos nuotolinio mokymosi tinklo LieDM palaikymo ir plėtros konsorciumo [5] projektą ,,LieDM tinklo plėtra", 2012–2014 m., vienas iš numatytų uždavinių studijų kokybės gerinimo srityje buvo parengti rekomendacijas – ,,Metodinę medžiagą elektroninių studijų rengimo savianalizei" [6], skirtas aukštosioms mokykloms atlikti e. studijų paslaugų savianalizę, rengti studijų kokybės vertinimo tvarkas ar naudoti kitoms su studijų kokybe susijusioms veikloms. Siekiant uždavinyje numatyto rezultato, rengiant metodines rekomendacijas, dirbo darbo grupė, sudaryta iš nuotolinio mokymosi ekspertų, atstovaujančių keturiolika Lietuvos aukštųjų mokyklų – universitetų ir kolegijų. Ši grupė buvo pasiskirsčiusi į keturis pogrupius, kurie gilinosi į skirtingus e. studijų rengimo savianalizei skirtos medžiagos aspektus. Darbo grupės nariai įvertino atstovaujamų organizacijų poreikius, peržiūrėjo naujausią informaciją e. studijų srityje, apžvelgė aktualiausias su studijų kokybe ir jos vertinimu susijusias publikacijas bei praktinius darbus. Parengtas dokumentas, kuriame pateikiamos metodinės rekomendacijos kokybės reikalavimų taikymo principams. Dokumente pristatomi:

- bendrieji tarptautinius standartus atitinkantys kokybės reikalavimai;
- su virtualia mokymosi aplinka susijusių e. studijų paslaugų kokybės vertinimo rodikliai ir kriterijai;
- rekomenduojami e. kursų, kitos e. mokomosios medžiagos kokybės rodikliai;
- rekomenduojamos e. studijų kokybės užtikrinimo priemonės.

Pastebima, jog pateikiamuose reikalavimuose laikomasi principo, nusakomo žodžiais: „reikia įvertinti", ,,jeigu pasikeičia, tuomet..." ir pan. Tai demonstruoja neišvengiamą proceso dinamiškumą, grįžtamojo ryšio, poveikio vykstančiam procesui poreikį ir rezultatų vertinimą. Kiekviena aptariama rodiklių grupė nurodo reikalavimus nagrinėjamo klausimo atžvilgiu išskirtiems svarbiausiems veiksniams ar elementams. Institucija, atitinkamo skyriaus darbuotojas ar kiekvienas besidomintis dėstytojas pasirinks jam aktualią veiksnių grupę, galės remtis šiais nurodymais. Žemiau supažindinama su svarbiausiais darbo grupių pateiktos metodinės medžiagos aspektais.

2.1. Bendrieji tarptautinius standartus atitinkantys kokybės reikalavimai

Darbo grupės[1] parengtame dokumente apibrėžiama e. mokymosi samprata ir konstatuojama, jog IKT dalyvauja visuose mokymosi proceso lygiuose, yra svarbi ir neatsiejama jo dalis. Remiamasi nuostata, jog mokymosi kokybė atspindi sąryšį tarp mokymosi ir įvairių objektų ar subjektų nustatytų reikalavimų, todėl sąvoką „mokymosi kokybė" apima daugiau aspektų ir ją galima išskaidyti į keletą skirtingų sąvokų:

- mokymo kokybė;
- akademinio personalo kokybė;
- studijų programos kokybė;
- studijų aplinkos kokybė (įrangos, studijų palaikymo ir pan.);
- studentų, moksleivių, stojančiųjų savybės;
- aukštosios mokyklos valdymo kokybė;
- mokslinių tyrimų kokybė.

Metodinėje medžiagoje teigiama, jog mokymosi kokybės sąvoka nėra vienalytė, tad ir mokymosi kokybę lemia daug veiksnių.

Iš to išplaukia, jog aprašant ar nustatant studijų ar mokymosi kokybę, yra susiduriama su problemomis ją apibūdinti ir nustatyti vieningus reikalavimus, nors daug institutų, asociacijų, darbo grupių mėgina

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tą nagrinėti ir apibrėžti (pvz., Europos kokybės užtikrinimo aukštajame moksle asociacija (European Association for Quality in Higher Education (ENQA))[2], Europos nuotolinio ir e. mokymosi tinklas (European Distance and E-learning Network (EDEN))[3], Europos e. mokymosi kokybės fondas (European Foundation for Quality in eLearning (EFQUEL))[4] ir kt.

Kaip pavyzdys kokybės įsivertinimui pateikiamas Europos nuotolinio mokymosi universitetų asociacijos (EADTU) parengtas institucijos įsivertinimo įrankis QuickScan[5], skirtas e. mokymosi situacijai institucijoje įvertinti kokybė reikalavimų aspektu. QuickScan vertinamos šios institucijos veiklos sritys:

- strateginis valdymas;
- programos struktūra (planas);
- kurso / sando struktūra (planas);
- kurso / sando teikimas;
- personalo parama;
- studentų parama.

Metodinėje medžiagoje kiekviena ši aukščiau išvardyta veiklos sritis yra atskirai apžvelgiama.

QuickScan įrankis patogus naudoti, nes ne tik padeda įvertinti įvairius studijų ar mokymosi kokybę veikiančius veiksnius, platų jų spektrą, bet ir dėl to, jog analizė atliekama, suinteresuotam kokybe asmeniui atsakinėjant į sistemoje pateikiamus klausimus. Kiekvienam neigiamai įvertintam atsakymui pateikiama rekomendacija dėl veiklos gerinimo.

Darbo grupės siūlymu, kiekviena Lietuvos nuotolinio mokymosi tinklo LieDM palaikymo ir plėtros konsorciume dalyvaujanti organizacija turėtų atlikti savo institucijos bandomąjį įsivertinimą ir tokiu būdu galima būtų sužinoti bendrą kokybės vertinimą ir situaciją ir, kaip teigia darbo grupė, kurlink turime judėti, ką reikia tobulinti bendromis pajėgomis.

2.2. Su virtualia mokymosi aplinka susijusių e. studijų paslaugų kokybės vertinimo rodikliai ir kriterijai

Dokumente pateikti ir apibūdinti reikalavimai e. mokymosi teikimo sistemai, o taip pat, remiantis ankstesniame skyriuje pristatyto įsivertinimo įrankio QuickScan pagrindu, pateikti paslaugų teikimo vertinimo aspektai. Siekiant išvengti didelės kokybės rodiklių ir kriterijų įvairovės, darbo grupė[6] pasirinko šį patogų institucijos įsivertinimo įrankį. Svarbu ir tai, jog įrankis atitiko darbo grupės analizės objektą: QuickScan įrankyje išskirtas atskiras skyrius ,,Kursų teikimas".

Darbo grupė išskyrė tris reikalavimų grupes: reikalavimai e. mokymosi sistemoms, studentų parama ir personalo parama.

1. Reikalavimai e. mokymosi sistemoms. Švietimo reikalavimai apima mokymosi išteklių teikimą, komunikaciją ir žinių vertinimo priemones. Techniniai reikalavimai apima duomenų patikimumo ir saugumo standartus. E. mokymosi teikimo sistema turi būti stebima ir tobulinama, kad tenkintų šiuos standartus bei atitiktų reikalavimus:

- E. mokymosi sistemos techninė infrastruktūra turi būti pakankama akademinėms ir administracinėms funkcijoms palaikyti.
- Komunikacijos ir informacijos teikimo e. sistemos turi būti saugios, patikimos ir užtikrinti reikiamo lygio privatumą.
- E. sistemos priežiūros, stebėsenos ir peržiūros rezultatus pastoviai reikia lyginti su nustatytais standartais. Šie standartai, kai būtina, turi būti atnaujinami.

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[2] *http://www.enqa.eu/*
[3] *http://www.eden-online.org/*
[4] *http://efquel.org/*
[5] *http://e-xcellencelabel.eadtu.eu/tools/quickscan*
[6] *P. Abarius, Vilniaus universitetas, S. Turskienė, Šiaulių universitetas, D. Martišienė, Kauno technikos kolegija.*

- E. mokymosi sistemos leidžia pasirinkti internetinius įrankius, kurie būtų tinkami naudojamiems švietimo modeliams bei studentų ir dėstytojų poreikiams.
- Informacija apie tai, kaip naudoti įstaigos e. mokymosi sistemas ir paslaugas, turi būti teikiama logišku, nuosekliu ir patikimu būdu visiems vartotojams.
- Institucinė medžiaga ir informacija, prieinama per VMA, turi būti reguliariai stebima, peržiūrima ir atnaujinama.

2. Studentų parama. Studentų paramos paslaugos yra esminis komponentas e. mokymesi. Jų projektavimas turi apimti pedagoginius, techninius ir informacijos išteklių aspektus. Palaikymo paslaugos turi prasidėti nuo studento prieigos per institucijos internetinį puslapį prie e. mokymosi sistemos, dažnai tai būna virtuali mokymosi aplinka (VMA), baigiant atskirais e. kursais ar mokymosi objektais, pateikiant apie juos pilną informaciją.

Pagal aukščiau minėtą QuickScan įrankį studentų paramos kokybei išskiriami šie vertinimo aspektai:

- Studentams pateikiama aiški ir savalaikė informacija apie e. kursus, įskaitant mokymosi ir vertinimo metodus.
- Studentams pateikiamuose studijų vadovuose nurodomos jų ir institucijos teisės, vaidmenys ir atsakomybė. Juose taip pat pateikiama informacija apie prieigą bei dalyvavimą įvairiose bendradarbiavimo veiklose.
- Socialinių tinklų teikiamos galimybės leidžia sukurti ir remti studentų bendruomenes. Tai gali būti pasiekta naudojant institucijos virtualioje mokymosi aplinkoje (VMA) arba, jei reikia, per išorės socialinių tinklų svetaines.
- Studentai turi galimybę naudotis paramos paslaugomis, įskaitant techninės pagalbos tarnybos paslaugas, administracinę paramą ir visaverčius patarimus dėl e. kursų pasirinkimo.
- Studentai turi turėti prieigą prie e. mokymosi išteklių, įskaitant internetinę biblioteką bei mokymosi įgūdžių ugdymo ir studijų patarėją / vadovą.

3. Personalo parama. Personalo paramos paslaugų tikslas yra suteikti galimybę visiems akademinio, administracinio ir techninio personalo nariams visapusiškai prisidėti prie e. mokymosi plėtros ir paslaugų teikimo. Naujovių diegimas, pradedant nuo aplinkos ir techninės įrangos, sąlygoja ir darbuotojų ugdymo veiklas. Taip pat reikalinga nuolatinė geros praktikos sklaida. Personalo paramos kokybei išskiriami šie vertinimo kriterijai:

- Akademinis, VMA kūrimo ir administracinis personalas turi palaikyti e. mokymosi komponentų kūrimą ir teikimą.
- Institucija turi užtikrinti tinkamą mokymą ir paramą darbuotojams, atsižvelgiant į technologijų ir švietimo pokyčius.
- Švietimo tyrimai ir inovacijos e. mokymesi yra aukšto lygio veikla ir skatina karjeros pokyčius.
- Užtikrinami mechanizmai geros praktikos sklaidai, remiantis e. mokymosi patirtimi ir moksliniais tyrimais.
- Turi būti užtikrinamas darbuotojų darbo krūvio problemų sprendimas, atsižvelgiama į kitą darbuotojų dalyvavimą e. mokymosi veiklose, teikiant e. mokymosi kursus ar studijų programas.
- Tinkama parama ir ištekliai (pvz., techninė pagalba ir administracinė parama) turi būti prieinama visam akademiniam personalui.

Darbo grupės nuomone, jų pateiktame dokumente apžvelgti svarbiausi su e. mokymosi paslaugomis susiję rodikliai ir kriterijai. Taip pat teigiama, jog EADTU asociacijos pateikto QuickScan institucijos įsivertinimo įrankio taikymas gali būti greita ir aiški institucijos teikiamų e. mokymosi paslaugų kokybės lygio nustatymo priemonė, įrankis pakankamai lankstus ir jame nėra per daug perteklinių rodiklių, kaip daugelyje kitų sukurtų priemonių kokybei nustatyti, pavyzdžiui, Canadian Recommended E-learning Guidelines(Can/REGs) ar European Foundation for Quality in eLearning (EFQUEL).

2.3. Rekomenduojami e. kursų, kitos e. mokomosios medžiagos kokybės rodikliai

E. studijų technologijų įvairovė yra labai didelė, ir tai atveria gausybę galimybių. Darbo grupė[7] iškelia tokius klausimus: ar e. studijoms ir jose naudojamai mokomajai medžiagai galima taikyti tradicinių studijų kokybės rodiklius? Jei ne, tai kokie rodikliai nusako e. studijų mokomosios medžiagos kokybę? Ar jie yra universalūs skirtingoms institucijoms, studijų programoms, moduliams?

Darbo grupės pateiktoje medžiagoje apžvelgiami rekomenduojami e. kursų, kitos e. studijų mokomosios medžiagos kokybės rodikliai: turinio ir technologijų dermės vertinimo, mokymosi turinio kokybės vertinimo, e. studijų išteklių naudojimo mišraus mokymosi procese. Buvo išanalizuota Lietuvos bei Vakarų Europos aukštojo mokslo institucijų parengtos e. studijų mokomosios medžiagos kokybės užtikrinimo rekomendacijos ir struktūruotai pateikiami svarbiausi kokybės rodikliai. Kadangi mokomosios medžiagos kokybė be institucijos konteksto yra nepakankamai apibrėžta, šie rodikliai apima ir institucinį lygmenį.

Pateikiamos šešios kokybės rodiklių grupės: strateginis valdymas, studijų plano kūrimas, dalykų/kursų kūrimas, dalykų / kursų dėstymas ir pateikimas, personalo parama ir studentų parama.

1. Strateginis valdymas. E. studijų strategija turėtų būti integruota į institucijos mokymo ir mokymosi strategiją. Institucijoje turėtų galioti e. studijų teikimą reglamentuojantys dokumentai. Šie dokumentai turėtų aiškiai nusakyti vartotojų grupes bei visus taikymo praktikoje aspektus, atsakingų darbuotojų bei infrastruktūros plėtrą. Atsirandančių technologijų bei pažangos e. studijų srityje turėtų būti vykdomas tyrimas, monitoringas ir planavimas, kaip šiuos dalykus integruoti į mokymosi aplinką. Institucijos žmogiškųjų ir finansinių išteklių paskirstymas turėtų būti vykdomas taip, kad būtų efektyviai aprūpinti su kokybiškų e. studijų teikimu susiję poreikiai.
2. Studijų plano kūrimas. E. studijų sudėtinės dalys turėtų atitikti institucijos personalo kvalifikacijos tobulinimo planus bei kitus institucinius ir nacionalinius kokybės reikalavimus. Studijų planai turėtų būti kuriami taip, kad juos būtų galima personalizuoti bei suteikti besimokančiajam galimybes mokymosi rezultatus integruoti su kitomis (ne elektroninėmis) studijomis.
3. Studijų dalykų kūrimas. Kiekvienam dalykui turėtų būti apibrėžti siekiami mokymosi rezultatai tiek žinių, tiek įgūdžių prasme. Mišraus mokymosi kontekste turi būti aiškiai grindžiama kiekvieno mokymosi būdo naudojimo paskirtis. Mokymosi rezultatai, o ne technologijų prieinamumas turėtų sąlygoti, kokiais būdais dalyko medžiaga bus pateikiama.
4. Studijų dalykų dėstymas ir pateikimas. Techninė infrastruktūra, naudojama e. studijų sistemoje, turėtų būti tinkama, atliekant tiek akademines, tiek administracines funkcijas.
5. Personalo parama. Personalas, kuris yra susijęs su akademine, informacine bei administracine veikla, turėtų remti e. studijų komponentų plėtrą bei taikymą. Institucija turėtų užtikrinti reikalingus mokymus bei paramą šiam personalui. Personalo ugdymas turėtų neatsilikti nuo sistemos plėtros bei pedagoginės pažangos.
6. Studentų parama. Studentams turėtų būti suteikiama visapusiška informacija apie e. studijų išteklius: apie sistemos bei e. mokymosi aplinkos techninius reikalavimus, reikalingas žinias bei įgūdžius, programos pobūdį, mokymosi metodų įvairovę, galimą paramą, vertinimo reikalavimus ir t. t. Studentai turėtų turėti prieigą prie mokymosi išteklių bei besimokančiųjų paramos sistemų. E. studijų sistema turėtų turėti:

- prieigą prie bibliotekos e. išteklių;
- paramą, susijusią su pagrindinių įgūdžių gerinimu: e. studijų įgūdžius, bendradarbiavimą internetu bei dalyvavimą interneto bendruomenėse ir kt.;
- paaiškinimus apie studijų dalykų pasirinkimą bei programos vykdymą;
- konkretų asmenį, atsakingą už informaciją apie akademinius rezultatus bei pažangą;
- techninės ir administracinės pagalbos centrą;

[7] *D. Rutkauskienė, Kauno technologijos universitetas, S. Radzevičienė, Lietuvos sveikatos mokslų universitetas, E. Sakalauskaitė, Vilniaus kolegija*

- formalų grįžtamąjį ryšį dalyko lygmenyje;
- procedūras, skirtas spręsti galimus sunkumus ar ginčus;
- prieigą prie alumni organizacijų.

Kokybės rodiklius analizavusi darbo grupė teigia, jog e. studijų medžiaga yra labai dinamiška, orientuota į besimokantįjį, netgi individualizuota, todėl kokybės rodikliai yra labiau rekomendacinio pobūdžio, nei neišvengiamas reikalavimas. Iš pateikto sąrašo būtina atrinkti tuos rodiklius, kurie yra aktualūs institucijai, studijų programai, kursui.

2.4. Rekomenduojamos e. studijų kokybės užtikrinimo priemonės

Parengtame dokumente darbo grupė[8] teigia, jog e. mokymesi kokybės kriterijai iš esmės neliečia studijų dalyko turinio ir yra orientuoti į institucijos pasirengimą teikti e. studijų paslaugas visuose organizacijos lygiuose, todėl ir kokybės užtikrinimo priemonės turi būti orientuotos į: studijų aplinką / infrastruktūrą; akademinį personalą; studentų ir akademinio personalo paramą.

1. Studijų aplinka/infrastruktūra. Ypatingas dėmesys turi būti skiriamas IKT. Siekiant palaikyti e. mokymosi aplinkas ir pakankamą prieigą prie jų, turi būti numatytos pakankamos lėšos greitai interneto prieigai ir serveriams. Institucija pagal galimybes gali naudotis savo IKT infrastruktūra arba debesų technologijų teikiamomis paslaugomis. E. mokymosi aplinkas diegti, administruoti ir atnaujinti turi kvalifikuotas įstaigos personalas.

   Rekomenduojamos studijų aplinkos / infrastruktūros kokybės vertinimo priemonės:

- naudojamų IKT tinkamumo vertinimas;
- interneto prieigos greičio pakankamumo vertinimas;
- naudojamos kompiuterinės įrangos tinkamumo ir pakankamumo vertinimas;
- studentų nuomonė apie studijų aplinką / infrastruktūrą.

2. Akademinis personalas. E. studijas realizuojantis akademinis personalas turi būti tinkamas šių studijų vykdymui: turi turėti reikiamą kompetenciją ir patirties e. studijų realizavimo srityje. Visų pirma, institucija turi įsivertinti akademinio per¬sonalo pasirengimą ir kvalifikaciją: ar dirba pakankamas skaičius personalo, galinčio kokybiškai teikti e. mokymą virtualioje erdvėje, rengti ir tobulinti e. mokymosi programas ir kursus. Rekomenduojamos akademinio personalo kokybės vertinimo priemonės:

- akademinio personalo kvalifikacijos tinkamumo vertinimas;
- akademinio personalo patirties e. studijų realizavimo srityje pakankamumo vertinimas;
- akademinio personalo profesinio tobulėjimo sistemiškumo vertinimas.

3. Studentų ir akademinio personalo parama. E. studijose nėra galimybės turėti tiesioginį kontaktą su dėstytoju arba šis kontaktas vyksta technologinėmis priemonėmis, todėl e. mokymosi programų kokybę didele dalimi lemia studentų paramai naudojamos priemonės. E. studijų kursus ir programas teikianti institucija turi aiškiai apibrėžti savo atsakomybę už savarankiškų studijų skatinimą, paramą tokioms studijoms ir studentų galimybes kontroliuoti savo asmeninius studijų rezultatus. Turėtų būti parengtos tokių studijų rekomendacijos (vadovai). Svarbus dėstytojo (kuratoriaus), kuris organizuoja e. studijų procesą, vaidmuo. Vieni svarbiausių veiksnių, lemiančių e. studijų kokybę, yra dėstytojo (kuratoriaus) komunikavimas su studentais ir studentų komunikavimas tarpusavyje. Institucijoje turi būti atliekami tyrimai (studentų apklausos) parodantys, ar naudojamos e. studijų priemonės ir technologijos yra interaktyvios ir ar jos padeda pasiekti studijų rezultatus. Institucija taip pat turi suteikti reikiamą techninę bei metodinę pagalbą dėstytojams, konsultuojant juos tiek techniniais, tiek e. studijų teikimo klausimais.

   Rekomenduojamos studentų ir akademinio personalo paramos kokybės vertinimo priemonės:

- studentų paramos sistemos tinkamumo vertinimas;

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[8] *D. Baltrušaitis, Kauno kolegija, K. Traškevičius, Marijampolės kolegija, Lijana Šarkaitė-Vilums, Lietuvos muzikos ir teatro akademija*

- akademinio personalo paramos tinkamumo vertinimas;
- studentų nuomonė apie e. studijų palaikymo priemones.

Vertinimams visose – studijų aplinkos / infrastruktūros, akademinio personalo, studentų ir akademinio personalo paramos – srityse galima naudoti keturių balų skalę: ,,nepatenkinamai: yra esminių trūkumų, kuriuos būtina pašalinti", ,,patenkinamai: tenkinami minimalūs reikalavimai, reikia tobulinti", ,,gerai: sisteminis plėtojimas, yra savitų bruožų", ,,labai gerai: išskirtinumas".

Darbo grupės nuomone, gauti institucijos vykdomų e. studijų įvertinimą galima ir pasinaudojus jau ankstesnėse šio dokumento dalyse pristatytu įrankiu QuickScan. Šiuo įrankiu vertinamas platesnis, negu aukščiau nagrinėjamas kontekstas, apimantis institucijos strateginio valdymo, programos struktūros (plano), kurso / sando struktūros (plano), kurso / sando pateikimo, personalo paramos ir studentų paramos sritis.

Gautas rekomendacijas vertėtų aptarti institucijos viduje, nusistatyti prioritetus bei panaudoti sudarant institucijos e. studijų tobulinimo veiksmų planą. Reikėtų pastebėti, kad internetinio QuickScan įrankio pagalba teikiamos rekomendacijos yra bendro pobūdžio ir realiai yra teikiamos neatsižvelgiant į institucijos dydį bei tipą. Todėl institucijos e. studijų savianalizės grupės narių jos turėtų būti įvertintos ir adaptuotos konkrečiai situacijai. Apibendrinant galima teigti, kad QuickScan įrankis turėtų būti naudojamas kaip pagalbinė e. studijų kokybės vertinimo priemonė orientaciniam įsivertinimui gauti greta institucijos periodiškai vykdomo e. studijų savianalizės proceso.

IŠVADOS

Nors kokybės sąvokų ir procesų vertinimas vis dar susiduria su požiūrių įvairove, studijų kokybės užtikrinimui reikalingus veiksmus galima vykdyti, pasiremiant siūlomais standartais ir gairėmis. Metodinės medžiagos e. studijų rengimo savianalizei rekomendacijose pateikti rodikliai ir kriterijai padeda ir planuoti, ir organizuoti e. studijų procesą. Tai savotiškas atspirties taškas, kai galima sužinoti, kokio lygio paslaugas institucija teikia. Lengvai prieinamas internete ir patogus naudoti EADTU asociacijos sukurtas įsivertinimo įrankis QuickScan skirtas visoms e. studijas teikiančioms institucijoms. Tai gali būti pradinis etapas, padedantis suvokti kokybės proceso struktūrą, reikšmingus elementus, eiliškumą ir ryšius. Įsisavinus vieną kokybės vertinimo priemonę, galima lengviau pasirinkti tarp kitų priemonių studijų kokybei vertinti ir kokybės reikalavimų, nes turėtume su kuo lyginti ir žinotume, ką lyginame.

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Informacinių ir komunikacinių technologijų diegimo lygiai universiteto dėstytojo edukacinėje veikloje

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SANTRUMPA. Informacinių komunikacinių technologijų (toliau - IKT) taikymas vis aktualesnis universiteto studijose, todėl dėstytojui būtina IKT kompetencija. Straipsnyje sprendžiami probleminiai klausimai: kaip universiteto dėstytojo IKT kompetencija pasireiškia edukacinėje veikloje? Kaip IKT diegimo lygiai atliepiami dėstytojų edukacinėje veikloje, realizuojant skirtingų sričių studijų programas? Šie klausimai sudaro tyrimo mokslinę problemą. Straipsnį sudaro trys dalys. Pirmoje dalyje atskleidžiama dėstytojo IKT kompetencija skirtingų IKT diegimo lygių aspektu. Antroje straipsnio dalyje pristatoma tyrimo metodologija, trečioje dalyje pateikiami apibendrinti tyrimo rezultatai.

Raktiniai žodžiai: *universiteto dėstytojas, informacinės ir komunikacinės technologijos, IKT diegimo lygiai, edukacinė veikla, mokymo/mokymosi procesas.*

Įvadas

Spartūs pokyčiai ir nuolatinio mokymosi poreikis šiandieninėje visuomenėje kelia universitetinių studijų kokybės, jų lankstumo, efektyvumo klausimus. Atliepiant šiandieninius poreikius, mokymo ir mokymosi procesas universitete vis glaudžiau siejamas su informacinėmis komunikacinėmis technologijomis (toliau – IKT). IKT taikymas mokymui ir mokymuisi, naujos mokymosi galimybės plačiai analizuojamas mokslinėje literatūroje [2], [9], [14] ir kt. IKT taikymas studijose reikalauja dėstytojo IKT kompetencijos [3]. Mokslinėje literatūroje atskleistos dėstytojo IKT veiklos, gebėjimai, požiūriai, parodytas jų poreikis konkrečiose edukacinėse ir mokymosi aplinkose [10], [11], [14] ir kt. Pagrįstas universiteto dėstytojo IKT kompetencijos holistiškumas [3]. Išskirti IKT diegimo lygiai [9], atskleista, kokia dėstytojo IKT kompetencija būdinga skirtinguose IKT diegimo lygiuose [4]. Tačiau mokslinėje literatūroje neaptikta, kaip universiteto dėstytojo IKT kompetencija pasireiškia edukacinėje veikloje. Analizuojant mokslinę literatūrą išryškėjo, kad IKT taikymas gali skirtis, realizuojant skirtingų mokslų studijų programas [7], [13], [16] ir kt. Priklausomai nuo studijų srities gali skirtis bei būti orientuota į skirtingą IKT diegimo lygį ir dėstytojo IKT kompetencijos raiška. Taigi kyla klausimas, kaip IKT diegimo lygiai atliepiami dėstytojų edukacinėje veikloje, realizuojant skirtingų sričių studijų programas. Šie probleminiai klausimai ir sudaro tyrimo mokslinę problemą.

Tyrimo tikslas – atskleisti universiteto dėstytojo IKT kompetencijos raišką edukacinėje veikloje IKT diegimo lygių kontekste, realizuojant fizinių ir socialinių mokslų studijų programas.

Taikyti tyrimo metodai: mokslinės literatūros analizė, pusiau struktūruotas interviu, kokybinė turinio analizė.

1. DĖSTYTOJO IKT KOMPETENCIJA SKIRTINGŲ IKT DIEGIMO LYGIŲ ASPEKTU

Mokslinėje literatūroje yra įvairių IKT, kompetencijos, IKT kompetencijų sampratų [1], [8], [17] ir kt. Išanalizavus universiteto dėstytojo veiklas bei šias sampratas, remiamasi Jucevičienės pateiktu kompetencijos apibrėžimu [5]. Taigi dėstytojo IKT kompetencija apibrėžiama kaip dėstytojo žinios, įgūdžiai, gebėjimai, požiūriai, vertybės, sąlygojusios sėkmingus IKT naudojimo, taikymo ar integravimo universiteto dėstytojo veiklose rezultatus.

Kompetencijos sandara išryškėjo išanalizavus skirtingus IKT bei e. kompetencijos modelius ir struktūras [1], [14], [15] ir kt., taip pat mokslinėje literatūroje pažymėtus dėstytojo IKT kompetencijos aspektus. Nustatyta, kad dėstytojo IKT kompetenciją sudaro bazinė IKT kompetencija, būdinga daugeliui IKT naudotojų, ir integralioji edukacinė IKT kompetencija, specifinė dėstytojo veiklai [3], [4]. Bazinė IKT kompetencija apima technologinį raštingumą, informacinį raštingumą ir sociokultūrinį raštingumą, integraliąją edukacinę IKT kompetenciją sudaro pedagoginė IKT kompetencija, vadybinė IKT kopetencija bei dalykinė IKT kopetencija.

Dėstytojo IKT kompetencijos IKT diegimo lygiuose atskleidimui pasirinktas Molz, Eckhardt, Schnotz

modelis [9]. Pasirinkimą lėmė tai, kad jame sujungiamos esminės, naudojamos universitete IKT pagal panaudojimo lygius ir tipus. Akcentuojama fizinė–virtuali erdvė ir komunikacijos procesas. Be to, įvertinamos situacijos nuo visiško IKT nenaudojimo ir tradicinio dėstymo auditorijoje iki naujų mokymosi galimybių pasauliniame tinkle. Dėstytojo IKT kompetencijos modeliavimui svarbūs ir edukaciniai aspektai, kurių nėra anksčiau minėtame modelyje, todėl jis buvo papildytas pedagoginės sistemos elementais.

Remiantis Molz, Eckhardt, Schnotz, 0-iame lygyje mokoma(-si) konkrečioje fizinėje erdvėje (pvz., auditorijoje) ir IKT nenaudojamos [9]. Žvelgiant plačiau, šiandien dėstytojui IKT kompetencija reikalinga net ir nenaudojant IKT auditorijoje. Taigi tikslinga modifikuoti Molz, Eckhardt, Schnotz modelį ir įterpti 1-ą IKT diegimo lygį, kai dėstytojas nenaudoja IKT studentų mokyme(-si), bet jam reikalingas bent elementarus technologinis raštingumas (pagrindinių darbo principų su IKT žinojimas, gebėjimas komunikuoti, suvesti akademinę informaciją ir pan.), informacinis raštingumas (gebėjimas surasti ir panaudoti aktualią studijoms informaciją), sociokultūrinį raštingumas (naudojant IKT, kitų asmenų intelektinės nuosavybės gerbimas).

Kitame (2-ame) IKT diegimo lygyje, akcentuojama konkreti fizinė erdvė, tačiau IKT praturtina mokymo(-osi) procesą. Paskaitų metu, perteikiant ugdymo turinį, demonstruojamos skaidrės ar kita vizualinė medžiaga, įgalinanti išsamesnį nagrinėjamo dalyko perteikimą [6]. Padalomoji medžiaga duodama studentams, įrašant ją į el. laikmeną ar persiunčiant el. paštu (el. pašto naudojimas nėra sudėtingas veiksmas, todėl galima diskutuoti su Molz, Eckhardt, Schnotz, kurie tai priskiria aukštesniam lygiui [9]). Dėstytojas studentams gali parengti įvairesnes užduotis, atliekamas IKT priemonėmis, Taigi dėstytojo IKT kompetencija šiame lygyje apima technologinį raštingumą (gebėjimą naudoti ir valdyti IKT); informacinį raštingumą (gebėjimą surasti ir naudoti aktualią informaciją), sociokultūrinį raštingumą (naudojant IKT, kitų asmenų intelektinės nuosavybės gerbimą, privatumo ir konfidencialumo paisymą), pedagoginę IKT kompetenciją (tinkamą IKT priemonių parinkimą), vadybinę IKT kompetenciją (organizuojant savarankišką mokymąsi su IKT). Dalykinės IKT kompetencijos reikia, kai naudojamos specifinės dalykui ar mokslo krypčiai IKT.

3-ame IKT diegimo lygyje akcentuojamos virtualios edukacinės erdvės, kai naudojamas el. paštas, pokalbių kambariai, vaizdo konferencijos ir kt. [9]. Į virtualią erdvę gali būti perkeltas mokymas arba įgalinamas studentų mokymasis [12]. Šiame IKT diegimo lygyje išryškėja papildomi aspektai dėstytojo IKT kompetencijoje. Technologiniame raštingume itin reikšminga informacijos sklaida ir komunikavimas IKT priemonėmis. Siekiant aktyvaus studentų mokymosi ypač reikšminga vadybinė IKT kompetencija, kurioje itin aktualus studentų mokymosi organizavimas ir palaikymas IKT priemonėmis, taip pat komunikavimas su kolegomis ir IKT specialistais. Šie aspektai siejasi su pedagogine IKT kompetencija (tinkamu IKT priemonių parinkimu bei metodų ir IKT priemonių, skatinančių mokymąsi, taikymu).

4-asis IKT diegimo lygis siejamas su mokymosi tinklais, virtualiomis bendruomenėmis, žmonijos multimedijos biblioteka, pažangiomis interneto technologijomis [9]. Dėstytojo. IKT kompetencijos sudedamosios dalys pasipildo įgūdžiais, gebėjimais, nuostatomis taikyti naujas technologijas mokymosi įgalinimui. Prisitaikant prie individualių studentų poreikių išauga pedagoginės IKT kompetencijos svarba (pagalba studentui pasirenkant tinkamas IKT priemones, metodų ir IKT priemonių, skatinančių mokymąsi, taikymas). Itin reikšminga vadybinė IKT kompetencija. Svarbios charakteristikos – studentų mokymosi organizavimas ir palaikymas IKT priemonėmis. Šiam etapui būdingas vadybinės IKT kompetencijos aspektas – bendradarbiavimas su kolegomis ir kitais specialistais mokymosi ir partnerystės tinkluose, taip pat integraliosios edukacinės IKT kompetencijos tobulinimas.

Taigi kuo aukštesnis IKT diegimo lygis, tuo aukštesnė IKT kompetencija reikalinga dėstytojui. Siekiant atskleisti dėstytojo IKT kompetencijos raišką edukacinėje veikloje IKT diegimo lygių kontekste buvo atliktas empirinis tyrimas.

2. TYRIMO METODOLOGIJA

Straipsnyje iškeltos problemos tyrimas yra vienas iš universiteto dėstytojo IKT kompetencijos raiškos studijose tyrimo etapų. Siekiant visapusiškai ir išsamiai ištirti dėstytojo IKT kompetencijos raišką, taikyta atvejo studijos strategija bei mišraus (trianguliacinio) tyrimo dizainas. Duomenų rinkimui naudoti kokybiniai ir kiekybiniai metodai: dokumentų analizė, pusiau struktūruotas interviu, apklausa raštu. Šiame

straipsnyje analizuojamai problemai tirti taikytas pusiau struktūruoto interviu metodas duomenų rinkimui ir kokybinės turinio analizės metodas duomenų apdorojimui.

Tyrimas atliktas Kauno technologijos universitete (toliau – KTU). Siekiant atskleisti dėstytojo IKT kompetencijos raišką, pasirinktos mokslo sritys, mažiausiai susijusios tarpusavyje, su labai skirtingais mokslo objektais, t.y. fiziniai ir socialiniai mokslai. Pasirinktos pagrindinės, bakalauro lygmens studijos, kuriose tampama konkrečios srities specialistu. Studijų programų atranka buvo atliekama, remiantis universitete organizuojamos studentų apklausos rezultatais: atrinktos fizinių ir socialinių mokslų studijų programos su geriausiu modulių įvertinimų vidurkiu iš kiekvienos universitete esančių studijų krypčių grupės (gamtos mokslų, matematikos ir kompiuterių mokslo, socialinių studijų, verslo ir vadybos, švietimo ir ugdymo). Studentų apklausoje atsižvelgta į vertinimus IKT panaudojimo klausimais.

Dėstytojų atranka buvo vykdoma po dokumentų analizės (analizuoti 2010 m.m. rudens semestro moduliai, labiausiai susiję su studijų programų kryptimi, t.y. fizikos programoje fizikos krypties moduliai, edukologijos programoje edukologijos krypties moduliai ir t.t.). Studijų programose atrinkti dėstytojai, kurių dėstomų modulių aprašuose išryškėję daugiausiai prielaidų dėstytojo IKT kompetencijos raiškai, atitinkančiai skirtingus IKT diegimo lygius ar bent IKT diegimo lygių elementus. Taip pat atsižvelgta į KTU organizuotos studentų apklausos rezultatus pagal kriterijus, susijusius su IKT taikymu (kreiptasi į dėstytojus, kurių moduliai pagal minėtus kriterijus geriausiai įvertinti studentų). Iš viso apklausta 18 dėstytojų: informatikos, fizikos ir edukologijos krypties programose po 4 dėstytojus (visi jie dėstė po vieną modulį), sociologijos krypties programoje – 2 dėstytojai (3 modulių iš 4 atrinktų pagal atrankos kriterijus); vadybos ir administravimo krypties programoje – 4 dėstytojai (6 modulių).

3. TYRIMO REZULTATAI

Šiame skyriuje pristatomi apibendrinti tyrimo rezultatai.

Remiantis informantų įžvalgomis, visų analizuotų studijų programų informantų dėstomuose moduliuose dėstytojo technologinio raštingumo raiška atitinka 2-ą IKT diegimo lygį, tačiau yra elementų, būdingų 3-iam IKT diegimo lygiui (IKT naudojamos konkrečioje fizinėje erdvėje, tačiau atskiros IKT priemonės būdingos virtualiam mokymui ir mokymuisi). Informatikos krypties modulius dėstančių informantų technologinio raštingumo raiškos ypatumas – informacijos sklaidos IKT priemonėmis būdų įvairovė (perduodant mokymo(-si) medžiagą studentams), todėl šioje kryptyje informantų technologinio raštingumo raiška atitinka 2-3-ią IKT diegimo lygį. Pažymėtina, kad visų krypčių modulius dėstančių informantų tarpe, jų teigimu, yra dėstytojų, kurie turi patirtį, ketina naudoti ar jau naudoja virtualias edukacines aplinkas.

Visų analizuotų studijų programų informantų dėstomuose moduliuose, remiantis informantų įžvalgomis, akcentuojama dėstytojo informacinio raštingumo raiška, atitinkanti 3-ią IKT diegimo lygį, kai naudojamos prenumeruojamos duomenų bazės, užsakoma naujausia informacija. Tačiau yra informatikos ir edukologijos krypties modulius dėstančių informantų, kurie neatskleidė 3-iam IKT diegimo lygiui būdingos informacijos paieškos ir akcentavo tik interneto paieškos sistemų naudojimą. Tai atitinka 2-ą IKT diegimo lygį. Atskleistas sociologijos krypties modulius dėstančių informantų informacinio raštingumo raiškos elementas – informantų akcentuojamas studentų informacinio raštingumo, atitinkančio 3-ią IKT diegimo lygį, gebėjimų (mokslinės literatūros paieškos prenumeruojamose duomenų bazėse) ugdymas sociologijos krypties moduliuose. Fizinių mokslų modulius dėstantys – informantai teigė, kad edukacinei veiklai dažnai pakanka informacijos, rastos naudojant interneto paieškos sistemas, pvz., Google, moksliniams straipsniams jau reikia ieškoti duomenų bazėse.

Interviu rezultatai rodo, kad edukologijos, vadybos ir administravimo bei fizikos krypčių modulius dėstančių informantų sociokultūrinio raštingumo raiška atitinka 2-3-ią IKT diegimo lygį, tačiau informantams žinomos ir 3-4 lygio su sociokultūriniu raštingumu siejamos asmens duomenų ar intelektinės nuosavybės teisių apsaugos virtualioje erdvėje problemos, dėl kurių neskubama ar vengiama mokymo(-si) medžiagą talpinti internete. Informatikos krypties modulius dėstančių informantų sociokultūrinio raštingumo raiškai būdingas intelektinės nuosavybės teisių paisymas ir žinojimas kaip apsaugoti internete talpinamą informaciją, dėl to informacija skelbiama ir virtualioje erdvėje. Tai paaiškinama informatikos krypties specifika. Išryškėjęs sociologijos krypties moduliuose dėstančių informantų sociokultūrinio raštingumo raiškos elementas – studento sociokultūrinio raštingumo ugdymas dėstytojo pavyzdžiu. Jis aktualus ir kitose kryptyse, tačiau ne tiek akcentuotas informantų.

Remiantis informantų įžvalgomis, jų pedagoginės ir vadybinės IKT kompetencijų raiška atitinka 2-ą arba 2-3 IKT diegimo lygį (2-as IKT diegimo lygis siejamas su IKT panaudojimu konkrečioje fizinėje erdvėje, 3-ias – su virtualių edukacinių erdvių taikymu). Edukologijos krypties studijų programoje dėstančių informantų pedagoginės IKT kompetencijos raiškai būdingas IKT priemonių parinkimo, atliepiant konkrečią situaciją, kriterijų įvairovė, aktyvaus studento mokymosi veiklų, panaudojant IKT, skatinimas. Tai paaiškinama edukologijos krypties specifika. Fizikos krypties moduliuose informantų pedagoginės IKT kompetencijos charakteristika „Metodų ir IKT priemonių, skatinančių mokymąsi, taikymas" pasireiškia silpnai, t.y. informantai pažymėjo tik keletą aktyvaus mokymosi veiklų, siejamų su IKT. Silpniau pasireiškia ir vadybinė IKT kompetencija. Visose kryptyse, išskyrus fizikos, atskleista pagalba studentui pedagoginiais IKT taikymo aspektais, ypač prezentacijose. Tai gali būti paaiškinama socialinių mokslų specifika ir tuo, kad prezentacijose, kuriose naudojamos IKT, susiję pedagoginiai ir technologiniai, aktualūs informatikai, elementai.

Remiantis interviu rezultatais, dalykinės IKT kompetencijos raiška būdinga fizinių mokslų moduliuose dėstančių informantų edukacinėje veikloje ir nežymiai pasireiškia arba nepasireiškia socialinių mokslų informantų dėstomuose moduliuose (atskleisti tik pavieniai programų, reikalaujančių edukologijos žinių ir gebėjimų, faktai).

IŠVADOS

1. Tyrime dalyvavusių ir socialinių mokslų modulius dėstančių dėstytojų edukacinėje veikloje atskleista visų dėstytojo IKT kompetencijos sudedamųjų dalių raiška, išskyrus dalykinę IKT kompetenciją, kuri pasireiškia tik pavieniais atvejais. Dėstytojo IKT kompetencijos raiška atitinka 2-ą IKT diegimo lygį, tačiau atskiri elementai būdingi 3-iam IKT diegimo lygiui, ypač informacinio raštingumo bei sociokultūrinio raštingumo raiškos, atitinkančios 2-3-ą arba 3-ą IKT diegimo lygį.
2. Tyrime dalyvavusių fizinių mokslų modulių dėstytojų edukacinėje veikloje išryškėjo visų dėstytojo IKT kompetencijos sudedamųjų dalių raiška. Informatikos krypties modulius dėstančių dėstytojų veikloje pasireiškia IKT kompetencija, būdinga 2-am IKT diegimo lygiui, tačiau yra elementų, atitinkančių aukštesnius IKT diegimo lygius (dalykinės IKT kompetencijos ir technologinio raštingumo raiška atitinka 2-4-ą lygį, sociokultūrinio raštingumo raiška – 3-4-ią lygį). Tyrime dalyvavusių fizikos krypties modulių dėstytojų edukacinėje veikloje dėstytojo IKT kompetencijos raiška atitinka 2-ą IKT diegimo lygį, tačiau atskiri elementai būdingi 3-iam IKT diegimo lygiui.
3. Socialinių mokslų modulius dėstančių dėstytojų edukacinėje veikloje pasireiškia aukštesnį IKT diegimo lygį atitinkantis informacinis raštingumas nei fizinių mokslų. Fizinių mokslų modulius dėstančių dėstytojų IKT kompetencijos raiška edukacinėje veikloje skiriasi priklausomai nuo krypties.
4. Fizinių mokslų modulius dėstančių dėstytojų edukacinėje veikloje dalykinė IKT kompetencija pasireiškia ryškiau nei socialinių, be to, dalykinės IKT kompetencijos raiška priklauso nuo fizinių mokslų krypties.
5. Lyginant socialinių ir fizinių mokslų modulius dėstančių dėstytojų IKT kompetencijos raišką IKT diegimo lygių kontekste, labai ryškių skirtumų nepastebėta; IKT diegimo lygis priklauso nuo studijų programos, modulio ir dėstytojo (tik informatikos krypties kai kuriuose moduliuose yra daugiau aukštesnius IKT diegimo lygius atitinkančių elementų, ypač technologinio raštingumo ir dalykinės IKT kompetencijos).
6. Nustatyti IKT diegimo lygiai fizinių ir socialinių mokslų modulius dėstančių dėstytojų edukacinėje veikloje įgalina tobulinti IKT panaudojimą bei taikomus metodus, taip pat tobulinti dėstytojų IKT kompetenciją bei jos raišką edukacinėje veikloje.

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Distance Learning Organization at Vilnius Gediminas Technical University (Lithuania)

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ABSTRACT. Development of information society is transforming science and study process. Probably the greatest advantages of electronic studies are related to the distance studies organization 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 organization of distance studies, assess possibilities of their use, to be aware of alternative tools, have a clear structural organization scheme of distance studies, and answer series of related questions. The authors of the article are involved in distance studies organization process at Vilnius Gediminas Technical University. In this paper is presented distance study process organization model developed according last several years practical experience.

Keywords: *Distance learning, Distance studies, Studies organization, Master degree studies, Bachelor degree studies.*

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.

While the concept of distance education is defined as an educational teaching model which requires specific communication ways carried out via techniques of conception of special course and special teaching methods, distance education is defined as a training method supplying an opportunity of education to individuals who weren't able to have a right to study in formal education institutions, because of age, illness, geographical distance or individuals who lost this opportunity by using various materials such as pressed, visual, auditoria, and electronic materials [1, 2]. Isman defines "distance education" as an education system where instructors and learners carry out their relations of teaching-learning at different places and different times via communication technologies or via post [2].

While talking about distance studies, a particular attention is paid on technical sciences. Organization of such studies has been performed at Vilnius Gediminas Technical University for years.

This article analyzes the organization of distance learning technical and organizational principles and their realization of Vilnius Gediminas Technical University.

1. THE STAGES AND FOUNDERS OF DISTANCE STUDIES

1.1. Stages of distance education development

The history of distance education tells us the evolving use of technologies. The distance education had gone through three stages. The first generation of distance education refers to those which mainly utilize written and printed texts and postal services for delivering such texts in the forms of books, newspapers, and manuals. It is so-called print-based correspondence education. In this stage, the interaction between teachers and students was usually limited to correspondence, meaning hand-written texts that were sent via postal mail [3].

The second generation is characterized by the use of radio and television as instructional media in addition to print materials. This generation is often referred to as the "industrial mode" of distance education with highly specialized division of labor in producing and delivering instructional materials and the potential

to educate thousands of students at once. Many open universities in the world including British Open University, Anadolu University's Open Educational Faculty in Turkey, Korea National Open University and the Open University of Japan also started as this second generation institutions. When those institutions were started, broadcasting media such as television and radio were selected as the mediums of instruction as they could easily reach mass audience and it matched the mission of open universities to expand educational opportunities [3]. The second generation model of distance learning gave way to the third generation model when access to computers changed the way in which teachers and students were able to process information, interact with it, and communicate with one another [4].

The third generation of distance education utilizes information and communication technologies (ICT) to provide interaction in addition to content delivery. There are two aspects of interactivity in the use of ICT: the interactivity between the learner and the content as seen in interactive multimedia learning materials in CD-ROM as well as on the Web and the interactivity between teachers and students and among students [3]. In studies of learning and teaching, as well as efficacious evolution of technology, importance of active participation, critical thinking, social presence, collaborative learning and two way communications are also underlined for quality learning [5].

1.2. Founders of distance education

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" [6]. At the same time, i.e. in 1973, the first correspondence school „Fotonas" of young physicists was established in Lithuania [7].

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 program „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 program „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 [8].

2. TECHNICAL TOOLS IN THE ORGANISATION OF DISTANCE STUDIES AT VGTU

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 largnal 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 [9, 10]. 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 [9, 10].

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.

3. THE ORIGIN OF DISTANCE LEARNING AT VGTU

In this chapter the origin of distance learning at Vilnius Gediminas Technical University is presented as well as current studies.

Distance studies in Vilnius Gediminas Technical University have been organised for more than ten years.

3.1. First distance learning studies at VGTU

The distance learning courses at the Department of Construction Economics and Property Management of the Faculty of Civil Engineering of VGTU were introduced in September of 1999. They were the first distance learning courses at VGTU. 27 students from all over Lithuania were accepted into the Real Estate Valuation program. Most of them were people working in the real estate sector. Since 2003 the Real Estate Valuation and Management program (RPVM) contains two major subjects: Real Estate Management and Internet Technologies and Real Estate Business. Since 2000 students can enroll in Construction Management e-learning course selecting Construction Economics and Management (CEB) as a major subject [11].

The distribution of students according to the study programs is presented in Figure 1.

All program materials are available as printed program notes which are enhanced, where appropriate, to

take advantage of modern teaching techniques and delivery mechanisms. In particular, the following media are used in specific modules: electronic format of the textbooks, video, computer software, computer learning systems, computer conferencing, computer networks, 'face-to-face' contact. Study materials are prepared with reference to Great Britain, Germany, the USA and other countries' experience [12]. Electronic format of the textbooks is provided on CD (see Figure 2) and also available in virtual environment on distance learning web-site.

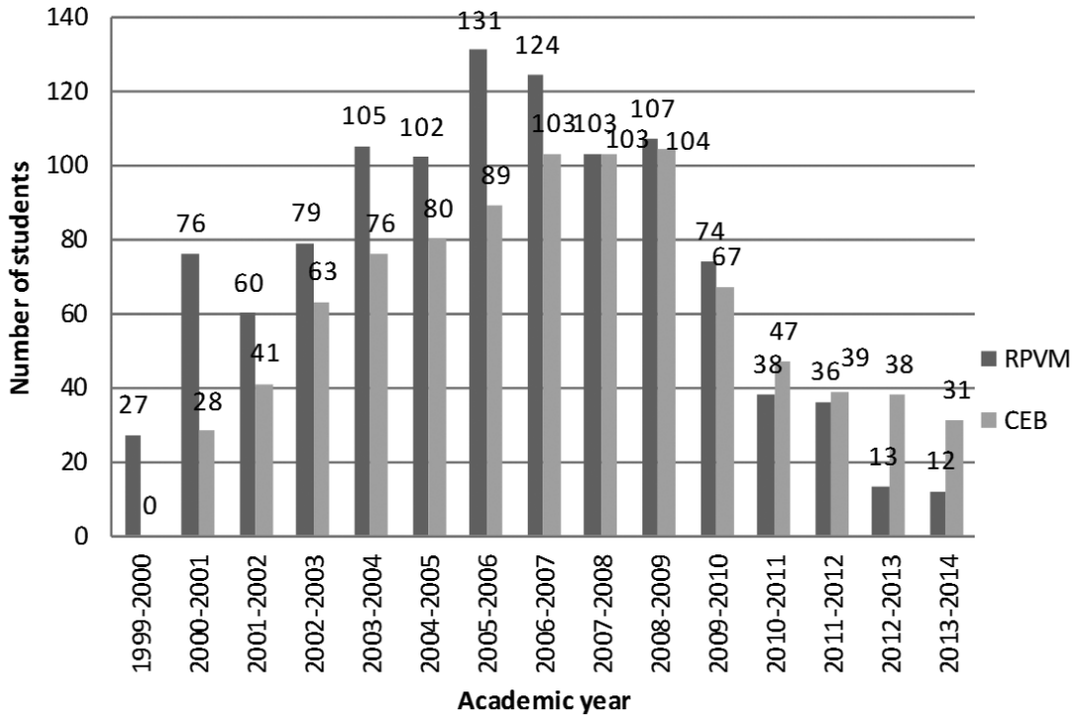

Figure 1. Variation in the number of students in distance learning programs

3.2. Experience of VGTU while organising distance bachelor's degree studies

Currently it is possible to choose from 20 different distance study programs at the university, which include not only the second, but the first stage study programs as well. Namely, the first stage study programs (which provide university bachelor's degree) have raised a lot of new challenges. First of all, these are not only the study programs 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

CD for students enrolled in Construction Economics and Business program (1 specialization)

CDs for students enrolled in Real Estate Valuation and Management (2 specializations)

Figure 2: Electronic format of textbooks, video- and audio- material for students prepared in CD

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 organization 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 organization of distance studies was established, which was oriented towards a student.

Regarding the study schedule, prepared according to the order of organization 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 organized 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 organized according to the following structure, presented in Figure 3 [13].

With regard to the scheme, presented in Figure 3, it is clear, that unlike traditional case, while organizing distance lectures, video lectures occupy a large period of time. During video lectures students are provided with structuralized 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.

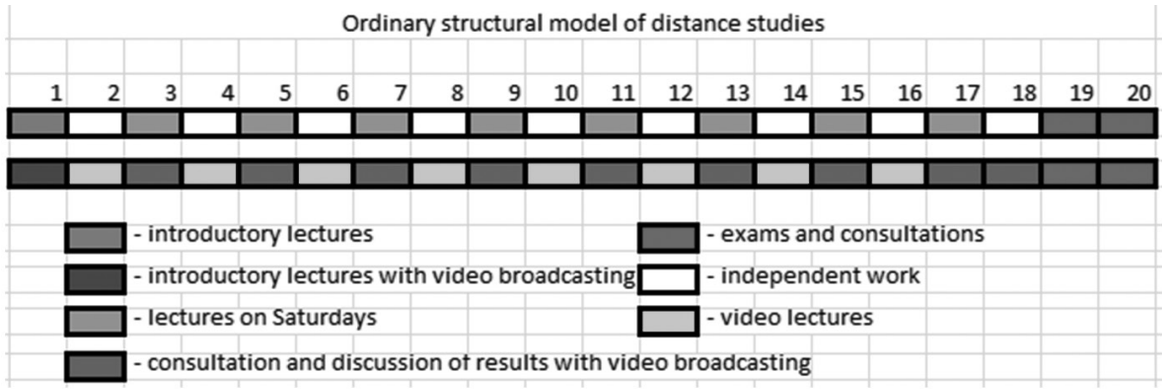

Figure 3. Structural study scheme.

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 organization 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 [9]. 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, organization 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.

CONCLUSIONS

The distance learning at Vilnius Gediminas Technical University has developed rapidly and students very interested in such form of study.

These are the main advantages of distance learning at Vilnius Gediminas Technical University: convenient form of studies; an opportunity to get acquainted with new information technologies; saving of time; fast communication; flexible choice of academic subjects; good professional training.

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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eLearning and Social Networking for Women Entrepreneurs

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ABSTRACT. The paper is presenting the research with focus groups discussed about eLearning courses and social networking between women entrepreneurs. eLearning curses were selected to develop: Time management and project scheduling, Communication skills, eLearning, Organic agriculture and tourism and Farm shop marketing are the courses that would help young rural women to become successful entrepreneurs. As the fast internet connection is reachable in Lithuania in rural areas and the object of discussions there were using digital technologies the conclusion made that a course could be added which would help for learners to use technologies for their business. For example - computer based marketing and communication or e-facilities and networking.

Keywords: *ICT, entrepreneurship, technologies, eLearning courses.*

Introduction

Information communication technologies introduced a new set of educational opportunities for educators and learners in different sectors. Analyzing the advantages that are provided to the learner by IT mediated education different authors [4] emphasize the following:

1. Increased amount of information. The resources and materials available via the World Wide Web expand information supply to a virtually infinite degree. The virtual libraries, collections of articles, dialogue forums, various databases, and historical archives from all around the world are available for everyone who uses the Internet.
2. Opportunities of interactive learning. These interactive opportunities can transcend the potential of most other educational media as a means to connect students with first person sources beyond classroom walls and national borders and across cultures.
3. Information technologies allow interactive communication: students can ask specific questions regarding any topic to an expert in the respective field. Many sites, such as Discussion Forums, are designed to facilitate dialogue and the sharing of ideas among educators and students.
4. Interdisciplinary and multicultural perspectives in learning. At a global level e-learning provides individuals with wide intercultural competence, and social and global awareness. The use of World Wide Web and mobile technologies resources allows learners to view the same issue from different cultural, national, religious perspectives which cannot be done during traditional lessons/lectures.
5. On-the-job training opportunities. E-Learning provides an opportunity to learn without leaving the work place [1].

Social computing tools (Web 2.0 technologies) are expected to enhance learning processes and outcomes in a number of ways. Firstly, it is believed they will respond better to the changed cognitive processes and learning patterns that have evolved due to the ubiquity and widespread use of information and communication technologies, thus facilitating knowledge acquisition. Furthermore, they reflect current communication and working patterns and are thus better fitted to preparing learners for the demands of society and endowing them with the necessary skills for a successful professional career [4]. Moreover, social computing tools recognize the diversity of users and are thus expected to contribute to the personalization of educational experiences, offering opportunities for flexible, distributed learning, which could provide learners with more varied opportunities to engage with learning and develop their own creative skills [3]. Social computing applications are expected to promote independent, autonomous and self-directed learners endowed with a variety of social skills that enable them to connect, interact and collaborate successfully with a variety of people on different tasks and in diverse environments. Scientists are analyzing different models of eLearning.

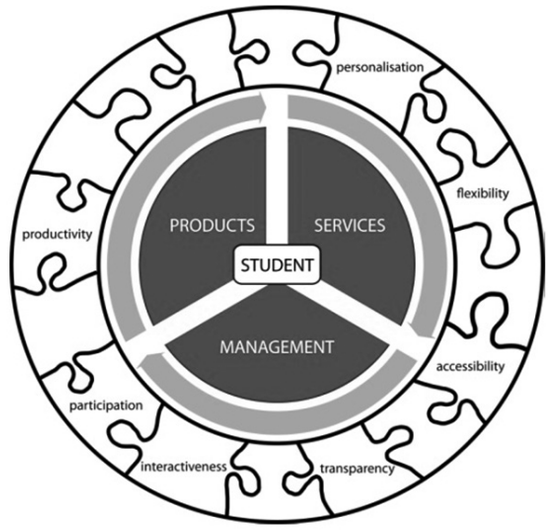


Figure 1. eLearning process [6].

Education institutions are susceptible to all of these strategies, although focus and implementation differ substantially between higher and secondary or primary education. Learning 2.0 opportunities outside the institutional framework arise in particular by combining networking potential of social computing with its strength in providing learning opportunities tailored to individual needs and preferences, especially for Youth at Risk. Teachers benefit in particular from social networking tools as they allow them to build up communities of practice for the exchange of knowledge, material and experiences. Evidence on adult education, workplace training and informal learning in general is scarce; the scope of Learning 2.0 strategies in this area is indicated under the heading "personal development" (1).

1. RESEARCH DATA

The most important content of training course for respondents is business planning grade is 4,94 out of 5,00. The enterpreneurship and negotiation skills follows immediately after with grades 4,89 and 4,83. The course Short supply chain got grade of 2,94.

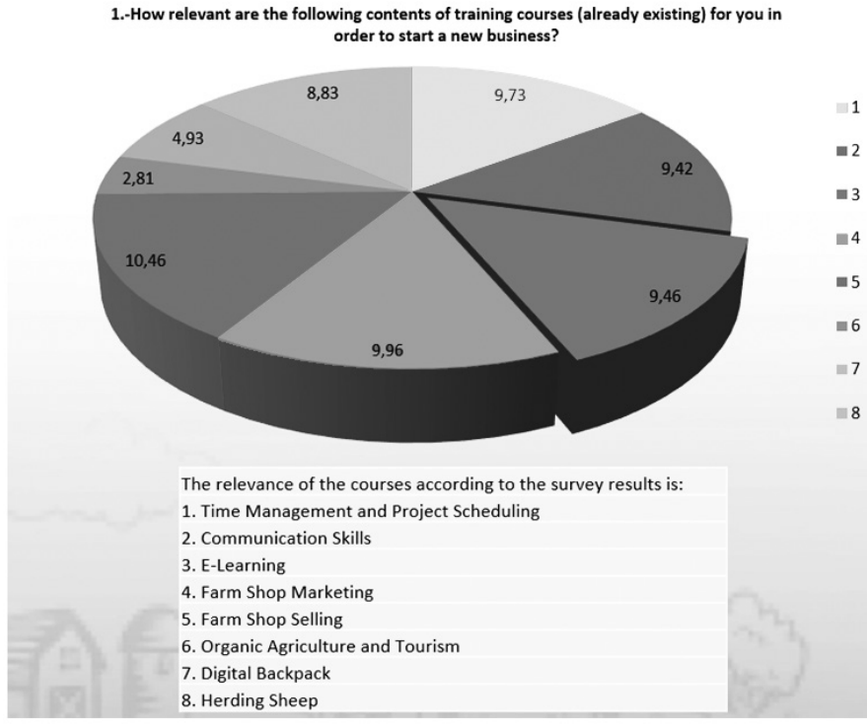


Figure 2. eLearning courses.

Figure 3. Necessary skills for enterpreneurs.

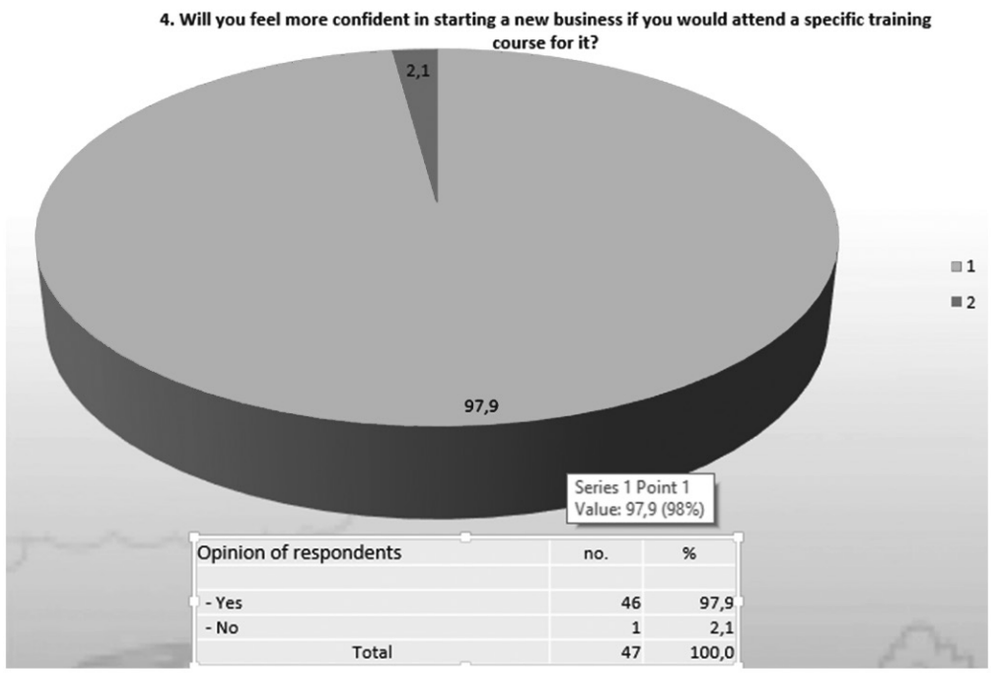


Figure 4. Filling confident in strating business.

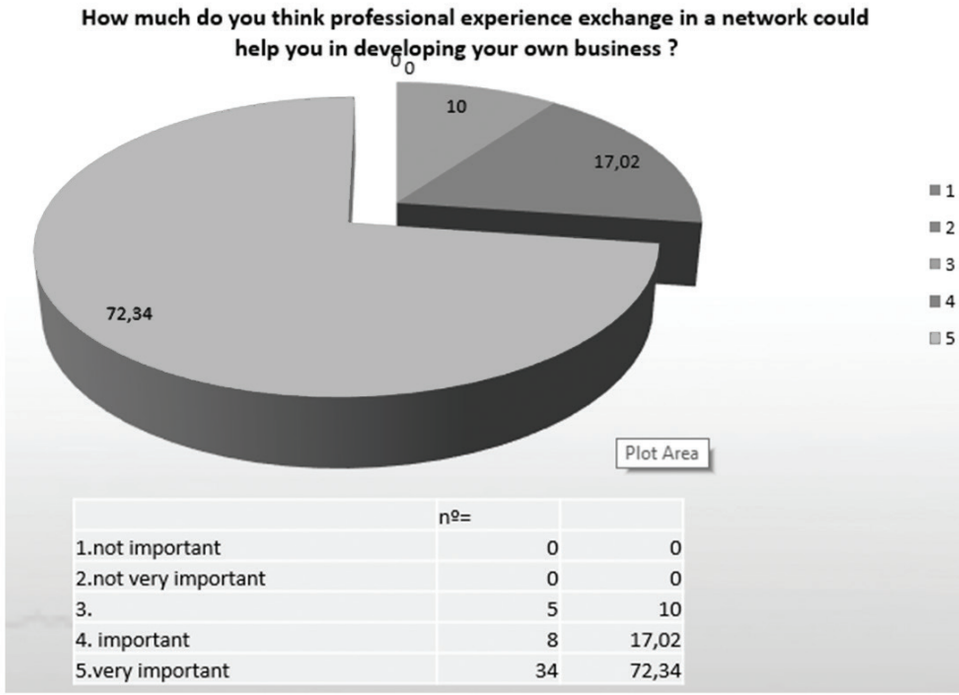
About 70 % of respondents answered that training in personal, professional and technical skills is important to become a successful entrepreneur and 25 % said that it is even very important. 93 % of respondents answered that lack of specific training possibilities is one of the problems that rural young women face in order to become entrepreneurs. Only 7 % thinks differently.

All conditions are more or less conductive, but being a women is the obstructive condition for respondents in setting up a successful business. Living in rural area is not the biggest problem for respondents in setting up their business. 65 % of respondents answered that it is important to have a mentor to help them in developing their own business, 19 % answered that it is very important. Most important is that mentor

would be a successful entrepreneur and would be accessible easily and the less important is the gender of the mentor.

Nearly 98 % of respondents say that they would feel more confident in starting a new business if they would attend a specific training course for it. 87 % of respondents identified that European rural women have more potential in entrepreneurship than it is already revealed.

The respondents think that professional experience exchange in a network could help in developing your own business, 72 % of respondents answered that it is very important. What are in your personal view the main benefits of working within a network? It allow to save time of travels to each other; It strengthen relationships with mentors and other entepreneurs; it allow to reach each other faster; It allow to be dynamic and flexible; working in network helps to gather more information; it helps to find knowledge



	nº=	
1.not important	0	0
2.not very important	0	0
3.	5	10
4. important	8	17,02
5.very important	34	72,34

Figure 5. Network based experience sharing.

or contacts to help a colleague; helps to develop new business; you can share interesting information with others very easyly; network allows to communicate with more people; you can always reach the information which is on a network and you can reach it by using any mobile device which is connected with internet. The most important characteristics of a network for respondents are flexibility and accessibility. The less important factor is the size of the network.

The most important characteristics of a network for respondents are flexibility and accessibility. The less important factor is the size of the network.

Advantages of a computer network is that it allows file sharing and remote file access which will help young rural women to learn and to connect. Resource sharing is another important benefit of a computer network, also it is important that a user can log on to a computer anywhere on the network and access his files. The disadvantages of the computer networks would be the security issues and also the technical

CONCLUSIONS

Professional exchange in a network will help young rural women to learn, to get contacts, to get confidence and to share experience. It will be useful for successful start-up of the career. Another point is that many new positions are not advertised so effective job search strategies require a commitment to networking and an understanding of the many approaches to finding employment or other information in the relation with career issues. There is a possibility to organize a discussion forums which would ensure active networking among rural young women, so that they take back new perspectives and practical solutions that will have

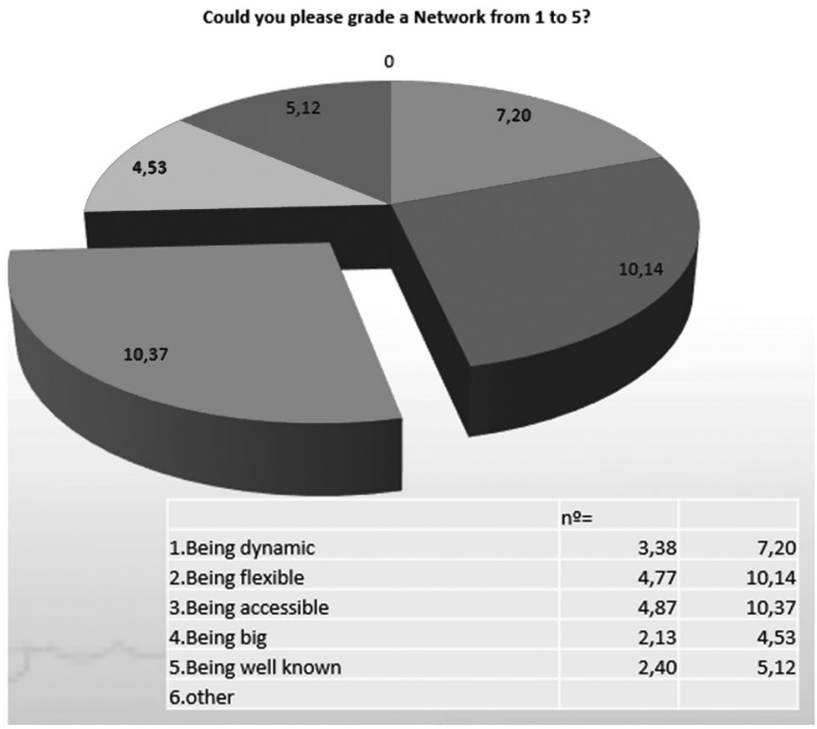


Figure 6. Networking features.

an impact that can be shared with others. Advantages of a computer network is that it allows file sharing and remote file access which will help young rural women to learn and to connect. Resource sharing is another important benefit of a computer network, also it is important that a user can log on to a computer anywhere on the network and access his files. The disadvantages of the computer networks would be the security issues and also the technical skills and know-how required to operate and administer a computer network.

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Veiklos duomenų integravimas: problemos, veiklos modelis, praktiniai žmogiškųjų išteklių informacijos integravimo aspektai

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SANTRUMPA. Straipsnyje trumpai atskleidžiamos veiklos duomenų integravimo valdymo problemos, o siekiant veiksmingos integracijos, siūloma pasitelkti veiklos (arba informacijos šaltinių) valdymo modelius. Atliktas empirinis tyrimas, skirtas verslo įmonės žmogiškųjų išteklių informacijos integravimo problemoms ir reikmėms aptarti. Parengti realūs šios informacinės veiklos valdymo modeliai (kaip praktinė integravimo valdymo priemonė), kurie nurodo veiklos komponentus, duomenų šaltinius ir tiekėjus bei atskleidžia ryšius tarp įmonės informacinių konceptų, integracinių ryšių ypatumus ir struktūrą.

Raktiniai žodžiai: *integravimas, veiklos modelis, žmogiškųjų išteklių valdymas.*

Įvadas

Pastaruoju metu veiklos informacijos valdymas neįsivaizduojamas be duomenų integracijos proceso, kuris, esant nevienalytei šiandienos veiklos aplinkai, sparčiai kinta ir sudėtingėja; tarpsta vis naujos integracinės reikmės. Be to, kartu atsiranda duomenų ir versijų palaikymo bei specializuotos (pvz., naujų informacijos objektų naudojimo, naujų informacijos kūrimo ir teikimo atvejų, daugybės informacinės sklaidos formatų saugojimo) problemos. Vadinasi, besikeičianti veiklos aplinka ir dinamiški reikalavimai darbo duomenims verčia nuolat ieškoti būdų ir sprendimų, kurie įgalintų efektyviau bei lanksčiau spręsti duomenų integravimo uždavinius. Vienas galimų integracijos procesų gerinimo (arba priežiūros) būdų – realios informacinės veiklos aplinkos analizė ir modeliavimas. Veiklos modelis yra gyvybiškai svarbus, siekiant įvertinti ir pagrįsti integruojamus duomenų šaltinius ir kokybę bei prisitaikyti prie nuolatinės veiklos aplinkos kaitos, organizacinių reikalavimų; tai tikslus ir objektyvus įrankis, užtikrinantis duomenų srautų supratimą ir duomenų naudotojų komunikaciją. Kitaip sakant, neatsietinas nuo duomenų integravimo procesų vykdymo.

Tyrimo tikslas – veiklos modelių taikymas veiklos duomenų integravimo procesams gerinti.

Uždaviniai: apžvelgti veiklos duomenų integravimo problemas ir atskleisti, kaip duomenų integravimo procesus gali įtakoti veiklos duomenų modelių naudojimas.

Tyrimo metodai: literatūros šaltinių analizė, grafinis duomenų vaizdavimas, empirinis tyrimas.

1. VEIKLOS DUOMENŲ INTEGRAVIMO PROBLEMINIAI ASPEKTAI

Vieni svarbiausių veiklos informacinėms sistemoms (IS) keliamų reikalavimų – tai (1) remtis esamos veiklos praktikos (faktinių duomenų, procesų) modeliu, (2) lanksčiai taikytis prie sparčiai kintančių veiklos sąlygų taisyklių, o siekiant išvengti informacijos fragmentacijos, (3) integruoti įvairius vidaus ir išorės aplinkos duomenis, taikomuosius uždavinius (Bara et al., 2009).

Integravimas paprastai suprantamas kaip nuolatinis duomenų perkėlimas iš skirtingų šaltinių į vieną integruotą vietą bei integruotas duomenų kaupimas, analizė ir teikimas galutiniams naudotojams.

Praktika ir tyrimai rodo, kad beveik kiekvienos įmonės vadovai ir specialistai, dalyvaujantys vykdomuose veiklos informacijos projektuose, susiduria su duomenų kokybės – tai duomenų tikslumo, nuoseklumo, vientisumo, pilnumo ir metaduomenų (kaip tarpinės informacijos) naudojimo, kad pagrįstų duomenis – problemomis, kurios turi neigiamą įtaką veiklai ir reikalauja papildomų išteklių bei pastangų derinant duomenis (Bologa ir Bologa, 2011). Duomenų integracijos projektai neaprūpina galutinių naudotojų kokybiškais duomenimis dėl įvairių priežasčių, pvz: Įmonėse gausu informacijos, pasklidusios skirtinguose ir įvairiarūšiuose šaltiniuose, kurios neįmanoma pilnai suprasti (Hassine ir Laboisse, 2011). Nuolat keičiasi informacijos srautas (priimamas, perduodamas, dorojamas, saugomas) ir srauto struktūra, kurį sudėtinga susieti (Вигурский ir Пивоваров, 2008). Taip pat sunku susieti veiklos ir IS modelius (Лядова,

2008). Dėl sukauptų daugybės duomenų, skirtingų sukūrimo motyvų ir gavimo šaltinių veiklų, funkcijų (veiklos sričių) bei lygmenų, informacija įgyja problemų, kliudančių dalytis ir naudotis ja (pvz., dvigubinami duomenys, IS segmentuotos į sritis) (Zhang et al., 2010).

Įprastai veiklos duomenys gaunami iš skirtingų vidaus ir išorės šaltinių. Dauguma jų būna sunkiai integruojami (apjungiami), neišsamūs (Dayal et al., 2009). Dažnai atsitinka ir tai, kad integracijos procesui reikia konkrečių duomenų, kurie iš viso nėra užfiksuoti (Halevy, et al., 2005). Todėl sparti veiklos procesų kaita ir dinamiškos reikmės veiklos duomenims integravimo projektus verčia spręsti vieną svarbų uždavinį – rasti ir suprasti informacijos šaltinius (duomenis), kuriuos reikia integruoti. Taip pat pažymėtina (Halevy et al., 2005), jog duomenų integracija, susidurianti su įvairiais ir nevienalyčiais šaltinių elementais, yra sudėtingas darbas, kurį reikia skaidyti į dalis bei nuolat tobulinti (kontroliuoti). Įmonėms reikia aiškiai nustatyti reikalingus duomenų šaltinius, nes tai svarbus žingsnis link objektyvios integracijos (Dayal et al., 2009; Halevy et al., 2005), arba tiksliau – integravimo veiklos pradžia.

Praktiniu aspektu, integravimo tikslas yra nukreiptas į informacijos kokybę, t. y. suteikti galimybę gauti išsamią informaciją apie pageidaujamus veiklos duomenų elementus, procesus. Tai įgalintų vertinti duomenų turinį, kiekvieno informacijos šaltinio patikimumą ir naujumą bei taikomosios sistemos ar jos komponenčių, posistemių reikalingumą naudotojo požiūriu.

Taigi, dėl anksčiau minėtų problemų randasi poreikis efektyviau valdyti veiklos procesus (kaip informacinius) ir jų generuojamus bei tinkamo integravimo reikalaujančius duomenis, siekiant vieningos įmonės informacijos. Šiuo atveju, gera integracijos valdymo priemone galėtų būti veiklos objektų modelis (arba verslo logika). Tačiau pastebima (Stary et al., 2010), jog veiklos procesų modeliai (arba tam tikros situacijos vaizdas), vykstant nuolatinei įmonių veiklos kaitai, reikalauja naujinimo ir tikslinimo, kad atspindėtų realią veiklos tikrovę.

2. DUOMENŲ INTEGRAVIMO PROCESAI PASITELKIANT VEIKLOS MODELIUS

Sklandus integravimo procesas galimas esant šių sąlygų visumai: (1) apibrėžti duomenų šaltinių (pvz., duomenų bazių, el. dokumentų rinkmenų) ir (2) duomenų tikslų (pvz., duomenų užklausų, integravimo schemų) rinkiniai bei (3) organizuotas duomenų transformacijos procesas (Marotta et al., 2010). Šį (integravimo proceso) ryšį apibendrinsime tokia išraiška:

Duomenų šaltiniai ⊸ Duomenų tikslai ⊸ Duomenų transformacijos procesas

Pirmame (ir svarbiausiame) veiklos duomenų integravimo etape, kaip buvo minėta, dėmesį reikia sutelkti į turimą (arba kuriamą, naujinamą) veiklos modelį, nes realios veiklos aplinkos modeliavimas (pvz., vidaus procesų ir veiklos įvykių detalizavimas) ar sukurtas veiklos procesų duomenų valdymo modelis gali ne tik padėti nustatyti integravimo uždavinius, bet ir lengviau pastebėti bei spręsti iškylančias duomenų integralumo užtikrinimo problemas. Todėl įvairūs integracijos tyrėjai (Замятина et al., 2008; 2013) teigia, kad šiandien sėkminga integracija beveik neįsivaizduojama be modelių (kaip pilnesnės ir produktyvesnės integracijos – ne tik duomenų, bet ir naudojamų veiklos modelių) kūrimo, valdymo ir perdavimo iš vienos sistemos į kitą. Remiantis įmonės (veiklos ir IT) modeliu (kaip integracijos planu), galima palaikyti informacijos (žinių) struktūravimą: duomenų modelis naujų duomenų integracijai ir metaduomenys nestruktūruotiems dokumentams (informacijos ištekliams) skirtinguose sąryšių aspektuose (Hinkelmann et al., 2010). Pagal (Kiauleikis ir Kiauleikis, 2005), informacijos kokybės parametras – modeliavimo tikslo funkcija, kuri įgalina įvertinti sistemą naudotojo požiūriu. Dėl to duomenų integravimo procesus būtina analizuoti kartu su informacijos šaltinių modeliais. Veiklos procesų modeliai (darbų sekų diagramos), parengti atlikus veiklos analizę – tai objektyvus metaduomenų lygmuo (Kilpeläinen ir Nurminen, 2007), t. y. nuosekliai ir lygiagrečiai komunikuojančios veiklos, kurios leidžia atskleisti: (1) veiklos srautų sudėtį (struktūrą) ir jų ryšį su veiklos funkcijomis, (2) ryšius tarp procesų srautų ir dalyvių, (3) duomenų šaltinius bei (4) sistemai keliamas reikmes (ribojimus) ir paaiškina faktinį duomenų bazių (duomenų) turinį.

Taip pat tvirtinama, kad esamo duomenų srauto ir duomenų kilmės ryšių pateikimas schema – tai galimybė paaiškinti duomenų radimąsi (prigimtį, šaltinius), jų kelią iki paskirties vietos bei nuolat suteikti informacijos apie duomenis (Jain ir Thomson, 2013), o tiksliau – tai tinkamos ir tikslios žinios bei įžvalgos, atskleidžiančios visą įmonės duomenų srauto informaciją. Kitaip tariant, tyrėjų (Halevy et al., 2005; Kilpeläinen ir Nurminen, 2007; Kilpeläinen, 2007) teigimu, pasitelkiant įprastinį veiklos procesų, duomenų

modeliavimą, galima nustatyti (ar atnaujinti) aktualią praktinei veiklai informaciją ir apibrėžti informacijos dorojimo modelį. Pastarasis įgalintų nesunkiai suprasti ir kritiškai įvertinti kokią informaciją įmonė turi ir kokios reikia ar kokia jos semantika, ryšiai tarp įmonės informacinių konceptų bei ką informacija iš tikrųjų reiškia veiklos kontekste. T. y. užpildyti metaduomenų lygmenį ir tokiu būdu nuolat stebėti, tikrinti ar analizuoti savo veiklos informaciją (reikalavimus), atliekamas veiklos funkcijas bei reflektuoti veiklos poreikių turinį. Taigi, tik tvarkingi (struktūruoti) veiklos procesai padėtų geriau pažinti ir detaliau kontroliuoti veiklos aplinkos duomenų srautus, užtikrinti darnius duomenų apibrėžimus ir aprašymus bei tokiu būdu išvengti neteisingo informacijos interpretavimo, taikymo ir leistų taupyti integravimo valdymo laiką.

Apibendrinant pasakytina, kad duomenų integravimo proceso modelio formavimas yra neformalus ir intuityvus procesas, o rezultatai – abstrakčios schemos, skirtos bendram supratimui arba yra nurodomojo pobūdžio integravimo veiksmų planas. Bet pasak tyrimo (Marotta et al., 2010), integruojamus duomenų šaltinius ir duomenų kokybę neišvengiamai reikia pagrįsti modeliais, paremtais konkrečios darbinės situacijos aspektais. Modelis ne tik įvardija pagrindinius integruojamus duomenų šaltinius, objektus ir specifikuoja integracines tų objektų reikmes, bet ir padeda suprasti sudėtingus integracinius procesus įmonėje, gerina informacinį / integracinį bendravimą tiek įmonės viduje, tiek ir už jos ribų, arba – kontroliuoja integracinius procesus. Taigi, nūdienos kontekste duomenų perkėlimas ir integracija neatsiejama nuo neprieštaringų veiklos procesų (informacijos šaltinių) modelių, siekiant suprasti sudėtingą veiklos duomenų integravimo logiką, tiksliai ir greitai perkelti duomenis.

3. INTEGRAVIMO MODELIŲ TAIKYMO PRAMONĖS ĮMONĖJE (ŽI VEIKLOS) PRAKTIKAI ATSKLEISTI SKIRTAS TYRIMAS

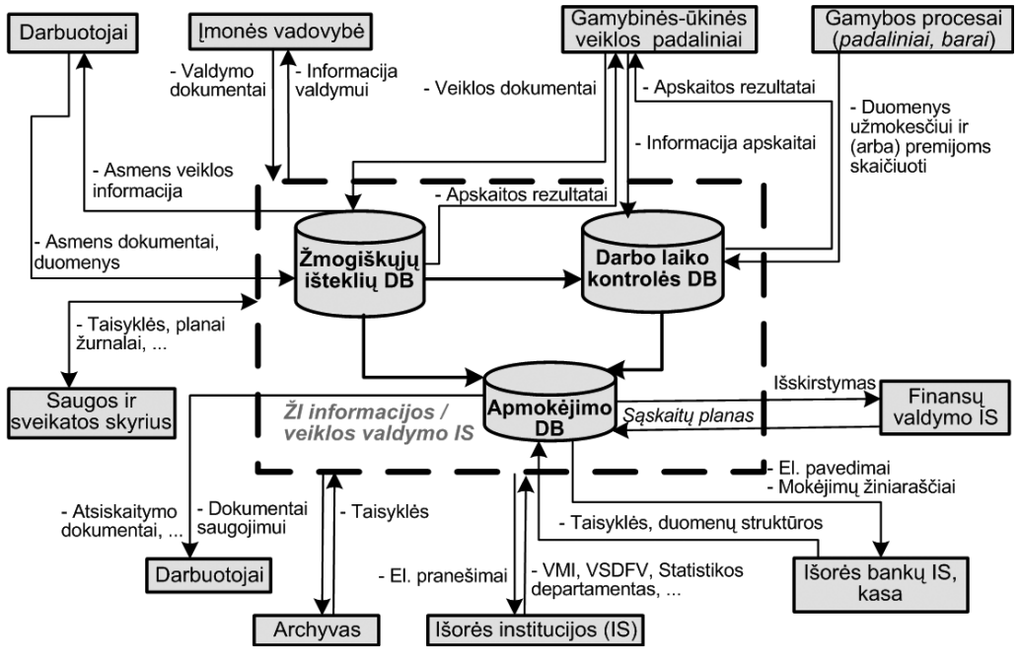
Trumpai aptarsime įmonės veiklos (visumos) modelio fragmentą, kuris aprašo veiklos procesą „Žmogiškųjų išteklių valdymas“ duomenų integravimo aspektu. Žmogiškųjų išteklių (ŽI) duomenų aibės laikui bėgant darosi vis sudėtingesnės, o duomenų iš skirtingų veiklos sričių integravimas tapo būtinybe. Įmonių informacinis aprūpinimas integruota ŽI apskaitos informacija labai svarbus veiklos analizei atlikti ir bendriems sprendimams priimti.

Pirmiausia, ištyrus žmogiškųjų išteklių veiklos procesų (ŽIVP) valdymo skyriaus informacinę veiklą, parengtas ŽI valdymo proceso modelis (1 pav.): nustatyta proceso įeiga (pradiniai resursai, kiti komponentai), kurie proceso eigoje transformuojami į naujus resursus (t. y. proceso išeigą) bei reikalingi šio proceso tiekimo ir kontrolės elementai.

1 pav. ŽI valdymo proceso modelis pramonės įmonėje.

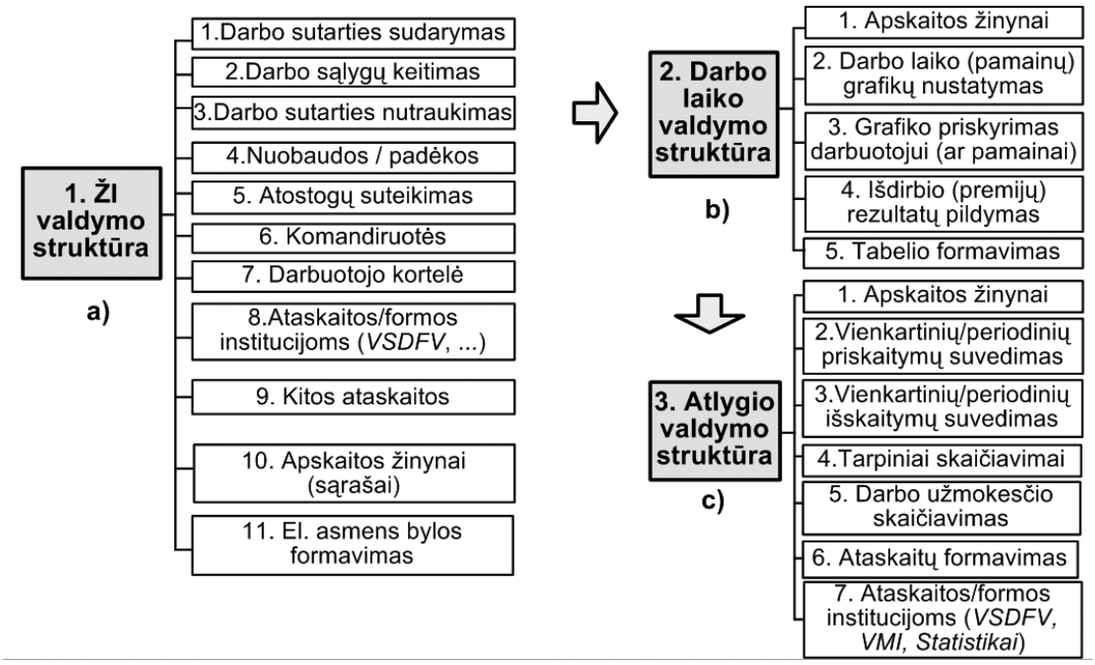
Atkreiptinas dėmesys, kad ŽIVP valdymo skyrius atlieka įvairias, bendro suderinimo reikalaujančias, funkcijas: samdo darbuotojus, valdo (apskaito, skaičiuoja, sistemina, kaupia) darbuotojų bei su jų veikla susietą informaciją, bendrauja su vidaus padaliniais ir išorės organizacijomis (atsiskaito, gauna užduotis, teikia bei renka veiklai reikalingą informaciją), teikia informaciją ir siūlymus vadovams, ir pan. (žr. 2 pav.) Praktikoje, ŽIVP valdymo skyriaus veiklos aplinka ir informacinės veiklos reikmės nuolat kinta (pvz.,

sensta IS, kinta veiklos turinys bei kontekstas, šią veiklą reglamentuojanti teisinė aplinka, atskaitomybė įvairioms institucijoms ir kt.), todėl reikia nuolat sekti, tirti, prižiūrėti ir susieti skirtingas duomenų šaltinių (ar sistemų) aibes. Šioje situacijoje, įvairi ir visą laiką turinti vykti integracija (pvz., skirtingų informacijos apie darbuotojus šaltinių, su išorės el. paslaugomis ir kitomis veiklos valdymo IS, finansiniais bei išlaidų apskaitos duomenimis ar naujoviška veiklos praktika), siekiant vientisos ŽIVP valdymo veiklą palaikančios IS, įgyja ypatingą aktualumą.



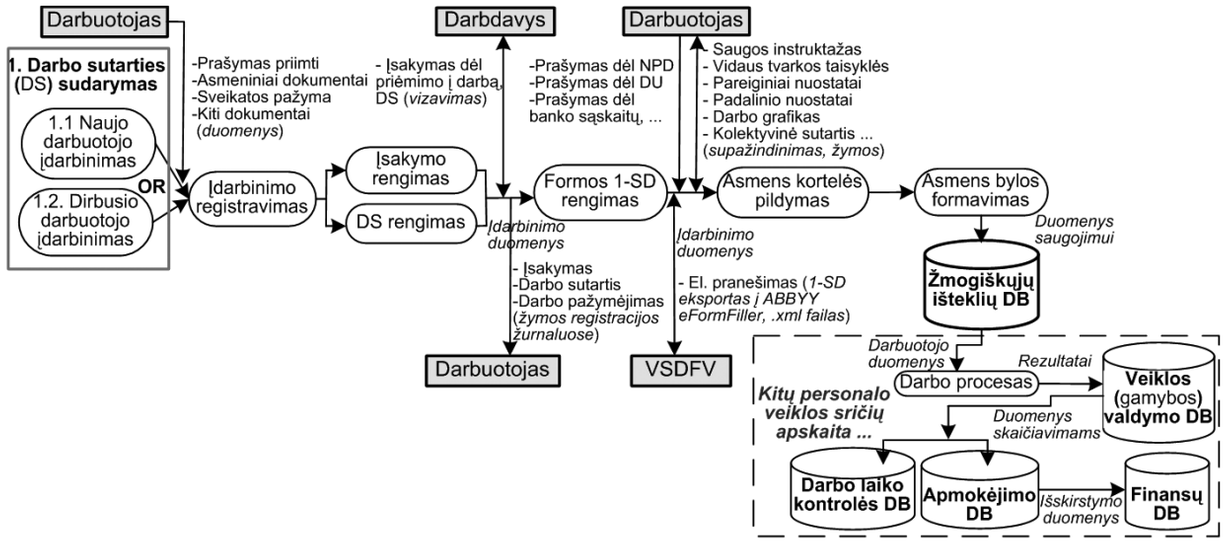
2 pav. ŽI veiklos komponentų bei informacijos keitimosi schema.

Empirinio tyrimo metu išryškėjo, kad įmonės turima tradicinė komercinė ŽI apskaitos IS dar nėra pakankamai išplėtota. Ji sudėtinga ir neatitinka visų naudotojų reikmių ir gebėjimų (pvz., naudojama mažai IS galimybių), menkos duomenų kaupimo ir analizės galimybės, bet svarbiausia – trūksta galimybės vartotojams sužinoti kaip vykdyti informacinius procesus naujų (ir jau apibrėžtų) duomenų šaltinių integravimo procese, t. y. nėra aiškūs duomenų integravimo aspektai ir aplinka. Atsižvelgiant į tai teigtina, kad ŽIVP valdymo skyriaus darbas, paremtas informacine veikla, reikalauja intensyvios (išsamios ir giluminės) stebėsenos ir žiūros, kad būtų konstruktyviai reaguota į integracines problemas ar



3 pav. Funkcinė IS struktūra: a) personalo, b) darbo laiko, c) atlygio.

naujas reikmes. Šią situaciją (t. y. integravimo vykdymą), kaip anksčiau nustatyta tyrime, gali palengvinti ir kontroliuoti veiklos įvykių, funkcijų ir informacinių srautų detalizavimas bei šią informaciją lydintys metaduomenys. Taigi, analizuojant šį integracijos procesą, svarbu tinkamai nustatyti sprendžiamus funkcinės veiklos uždavinius (3 pav.) bei jų informacinį turinį ir reikmes (faktinius informacinius įeigos ir išeigos duomenų srautus) (4 pav.), t. y. unikalų ŽIVP duomenų dorojimo ir integravimo modelį, būdingą konkrečiai įmonei.



4 pav. „Darbo sutarties sudarymas“ vykdymo žingsnių loginė struktūra ir tvarka.

Tvirtintina, kad ŽIVP valdymo funkcijų (informacinių veiklų ir srautų aibių), kurias įprastai vykdo tradicinės IT (funkcinės IS ir duomenų bazės), informacinę sandarą galima atskleisti, taip pat tikrinti ir kontroliuoti integracinius procesus (t. y. įvertinti veiklos tikslų atžvilgiu) formuojant ir pasitelkiant praktines, įmonės vidines situacijas atspindinčias, duomenų judėjimo (srautų) diagramas (pvz., nuoseklių sekų diagramas). Nustatyti ir pavaizduoti ŽI informaciniai procesai (kaip atskiri elementarūs žingsniai) atspindi ne tik šios dalykinės srities supratimų struktūrą ir joje turimų objektų ir faktų visumą, bet ir detalius IS elementus, integracinių ryšių ypatumus ir struktūrą. Šie vidiniai taikomieji modeliai padeda atskleisti ir kitus svarbius veiklos aspektus: organizacinės struktūros funkcinę sandarą (vienetus) ir veiklos dalyvius, informacinio darbo pasidalijimą, įmonės infrastruktūrą.

Viena vykstančių darbų seka aprašomas vienas ŽIVP informacinio valdymo funkcinės struktūros elementas (funkcija) (pvz., ŽI valdymo struktūros „1. Darbo sutarties sudarymas“, 4 pav.) ir konkrečios jo veiklos, informaciniai srautai. Šis supaprastintas praktinis pavyzdys vaizduoja ŽI veiklos funkcijos duomenų valdymo srautą (t. y. dokumentų, el. dokumentų bei pranešimų siuntimo ir gavimo tvarką); veiklos duomenis, siunčiamus tarp įmonės vidaus procesų dalyvių bei išorės aplinkos (taikomųjų uždavinių ir organizacijų). Šiuo tiriamuoju atveju ŽIVP valdymo IS turi glaudžiai sietis (siųsti / gauti) su „SoDros“, kontroliuojančios išorės institucijos, IS – el. būdu pranešti apie sudarytą darbo sutartį. Todėl, reikia įdiegti vieningą ataskaitos formatą bei užtikrinti reikiamą struktūrinių duomenų integravimą, ir žinoma – fiksuoti duomenų mainų metaduomenis (t. y. prieigos adresus, e. deklaravimo formas, pildymo tvarką, turinį ir struktūrą, galiojimo datą, ir kt.). Siekiant identifikuoti ir aprašyti visus įvairiarūšius, ŽIVP valdymui reikalingus duomenų išteklius, nustatyti turimos taikomosios srities IS duomenų integravimo galimybes (pvz., importavimą, įrašymą, eksportavimą, sinchronizavimą) bei objektyviai įvertinti visą probleminę sritį, privalu nagrinėti ir išreikšti modeliais kiekvieną veiklos modelio funkcinį objektą bei jų santykius (t. y. „Darbo sąlygų keitimas“, „Darbo sutarties nutraukimas“ ir t.t., žr. 3 pav.). Tokiu būdu, sudarius naudojamų ir integruojamų duomenų srautų valdymo modelius, randasi galimybė tiesiogiai suprasti veiklos sritį (funkcijas ir struktūrą), projektuoti, konstruoti, palaikyti ar gerinti (tinkamai pritaikius funkcinės veiklos tikslams) IS modelį. Kitaip tariant – reflektuoti veiklos reikmes ir geriau suvokti integravimo žingsnius. Pvz., tyrimu pastebėta (2 pav.), kad universali komercinė IS reikalauja sklandesnio taikymo konkretiems integraciniams poreikiams (pvz., tikslesnio ir lankstesnio gamybos darbuotojų darbo rezultatų duomenų (gamybos IS) susietumo su ŽIVP valdymo IS).

Šiame darbe atlikta ŽIVP informacinio valdymo situacijų analizė nėra baigtas tyrimas, nes praktinis ŽIVP valdymo veiklos duomenų (srauto šaltinių) integravimo įgyvendinimas reikalauja detalesnio nagrinėjimo ir įvertinimo. Apibendrinimas:

- Integracinių sprendimų įgyvendinimas ŽIVP valdymui nėra lengvas: reikia paruošti tiek IT aplinką, tiek naujas veiklos procedūras. Neretai įmonėse planuojamos išlaidos ŽIVP valdymo IS diegimui ar palaikymui tik tada, kai IS nebeveikia ir būtinas palaikymas ar naujinimas, pasikeitę teisės aktai ir pan. Įvairių IT ir veiklos sprendimų diegimas ir integravimas į visą ŽIVP valdymo IS yra atsakingas, reikalaujantis kryptingumo ir nuoseklumo, darbas.
- Tik atskleidus ir įvertinus realius esamus ŽIVP valdymo aspektus (veiklos reikalavimus), informacijos elementus bei jų tarpusavio ryšius, personalo veiklos turinio integracinius ryšius su kitomis veiklos sritimis ir IT (1, 2, 3, 4 pav.), galima nustatyti integravimo uždavinių sudėtines dalis įmonės aspektu bei parengti IT pokyčių valdymo tvarką, duomenų integravimo plėtojimo galimybių ir integruotos infrastruktūros planą ar įdiegti integracijos technikas.
- ŽIVP duomenų išteklių integravimo modelio įgyvendinimas ir plėtojimas – tai nenutrūkstamas, cikliškai pasikartojantis procesas, siekiant (1) turėti nuoseklius ir vientisus ŽI veiklos procesus, aprėpiančius ne tik įmonės vidines IS, bet ir leidžiančius bendrauti su išorės programų sistemomis; (2) nuolat žinoti tikslią personalo informacinių procesų erdvę, adaptyviai ir lanksčiai kontroliuoti integracinius procesus bei taikomosios IS vystymą, atsižvelgiant į besikeičiančią aplinką bei įmonės interesus, arba kitaip – siekiant vykdyti informacijos mainų ir (arba) integravimo nesėkmių prevenciją.

Taigi, remiantis žvalgybiniu tyrimu įmonėje ir praktiniu patyrimu galima teigti, kad yra nepakankamai kokybiškas ir savalaikis ŽIVP duomenų (ypač naujų) integravimas į bendrą ŽIVP valdymo IS ir visą įmonės informacinę veiklą. Be to, IS naudotojai per mažai informuoti (nesupranta) apie duomenų išteklių integravimą ir pasikeitimus, nėra įtraukiami į integravimo tobulinimo procesus. Todėl, kaip buvo pažymėta tyrime, veiklos (arba informacijos šaltinių) modeliavimas turi būti neatsietinas nuo duomenų integravimo procesų vykdymo, norint konstruktyviai išreikšti tiek geresnį nagrinėjamų veiklų supratimą, tiek efektyvesnį integravimo problemų pateikimą. Vadinasi, sudaryti ŽI valdymo procesų funkcijų modeliai integravimo aspektu – svarbi, veiklos specifika grįsta, priemonė (tiksliau – viena iš priemonių) siekiant: (1) didesnio bendro integruojamų duomenų šaltinių ir duomenų struktūrų (informacinės aplinkos) svarbos supratimo, (2) vykdomų ŽIVP veiklų ir funkcijų (ir jų sandaros) aiškumo ar (3) ištirti esamą tvarką ir duomenų integravimo dėsningumus, siekiant gauti naujos, praktinės vertės turinčios, informacijos bei (4) rasti (nustatyti) ŽI veiklos modelio perteikiamus metaduomenis, t. y. veiksmingo integravimo problemų turinio išaiškinimo ir sprendimų ieškos.

IŠVADOS

Nūdienos įmonių informacinės veiklos kontekste nuolat reikia spręsti veiklos duomenų integravimo uždavinį. Tačiau tyrimai ir praktika rodo, kad diduma duomenų integravimo projektų netenkina vartotojų reikmių. Šioje situacijoje, siekiant geriau pažinti ir veiksmingiau kontroliuoti veiklos aplinkos duomenų srautus bei tinkamai suprasti integravimo aplinką ir vykdyti integracijos procesus, geras integracijos valdymo bei veiklos ir IS modelių susiejimo įrankis – veiklos modelis.

Tyrimo rezultatai pateikia šiuolaikiškų žinių bei įžvalgų, kurios išryškina specifines veiklos duomenų integruoto valdymo problemines situacijas bei veiklos modelio naudojimo duomenų integravimui pagrįstumą. Grafiškai pavaizduotos žmogiškųjų išteklių informacinio valdymo situacijos (kaip empirinio tyrimo rezultatas) – tai praktinė priemonė plėtojant žmogiškųjų išteklių duomenų integravimą.

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Integruotų ugdymo sistemų architektūriniai modeliai

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SANTRUMPA. Šiame straipsnyje pateikiamos trys skirtingi ugdymo sistemų, kurių pagrindas yra atviro kodo nuotolinių mokymų sistema Moodle, praplėtimo architektūros modeliai. Straipsnyje pateikiamos skirtingų architektūrų savybės, pritaikymo gairės bei pateikiama keletas realizacijų pavyzdžių.

Raktiniai žodžiai: *informacinės sistemos, Moodle, turinio valdymo sistema.*

Įvadas

Informacinė sistema (IS) informatikoje apibrėžiama kaip informacijos apdorojimo sistemos ir organizacijos išteklių (pačios informacijos, žmonių, techninių priemonių, finansų ir pan.) visuma, skirta informacijai apdoroti, formuoti (kurti), skleisti (siųsti ir gauti) [1].

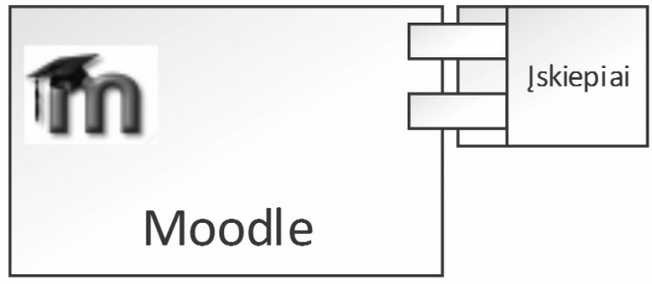
Ugdymo informacinė sistema – specifinė informacinė sistema, skirta ugdymui. Šiame straipsnyje analizuojamos ugdymo sistemos realizacijos, paremtos atviro kodo sistema Moodle. Moodle buvo pasirinkta dėl savo populiarumo [3][8], atviro kodo ir modifikacijų galimybių. Kaip teigia [2] socialinio konstruktyvizmo filosofija, Moodle yra puikus įrankis teikti nuotolinio mokymosi turinį, reikalaujantį bendradarbiavimo veiklų. Šiame straipsnyje išskirtos trys skirtingos architektūros: 1) Moodle su įskiepiais, 2) Moodle sujungta su turinio valdymo sistema, 3) Moodle patalpinta į turinio valdymo sistemą. Šios architektūros parinktos, nes jos ne tik iliustruoja skirtingo lygmens adaptacijas, bet ir kiekviena jų turi savo specifines savybes tiek iš naudotojo perspektyvos, tiek iš realizacijos pusės. Šiame straipsnyje taip pat pateikiami realizacijų pavyzdžiai.

1. UGDYMO INFORMACINIŲ SISTEMŲ ARCHITEKTŪROS MODELIAI

Moodle – atviro kodo nuotolinio mokymosi platforma. Ši mokymosi platforma sukurta taip, kad būtų atvira modifikacijoms naudojant įskiepius bei turėtų lanksčias integracijos su kitomis sistemomis galimybes [5]. Šios savybės leidžia pritaikyti Moodle prie specifinių poreikių [6]. Pati Moodle kūrėjų filosofija remiasi socialinio konstruktyvizmo koncepcija ir moderniomis metodikomis, tačiau, siekiant geriausio rezultato, modifikacijos ir adaptacijos konkretiems poreikiams yra neišvengiamos [7][8]. Šiame skyriuje pateikiama keletas Moodle modifikacijų/adaptacijų architektūros pavyzdžių.

1.1. Moodle papildymas įskiepiais

Moodle funkcijų papildymas naudojant įskiepius (1 pav.) yra vienas populiariausių Moodle pritaikymo metodų [9]. Tai iliustruoja moodle.org pateikiamų įskiepių kiekis.



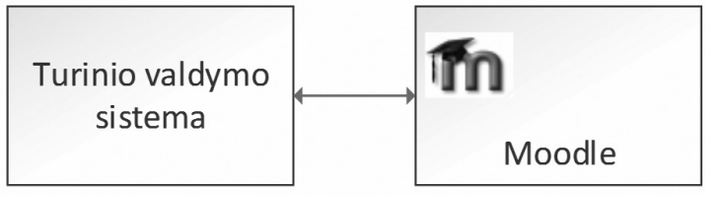
1 pav. Moodle pagrįstos mokymosi informacinės sistemos adaptavimo metodas, kai adaptacijos atliekamos įskiepių pagalba.

Adaptavimo specifiniams poreikiams architektūra, kai Moodle papildoma įskiepiais, leidžia pritaikyti Moodle išlaikant Moodle kaip platformą tiek naudotojų valdymui, tiek mokymo programų teikimui. Moodle papildymo įskiepiais architektūros pagrindinis privalumas – sistemą lengva įsisavinti naudotojams,

turintiems patirties dirbant standartiniu Moodle paketu. Taip pat dažniausiai nekyla problemų atnaujinant sistemą atsiradus naujai Moodle versijai. Tačiau adaptavimo architektūra, kai Moodle papildoma įskiepiais, turi apribojimų - jei netenkina kurie nors esminiai komponentai, pavyzdžiui, naudotojų valdymas, modifikacijos tampa sudėtingos. Tuomet tikslinga naudoti kitus adaptavimo architektūros variantus – prijungimą prie turinio valdymo sistemos arba patalpinimą į turinio valdymo sistemą.

1.2. Moodle prijungimas prie turinio valdymo sistemos

Architektūra, kai Moodle prijungiama prie turinio valdymo sistemos (2 pav.).

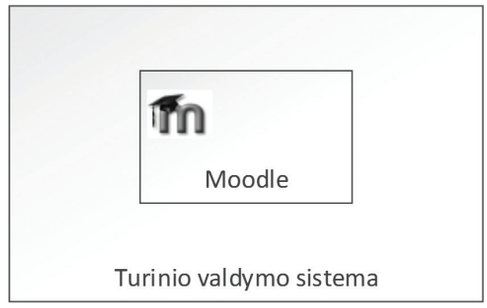


2 pav. Moodle pagrįstos mokymosi informacinės sistemos adaptavimo metodas, kai prie Moodle prijungiama turinio valdymo sistema.

Šią architektūrą tikslinga naudoti, kuomet ugdymo sistemai atsiranda poreikis turėti kitokį nei Moodle teikia naudotojų valdymą ar prireikia kitų turinio valdymo sistemos funkcijų, pavyzdžiui, norima turėti informacinę svetainę, kurios tik viena iš dalių yra nuotolinio mokymosi kursai. Realizuojant Moodle prijungimą prie turinio valdymo sistemos jos yra apjungiamos vieningu prisijungimu (angl. SSO - Single Sign On), pavyzdžiui, SAML. Įdiegus vieningo prisijungimo sprendimą, naudotojai, prisijungę prie turinio valdymo sistemos aptarnaujamos svetainės, be jokių apribojimų, papildomų reikalavimų prisijungti, gali naudotis tiek turinio valdymo sistemos, tiek mokymosi aplinkos Moodle funkcijomis. Naudojant šią architektūrą naudotojas, nors iš jo ir nereikalaujama jungtis prie kiekvienos sistemos atskirai, vis tiek jaučia perėjimą tarp sistemų. Pagrindinis perėjimo tarp sistemų požymis – pasikeičiantis sistemos meniu – esant turinio valdymo sistemos aptarnaujamoje svetainės dalyje matomi turinio valdymo sistemos tvarkomi meniu punktai, o esant Moodle – Moodle sistemos meniu. Kita šios architektūros savybė – esant Moodle mokymosi aplinkoje navigacija tarp kursų išlieka tokia, kokią pateikia Moodle. Jei yra poreikis kiek įmanoma sumažinti perėjimo tarp turinio valdymo sistemos ir Moodle sistemos požymius ir/arba norima modifikuoti naršymo po kursus navigaciją, valdyti kursus, besimokančiuosius modifikuotoje, pritaikytoje prie specifinių poreikių aplinkoje – verta atkreipti dėmesį į architektūros variantą, kai Moodle ne prijungiama, o patalpinama į turinio valdymo sistemą.

1.3. Moodle patalpinimas į turinio valdymo sistemą

Architektūra, kai Moodle patalpinama į turinio valdymo sistemą (3 pav.).



3 pav. Moodle pagrįstos mokymosi informacinės sistemos adaptavimo metodas, kai Moodle patalpinama į turinio valdymo sistemos aplinką.

Šios architektūros pagrindą sudaro vieningas prisijungimas ir Moodle API naudojimas. Ją tikslinga naudoti siekiant betarpiškai sulieti mokymosi aplinką su turinio valdymo sistema. Vieningas prisijungimas (angl. Single Sign On) suteikia galimybę vienu prisijungimu prisijungti prie visų komponentų, o Moodle

API – valdyti mokymosi aplinką iš turinio valdymo sistemos. Moodle API naudojimas leidžia kontroliuoti kursų nustatymus, besimokančiųjų valdymą, grupių formavimą, siųsti besimokantiesiems žinutes, gauti kursų sąrašus ir dar daug kitų funkcijų valdant jas iš turinio valdymo sistemos. Naudojant šią architektūrą mokymosi aplinka integruojama į turinio valdymo sistemą taip, kad naudotojas vizualiai negali atskirti, kurios sistemos dalyje dabar yra. Įprastai turinio valdymo sistema atlieka naudotojų valdymo ir vartotojo sąsajos pateikimo vaidmenį, o Moodle – mokymosi aplinkos funkcijas.

2. UGDYMO SISTEMŲ ARCHITEKTŪRŲ MODELIŲ REALIZACIJOS PAVYZDŽIAI

Šiame skyriuje pateikiami pagal skirtingus architektūrinius modelius sukurtų integruotų ugdymo sistemų pavyzdžiai.

Architektūros, kai Moodle pritaikoma naudojant įskiepius pavyzdys – www.eBig3.eu. Tai viena iš dažniausiai naudojamų Moodle pritaikymo architektūrų. Moodle yra sukurtas taip, kad funkcionalumas Moodle viduje būtų keičiamas kuriant įskiepius. Įdiegus įskiepį Moodle branduolio kodas lieka nepaliestas, kas reiškia, kad atnaujinant į naujesnę Moodle versiją įskiepio kodas nebus prarastas. Įskiepių kūrimas yra geroji programinės įrangos kūrimo praktika.

www.eBig3.eu sistemos atveju Moodle aplinka buvo papildyta priemonėmis, leidžiančiomis registruotis siunčiant trumpąsias SMS žinutes mobiliuoju telefonu bei keletu kitų, kaip, pavyzdžiui, naudojimosi statistikos kaupimo ir apdorojimo įskiepiu. Viešai prieinama, turi mokymosi programų pradedantiesiems verslininkams. Skirta savarankiškam mokymuisi.

Architektūros, kai Moodle prijungiama prie turinio valdymo sistemos pavyzdys - www.verslokelias.eu.

Moodle sujungimo su turinio valdymo sistema architektūra yra lengvasvorės integracijos pavyzdys. Naudojant šią architektūrą sistemos susiejamos bendru prisijungimu, o tarpusavio navigacija - nuorodomis. www.verslokelias.eu yra uždara aplinka, skirta projekto dalyviams, turinti šias pagrindines galimybes [4]:

a. Praktikos vietų skelbimai, paieška;

b. Praktikos proceso valdymo, artefaktų kaupimo priemonės;

c. Mokymosi, konsultavimosi priemonės;

d. Verslo imitaciniai žaidimai.

Pagrindiniai architektūriniai komponentai:

a. Socialinės tinklaveikos sistema – praktikos vietų paieškos, skelbimų, dalinimosi ir bendravimo aplinka;

b. Mokymosi sistema – mokymosi veiklų, konsultavimosi aplinka;

c. Verslo imitavimo žaidimas;

d. Turinio valdymo sistema – visus komponentus apjungianti aplinka.

Pagrindiniai architektūriniai komponentai:

a. Praktikos vietų paieška;

b. Praktikos metu gautų artefaktų kaupimo aplinka;

c. Grupinio darbo, bendravimo, dalinimosi priemonės.

Elgg suteikia lanksčias galimybes konfigūruoti grupes ne tik apribojant matomumą, galimybę prisijungti prie grupės, bet ir kurti pogrupius bei įgalinti ar išjungti įvairius funkcionalumus, kaip, pavyzdžiui, įgalinti vidines diskusijas ar dienoraštį.

Moodle - aplinka mokymuisi bei konsultacijoms. www.verslokelias.eu portale Moodle naudojama pateikti mokomąją medžiagą bei konsultuoti su mokymosi medžiaga susijusiomis temomis. Konsultacijos atliekamos naudojant forumus ir realaus laiko tekstinius pokalbius.

Architektūros, kai Moodle patalpinama į turinio valdymo sistemą pavyzdys - www.smis.lt.

Šioje sistemoje panaudotos komponentų apjungimo priemonės – žiniatinklio paslaugos (angl. Web Services), vieningas prisijungimas, tarpusavio HTML formų persidavimas bei keletas kitų.

www.smis.lt yra viešai prieinama, skirta savarankiškam mokymuisi. Sistemoje pateikiama keli šimtai kursų, skirtų įvairių kvalifikacijų tobulinimui, tame tarpe ir verslumui. Šioje sistemoje Moodle mokymosi aplinka glaudžiai susijusi su turinio valdymo sistema.

Dėl naudojamos architektūros, kai Moodle patalpinama į turinio valdymo sistemą, perėjimas tarp sistemų nejuntamas, meniu elementai, apipavidalinimas yra naudojami tie patys tiek Moodle, tiek turinio valdymo sistemos dalyse. Tai pasiekta naudojant Moodle teikiamas žiniatinklio paslaugas (angl. Web Services), SimpleSAMLphp vieningo autentifikavimo mechanizmą. Kursų paieška atliekama turinio valdymo sistemos priemonėmis susikomunikuojant su Moodle kursų duomenų baze per žiniatinklio paslaugas bei turinio valdymo sistemos priemonėmis papildant papildoma informacija prieš pateikiant kurso objektą naudotojui. Papildoma kurso informacija – tai kurso metaduomenys – naudotojų suteiktas reitingas, papildomas aprašymas, administruojančio naudotojo duomenys ir keletas kitų, skirtų lengviau, tiksliau identifikuoti kursą ir pateikti naudotojui patogesne forma.

Esant poreikiui Moodle aplinkoje pateikti turinio valdymo sistemos fragmentus tai taip pat yra įmanoma, naudojant iFrame HTML technologiją arba perduodant turinio valdymo sistemoje suformuotą HTML kodą ir jį tiesiogiai atvaizduojant Moodle priemonėmis.

Taigi, panaudojant abipusės integracijos priemones, įmanoma sukurti sistemą, susidedančią iš visiškai skirtingų komponentų, bet iš naudotojo perspektyvos atrodančią kaip vientisa, vienalytė sistema.

3. ARCHITEKTŪROS MODELIO PASIRINKIMO ATVEJO ANALIZĖ

Šiame skyriuje pateikiama projekto „Vyresnio amžiaus Europos darbuotojų mobilumas: senstančios Europos darbo jėgos įdarbinimo galimybių pagerinimas ir praplėtimas padidinant mobilumą“ (angl. „Career Mobility of Europe's Older Workforce: Improving and extending the employability of an ageing workforce in Europe through enhancing mobility“) metu atlikta architektūros parinkimo analizė bei realizacijos detalizacija. Toliau minint šį projektą vartojama santrumpa - CaMEO.

3.1. Architektūros modelio parinkimas

Projekto CaMEO metu panaudota Moodle įskiepio architektūra, kurią galima laikyti modelio, kai Moodle funkcionalumo išplėtimui naudojami įskiepiai, pogrupis. Šiame skyriuje pateikiamas šio architektūros pasirinkimo pagrindimas.

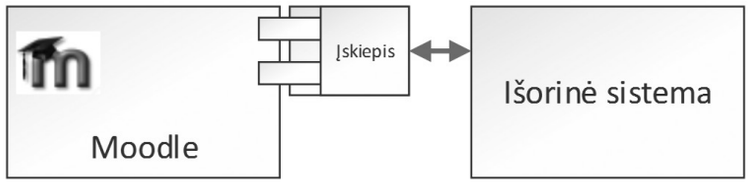
CaMEO projekto vienas iš tikslų – sukurti sistemą, kurios pagalba būtų kaupiama informacija apie asmenis ir jų kvalifikaciją bei ši informacija būtų pasiekiama potencialiems darbdaviams. Asmenys savo kvalifikaciją turi aprašyti pagal Europos kvalifikacijų karkasą (angl. European Qualification Framework) užpildydami testą, kurio pagalba automatiškai apskaičiuojamas kvalifikacijos lygmuo.

Asmenų su kvalifikacijomis šaltiniu pasirinkta ne kurti naują internetinį portalą, o naudoti jau egzistuojančias nuotolinio mokymo aplinkas, veikiančias Moodle pagrindu, taip pasinaudojant egzistuojančių sistemų populiarumu ir sukauptomis naudotojų grupėmis.

Faktas, kad bus naudojama ne viena, ir gal net ne projekto vykdytojų administruojama aplinka, reikalauja lengvai įdiegiamo universalaus sprendimo. Dėl to parinkta architektūra, kai reikiamas papildomas funkcionalumas įdiegiamas naudojant įskiepį.

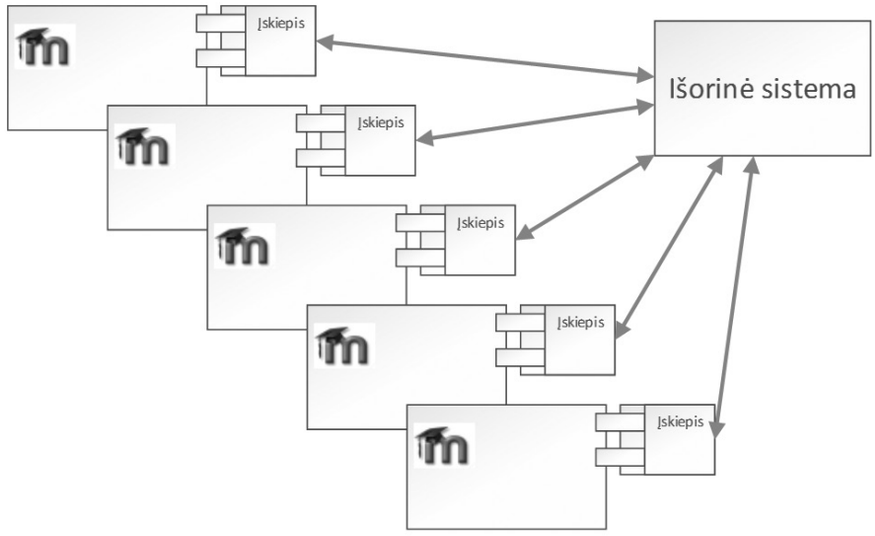
Dar vienas poreikis, dėl kurio parinkta žemiau aprašyta architektūra, yra tai, kad reikalinga galimybė atnaujinti klausimynus ar net skaičiavimo algoritmus nuotoliniu būdu.

Dėl aukščiau išvardintų priežasčių parinkta architektūra, kai sukuriamas integracinis Moodle įskiepis, kurio pagalba naudojamasi resursais iš išorinės sistemos (4 pav.).



4 pav. CaMEO projekto metu naudojama architektūra – Moodle įskiepis, bendraujantis su išorine sistema.

Schema, kai įskiepis įdiegtas į keletą sistemų pateikta paveikslėlyje žemiau (5 pav.):



5 pav. Visos sistemos, turinčios įskiepį, bendrauja su viena išorine sistema.

Integracinis įskiepis ypatingas tuo, kad jame realizuojamas tik išorinės sistemos integracijai reikalingas funkcionalumas, užtikrinantis komunikavimą su integruojama išorine sistema bei valdantis išorinės sistemos pateikimą Moodle aplinkoje. Integruojama per įskiepį išorinė sistema savo ruožtu turi turėti galimybes komunikuoti su įskiepiu bei pateikti reikiamus duomenis bei vykdomąjį kodą.

3.2. Sistemos realizacija

CaMEO projekte naudojamos sistemos valdymo srautai pavaizduoti 6 pav.

Moodle įskiepis pateikia valdymo užklausas centrinei valdymo sistemai, kuri savo ruožtu pateikia vykdomąjį kodą bei reikalingus duomenis. Komunikacija inicijuojama iš įskiepio pusės.

Duomenų perdavimo kryptis pateikta 7 pav. Duomenų perdavimas inicijuojamas įskiepio pusėje, o duomenys kaupiami bendroje duomenų bazėje. Duomenų integralumą, nepakeičiamumą ir saugumą užtikrina centrinės valdymo sistemoje realizuota logika bei įprastiniai duomenų bazės valdymo sistemos mechanizmai.

7 pav. pateiktoje schemoje matoma „naudingų“ duomenų saugojimo srautas, t.y. naudotojo kontaktinių duomenų, nustatymų ir kvalifikacijų įrašymas į nuolatinę saugyklą, kuri vėliau naudojama platinti iš įvairių šaltinių sukauptą informaciją skirtingais kanalais (8 pav.).

IŠVADOS

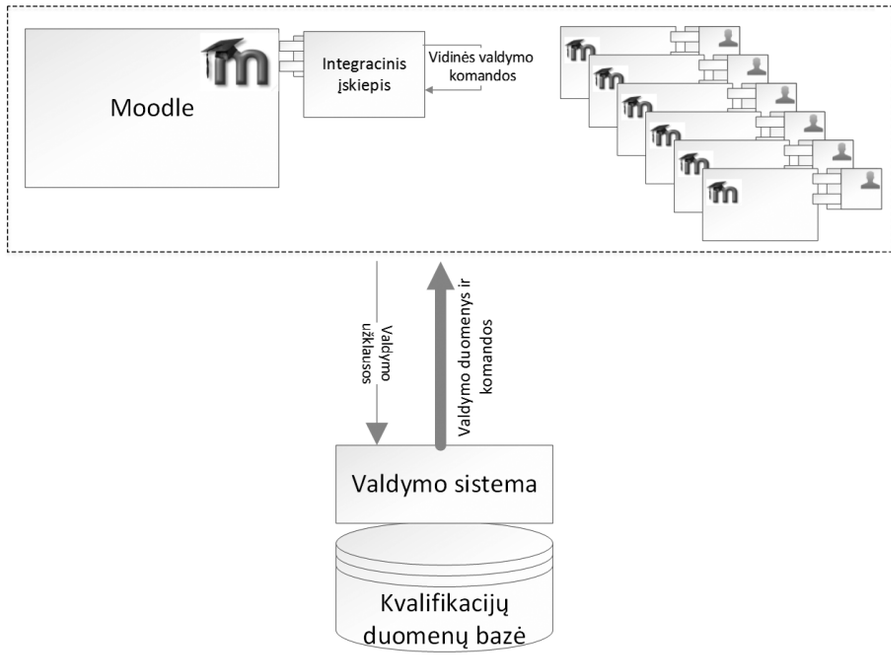
Straipsnyje pateikiamos sistemų pritaikymo prie specifinių poreikių architektūros, naudotos ugdymo informacinėms sistemoms, grindžiamoms atviro kodo nuotolinio mokymosi sistema Moodle. Apibendrinant galima padaryti išvadą, kad Moodle yra gana lanksti sistema, turinti įvairias adaptavimo galimybes, tinkamas įvairaus tipo nuotoliniam ugdymui teikti. Adaptavimo architektūros pasirinkimas priklauso nuo poreikių, tačiau apibendrinant rekomendacijos yra šios:

a. jei Moodle aplinka iš esmės tenkina ir norima papildyti arba pakeisti nedidelę dalį funkcionalumo – siūloma adaptacijas, modifikacijas atlikti kuriant Moodle įskiepius;

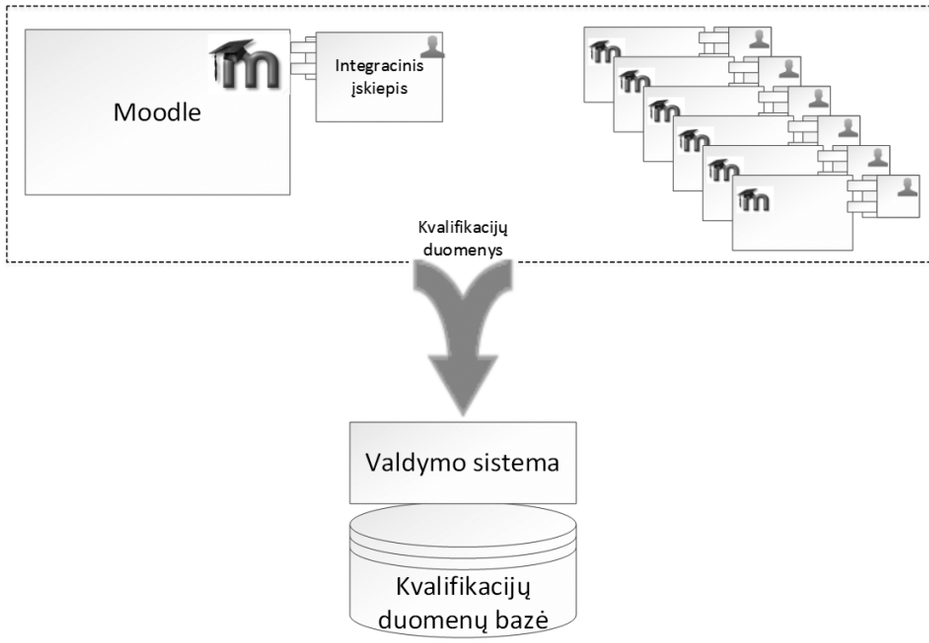
b. jei prireikia turinio valdymo sistemos galimybių – turinio valdymo sistemos prijungimas naudojant nuorodas ir bendrą autentifikavimąsi gali būti tinkamiausias sprendimas;

c. jei siekiama sukurti vienalytę sistemą, susidedančią iš turinio valdymo sistemos ir Moodle galimybių – siūloma integruoti abi sistemas naudojantis žiniatinklio paslaugomis, bendra duomenų bazę, iFrame technologijomis.

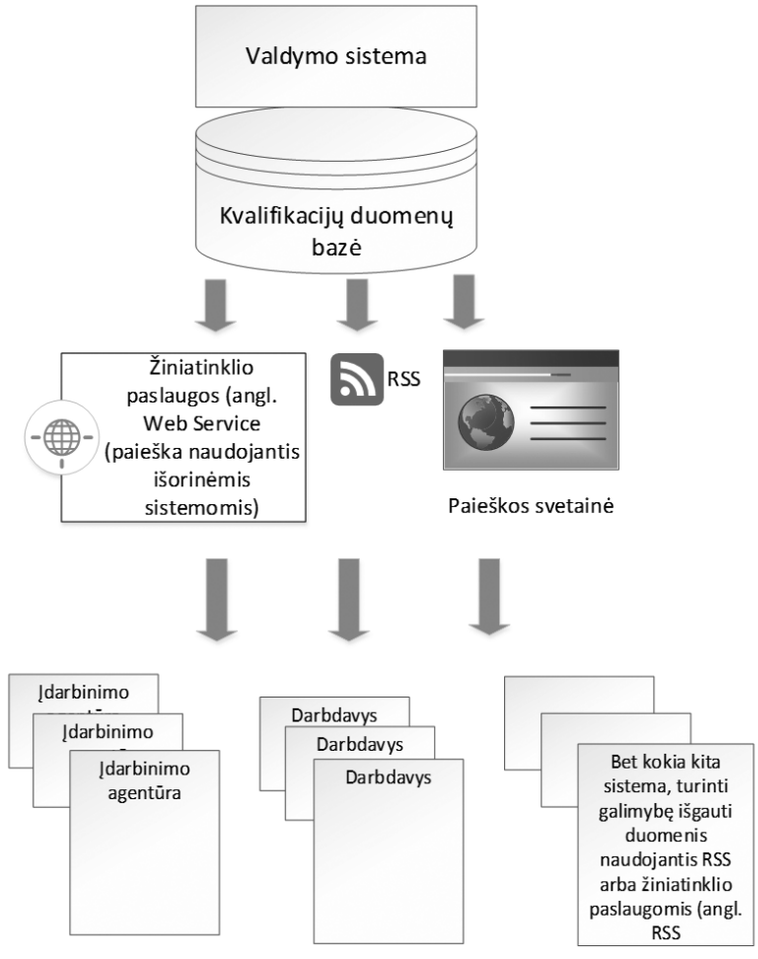
Tolesniuose tyrimuose planuojama atlikti straipsnyje aprašytomis architektūromis adaptuotų sistemų naudojimosi patogumo tyrimus. Taip pat tyrimo objektu galėtų būti atvirkštinė architektūra, negu straipsnyje aprašyta trečioji architektūra, kai turinio valdymo sistema patalpinama į Moodle, o ne atvirkščiai.



6 pav. Valdymo srautai.



7 pav. Duomenų srautas.



8 pav. Duomenų bazės informacijos sklaida trimis kanalais – naudojantis žiniatinklio paslaugomis, RSS ir paieškos svetaine

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