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Proceedings



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The Conference is organized by the Military Academy "General Mihailo Apostolski"- Skopje associated member of the University "Goce Delcev" - Shtip, within the RADLI Project (Regional Advance Distributive Learning Initiative), supported by the Kingdom of Norway and implemented by the Jefferson Institute, USA.

The Conference has been immensely supported by the Ministry of Defence and the Armed Forces of the Republic of North Macedonia

Preface



Respected readers,

In front of you is the thematic Proceedings, as a collection of papers presented at the 2nd MILCON'19 Conference "Contemporary education based on ADL", organized on November 12th 2019, by the Military Academy "General Mihailo Apostolski" - Skopje associated member of the University "Goce Delcev" - Shtip, within the RADLI Project (Regional Advance Distributive Learning Initiative), supported by the Kingdom of Norway and implemented by the Jefferson Institute, USA.

The objective of the Conference was to gather educators and trainers from different countries in order to give us the opportunity to increase both knowledge and cooperation within all aspects of advance distributed learning - ADL. Hence, the Proceedings contain **32** papers focused on the contemporary trends in the use of information technology in a pedagogical way, as well as the best practices both from a theoretical point of view, but also from a practical aspect on the topics related to educational programs using blended learning, emerging learning technologies, multiplatform delivery of courseware, motivational and pedagogical learning strategies and other topics related to ADL. This international scientific conference gives us a wonderful opportunity for exchanging experience and knowledge between the scientific workers and the practitioners from North Macedonia, USA, Serbia, Poland, Slovenia, Bosna and Hercegovina and Norway.

The papers published in the Proceedings are written by eminent scholars as well as by members of the security system participating in the educational process of the army, police and other security services from different countries.

Each paper has been reviewed by international experts competent for the field to which the paper is related.

The data and information gained with the empirical research, as well as theoretical thoughts and comparative analyses in the Proceedings will give a significant contribution to the development of the use of ADL in a pedagogical way.

We wish to extend our gratitude to all authors and participants to the Conference, as well as to all those who contributed to, or supported the Conference, especially the Kingdom of Norway and the Jefferson Institute, as well as to the Ministry of Defense and the Armed Forces of the Republic of North Macedonia for their immense support of the Conference.

Skopje, November 2019

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Table of contents

Use of training needs' analysis for improvement of cadet's training skills.....	9
<i>Z Cikarski, Lj Shosholovski and R Mustafovski</i>	
Project based learning approach for undergraduate mechatronics education using the Arduino online platform	15
<i>S Domazetovska, J Jovanova and V Gavriloski</i>	
Kahoot! foster students' engagement, enhance classroom dynamics, assess and improve overall students' learning	26
<i>N Kletnikov, O Popovski and A Tomova</i>	
Online and distance learning program evaluation: a call for action	33
<i>T Mullis</i>	
Some aspects of using the ship's stability stand bed.....	42
<i>W Mironiuk and M Mięsikowski</i>	
Face recognition technology in the exam identity authentication system - implementation concept	49
<i>Lj Arnautovski</i>	
How to improve students' motivation in online education?.....	55
<i>B Karovska - Andonovska and E Trajanovska</i>	
E-learning platforms: The future of education	61
<i>K Ilievski, A Behlić and J Achkoski</i>	
E-learning course personalization using a Fuzzy logic, experience based algorithm (controller).....	67
<i>N Manev and E Nikolov</i>	
Development and implementation of special research procedures for risk prevention on sport events - with a special accent on the role of the police.....	73
<i>J Ivanovski and A Nedev</i>	
Bio-inspired and origami engineering approaches for project based learning mechatronics	79
<i>M Anachkova, V Gavriloski and J Jovanova</i>	
Moodle as an advanced distributed learning platform	87
<i>A Behlić, K Ilievski and B Dulovic</i>	
Learning strategies and metacognitive awareness.....	93
<i>Lj Shosholovski and R Mustafovski</i>	
<i>E-learning System based on Recommendations, implemented in Matlab</i>	101
<i>E Kamceva, Z Gacovski and A Sefidanoski</i>	
Modern platforms on the Internet as a instrument of power in hands of violent religious extreme organization	110
<i>N Taneski, B Karovska-Andonovska and A Petrovski</i>	

Video-conferencing distance learning.....	117
<i>A Stojanova, M Kocaleva, N Koceska and S Koceski</i>	
An autonomous mobile robot for obstacle avoidance	124
<i>A Panov and S Gelev</i>	
Improving the current way of learning in the Border Police of Republic of North Macedonia in e-learning and smart learning environment.....	131
<i>T Chekovikj and J Kalach</i>	
ADL based preparation, establishment and performance assessment of a tactical exercise for a communication network realization in a training procedure.....	139
<i>J Bajcetic, S Devetak, V Ristic and G Šimić</i>	
History of Heutagogy as a self-determined learning	146
<i>A Ilieva Nikolovska, A Grizev and A Iliev</i>	
Time allotment and its influence in the FLP computer-based assessment of the reading skill	153
<i>M Gjurovikj and E Trajanovska</i>	
International military cooperation with medical VR training	159
<i>B Presnall</i>	
Learning and Motivation.....	165
<i>A Iliev, Z Jovanovski and M Dojcinovski</i>	
Challenges of Differentiation in Learning and the ADL Approach	172
<i>N Serafimova</i>	
E-learning in the Slovenian armed forces - an example of good practice.....	182
<i>D Ščavničar</i>	
E-learning.....	192
<i>A Glavinov, B Jovanova and K Hrnjić</i>	
Implementation of the Advanced Distributed Learning (ADL) concept in the Ministry of Defense and the Armed Forces of Bosnia and Herzegovina.....	198
<i>S Muratović, S Blavicki, S Konjević and A Kasumović</i>	
Next Generation Digital Learning Environment (NGDLE).....	207
<i>R Mustafovski and B Temelkovski</i>	
Use of Technology	214
<i>S Tasevska and B Temelkovski</i>	
Advance distributed learning – ADL Motivational and pedagogical learning strategies.....	220
<i>S Idrizovska and B Temelkovski</i>	
The development of modern distance education	225
<i>B Filipovska, E Filipovska and D Petreski</i>	
Global education and disaster preparedness.....	233
<i>M Timovska and A Timovska</i>	

Use of training needs' analysis for improvement of cadet's training skills

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Abstract. Training needs analysis or training needs assessment is often considered the most important step among the steps in the training cycle and therefore, should precede any training invention. The training needs assessment or training needs analysis at organizational level should first be analyzed, followed by operational and individual analysis or assessment. Today we know that every educational institution and military organization invests in implementation of effective training programs to maximize the value of their existing human assets, which increases the effectiveness of the organization as well as their own effectiveness in the educational process. Human development training programs have been an integral part of encouraging the cadets/students to be a competent and skilled labor force that are knowledgeable and able to perform assigned tasks based on their training needs analysis and assessment. Training needs come from undeveloped skills, abilities, performance and insufficient knowledge or inappropriate cadets/student's attitudes that are considered as relevant for their educational process or practical job in their near future. The educational institution or the military organization should realize that there are elements for the identification of this type of assessment or analysis to increase the knowledge, skills, abilities, performance and competence of the cadets/students. Always we must be aware that there is still a lack of literature that reviews the potential elements for the identification of the training needs assessment and training needs analysis in different organizations.

1. Introduction

Training needs' assessment is crucially important for the professional knowledge and skills' development of the cadets at the Military Academy at all levels, helping them to be more successful and motivated in their study process. The study and learning process is very important for the cadets, because they are the new commanding generation of the army and they must be prepared in every way to become successful in their military career. Training needs' assessment can serve as main tool for creating a powerful training process that helps cadets/students to be more accomplishing and engaged during the four years of studying. Many tools and methods are used in order to find a way to help them to improve their results in studying or learning practical knowledge. However, today training needs' assessment can be considered as expensive and very costly, if not managed correctly. They should be planned in a wider perspective of growth and development of the cadets/students at the Military Academy.

It is essential to recognize the value of proper implementation of training needs' assessment in order to provide effective cost of training and studying that motivates and nurtures the students in their studying or learning performance. Implementing this type of training in the right way will increase the knowledge and the practical abilities. It is vital that this training, especially when it comes to the Military Academy, applies different training needs' assessment tools, methods and strategies for the purpose of increasing the study and learning performance of the cadets. The training needs assessment is the primary key to determining who needs to be trained in the process, where the training is needed and what type of training needs to be taught in order to stimulate learning success and motivation. The purpose is to ensure the effectiveness of the training program. Well-managed and planned training is needed by the cadets and by the military academic staff. If implemented in the right way in the

educational system, it increases knowledge, practical abilities and other skills, which makes the cadets successful in the educational system and afterwards in the military organization.

2. Related work

Before training design issues are considered, a careful needs' analysis and assessments is required to develop a systematic understanding of where the training is needed, by whom it is needed, what needs to be taught and who will be trained [1]. Unless such assessments have been adequately performed, it may be difficult to rationally justify providing training. Implementing helps and increases the result of the cadets/students in the theoretical and practical knowledge and in their skills and the different abilities in the military knowledge. Such need' assessment should enable an explanation to be given on why the training activities should be done and to show that training is the best solution for the performance problem and the development need. Now this type of training can be an important tool for every trainer and instructor. It can help develop a program or course based on the real needs of the cadets/students that are serving. As today the time is limited in the training program and courses, learners take this type of training into account. This can ensure what is more important that must be learned by them [2]. In every educational system today whether the complication of the education system requires the cadets/students to have knowledge, skills and abilities appropriate to the task.

If they are not skilled or do not have enough abilities to learn and study or to do the job, later it becomes difficult to them to do the job or to learn and study. Realizing they cannot do the job or cannot learn and study, they immediately are halfway in identifying their training needs assessment [2]. Identifying this type of training helps the cadets and them to increase the knowledge and also the skills and abilities to do the job and to make them successful in their educational process. Training needs' assessment can be defined as the gap between what a cadet or other civilian student must be able to learn or study and do and what he or she can or currently is doing [3]. This type of training identifies the gap between what the educational system expects from a cadet or other student to do, study or learn on one hand, and what they are actually doing on the other hand. The training needs' analysis or assessment helps them to do the right thing in order to be successful and to increase their skills and abilities in every moment [4].

The continuous training can help in discovering whether there is a conflict between what a cadet or student should do and what he or she is actually doing. Every educational system offers different skills and abilities that the cadet or student must acquire in order to be successful in future. Their needs may be personal, performance-related or career-related and include needs such as for example:

- updating knowledge, skills, abilities or job-related competences;
- making decisions about military career choices and career progression;
- increasing education and job satisfaction and the fulfillment of personal goals;
- identifying personal strengths and weaknesses;
- developing communication, teaching abilities and skills, personal effectiveness and life skills and abilities;
- identifying and achieving work targets;
- improving qualifications;
- Individual learning, teaching and self-development; building self-awareness, motivation and self-confidence.

3. Proposed framework

Today the identification of this training is the most common term that can be used to refer either the training needs assessment or training needs analysis or both terms together as they may be used interchangeably and it generally used as similar terms to help the cadets/students to increase the result in the educational system [5]. The training needs assessment or training needs analysis can become crucial in changing their orientation and managing smooth change in the educational system [6]. Today, the training needs assessment and analysis can be used as a primary factor to increase the

knowledge, skills, abilities and competency of the cadets and the other civilian students to achieve expected individual and organizational performance. Many researchers in the past have presented different models of this method to increase the knowledge, skills and abilities of the cadets and the civilian students in the educational system [7-9]. All of the models aim is to increase the knowledge, the skills and the abilities with which they will be successful in the educational system of the Military Academy and also later, successful in the military organization. All of the presented models refer to the same aim of increasing the knowledge, skills and abilities of the cadets/students, since they are the next generation of leaders in the military organization. Following is a brief description of three levels for conducting a successful training assessment and analysis model: organizational analysis, task analysis and person analysis [6], [10-12].

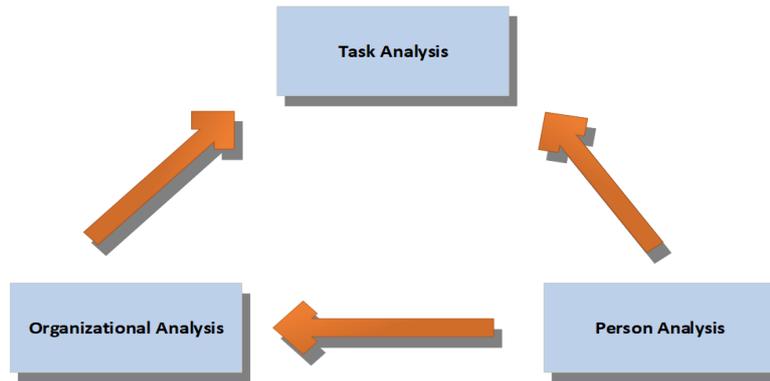


Figure 1. Proposed framework for training needs assessment.

3.1 Organizational Analysis

The organizational analysis or organizational assessment focuses mostly on identifying where in the educational system the training is needed, in order for the cadets and the civilian students to be more successful in their educational process [12-13]. The organization analysis or assessment determines the performance within the educational institution or system. This level of analysis or assessment can help them to reach organizational goals.

The purpose and the aim of organizational analysis or assessment is to provide information about where and when training was needed in an educational institution or system [5], [14-15]. By providing information when and where training needs assessment or training needs analysis is needed then the educational process can become easier and can increase the result in the practical knowledge in the field exercises.

3.2 Task Analysis

This level of analysis or assessment identifies the nature of task to be performed on the educational system or organization and the knowledge, skills, abilities and the competence of the cadets and the civilian students that is required to perform these different tasks. Task or operation analysis or assessment attempts to identify the content of training that a cadet or a civilian student must do in order to perform competently based on the educational analysis, organizational analysis, task analysis, knowledge, skills and abilities [5], [16-17]. Actually, this level of analysis or assessment is concerned with what knowledge, skills and abilities are necessary to perform certain activity, job or tasks [18].

The questions on what cadets and civilian students must learn and what types of training are required in order to perform well in tasks, jobs or in the educational institution or military organization can be identified in this level [19-20]. This level is important in the training needs assessment and analysis for identifying what they need to learn and study, in order to be more successful in the educational system or in the military organization.

3.3 Person Analysis

Person or individual analysis or assessment determines how well each cadet/student is performing the task that makes up their job [5], [21]. It actually analyses how well the cadet /student performs the job or task in the educational and military organization or system. This level identifies who needs the training and who should be trained, what type of training is needed and for what purpose or aim the training should be conducted.

All of the above three levels of training needs analysis and assessment are interrelated. The training needs should be identified at all levels. Organization's as well as cadets' needs can be developed through all of the three levels: organizational, task and individual or person training needs, in order to produce a good training program [19-21].

Training needs' assessment and analysis increases the nine major human resources management and development areas such as: training plans, goal setting, cadet and civilian student development, knowledge, skills, abilities and attitude, learning and study motivation, cost effectiveness and performance appraisal. Training needs analysis and assessment provides information between training and non-training needs that should be used for cadets and civilian student's professions and personal development respectively.

It shows that this training is one of the main processes to develop human resources, for attending an appropriate training that is suitable to their training needs, thus enhancing the performance in different organizations. It is crucial that before the training program begin, there are few elements that can serve as a guideline in order to know the important relations with the training needs assessment or analysis process [18], [22]. The analysis can be done with identifying the competencies, knowledge and skills of cadets/students. When there is a lack of knowledge, skills and abilities, both of these aspects can be improved through identification of training needs assessment and analysis process first.

This is one of the important elements or tools that need to be considered in the training process in order to increase the knowledge, skills and abilities.

3.4 Elements for Identification of Training Needs Assessment in Education

There are few crucial elements that are part of the activities for identification of training needs assessment in education, such as: competencies of knowledge and skill assessment, career development assessment and performance analysis [18-19], [22-23]. These elements help them to increase the knowledge, skills and the abilities in the educational process and to be successful in the practical exercises.



Figure 2. Elements for Identification of Training Needs Assessment in Education.

3.4.1 Competencies of Knowledge and Skill Assessment

Training is a systematic process for an individual to learn, study and increase the knowledge for the personal and educational goals [6], [11], [23]. Human resources need to be trained in order to enhance the performance and increase the knowledge, skills and abilities of the cadets and civilian students in other organizations. To improve their results different questionnaires should be used, interviews and other methods to identify the training needs and then, with different training needs analysis and assessment, to increase their knowledge, skills and abilities. Both knowledge and skills are important predictors that are being studied in analyzing the training needs [6], [10-11].

Knowledge and skills are the factors that can be used when justifying the identification of training needs among the cadets or civilian students. This can provide actual training and will improve the knowledge and skills of potential trainees through the implementation of training needs' assessment and analysis [1-4].

3.4.2 Career Development Assessment

The significance of training and development is widely perceived by organizational theory and practice [5], [20-21]. Today training and development provide guidance to cadets and civilian students for enhancing their career development.

Their career development can be accessed through the training needs, to give them opportunity for growth by attending the required training development needs [7-9], [13]. The educational institution or military organization must continuously assess and identify their cadets/students' current training and development needs, to prepare them for their next position or the job in the near future.

3.4.3 Performance Analysis

Performance analysis refers to the analysis of conflict between standard and actual performance, whose problems can be solved through instructional and non-instructional solutions [17], [19-21], [24].

The three elements of performance analysis: the individual, the process and the educational institution or military organization, are referring to the organizational level that is affected by performance, and provide the solutions of problems and processes. The individual level makes certain that processes meet the needs of the cadets and civilian students or other organization's needs, to make them work effectively and efficiently.

The individual level is the most detailed level of improving performance in the educational institution or military organization [5], [14], [24]. After these three important elements are identified, the training needs' assessment and analysis can fulfil the real needs of both sides, i.e. the cadets/students' and the organizations'.

4. Conclusion

Today, the human development training program has been an integral part in encouraging the cadets and civilian students to be a competent and skilled labor force that is knowledgeable and able to perform assigned tasks based on their different training needs. Training needs assessment and analysis is the first crucial stage in training and development and is an important factor in increasing the knowledge, skills and abilities. The requirement for training needs assessment and analysis comes from underdeveloped skills, abilities, insufficient knowledge or inappropriate cadets or civilian student's attitudes in the educational institution.

Therefore, the organization should realize that there are elements for identification of training needs' assessment and analysis to increase the knowledge, skills, abilities, competence and performance of the cadets and the civilian students.

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Project based learning approach for undergraduate mechatronics education using the Arduino online platform

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Abstract. The main objective of this paper is to present an innovative approach in project-based learning for an elective course: Fundamentals of mechatronics systems. The course is designed for 3rd year mechanical engineering students from various study programs. Implementing a project-based syllabus of an undergraduate course in mechatronics is a challenging task as it combines knowledge from mechanical engineering, computer science, electronics and control systems. The project based learning is presented through student projects inspired by the kinetic sculptures, which combines the mechatronics with the creative side of the art. By creating a project based on kinetic sculptures, the students were assigned to design and create moving smart structures with integrated microcontrollers using the Arduino online platform. Arduino is an inexpensive, straightforward and surprisingly powerful platform for implementation of algorithms in order to create real projects. The purpose of this paper is to present a successful methodology for teaching mechatronics by developing goal-oriented student projects based on open source platform within this course in the Faculty of Mechanical Engineering in Skopje. The structure, organization and evaluation of the course are explained, while the results indicate that our course structure provides effective means for learning mechatronics.

1. Introduction

Mechatronics, as a synergy of basic engineering disciplines (mechanical engineering, electrical engineering, electronics, control design and computer science) has established itself as one of the leading engineering disciplines all over the world. Technological advancements and globalization of manufacturing are leading to an increased interaction between different disciplines: mechanics, electronics, computers, embedded control software and computer control involved in different domains [1, 2].

Mechatronics is one of the important disciplines because of the integrated multidisciplinary approach and the scope for innovation in product engineering in order to establish trendy engineering [3]. Mechatronic syllabus design is a challenging process because it requires creative and critical thinking and team-oriented skills. The standard VDI2206 [4] is implemented in the teaching methodology, providing a new guidelines for the design of Mechatronic systems. This standard gives a definition about the process of developing a mechatronic system, from the requirements of getting the product by implementing system design and integration, followed by interdisciplinary way of thinking, use of computer-aided tools and model-based learning design.

Project-based learning (PBL) is a methodology applied in education in order to improve the classical form of teaching and allow students to plan, implement and evaluate real world projects [5, 6]. The PBL in mechatronic courses applies a methodology placing the importance of construction of prototypes and estimate the differences between the development of a conceptual design and the actual performance of a product that solves problems that are currently evident in society [7]. By creating study groups among students with different strength and abilities, an exchange and acquisition of knowledge for solving a problem can be generated.

Using online platforms such as the Arduino online platform, leads to creating a successful methodology. Arduino is an open platform created to make technology accessible to everyone, and into the hands of every student and educator. The Arduino Education is created in order to establish

successful online learning based on STEAM programs, integrating Science, Technology, Engineering, Arts and Math. This platform supports the needs of professors and students throughout the educational journey. Educational institutions use Arduino as a resource to assist in educating their students on a wide variety of topics, using several methods. Arduino is widely adopted at post-secondary education (e.g., universities, colleges, research institutes) in the fields of engineering, Internet of Things (IoT), robotics, art and design.

The project-based learning education is applied in the study program of Mechatronics for 10 years. In [2, 8], a prototypes of autonomous vehicles were constructed, based on the Lego NXT and DANI robot, using the LABVIEW software.

Choosing wearable electronics as a topic, successful prototypes were created by the students within the course entitled ‘Introduction in mechatronics systems’ [9].

This paper presents the project-based learning implemented in the course entitled ‘Fundamentals of mechatronics systems’ at the Faculty of Mechanical Engineering, St Cyril and Methodius University in Skopje, North Macedonia and summarizes the outcomes of integration of this methodology. The teaching of mechatronic engineering is presented as the appropriate space for integration of information related to mechanics, electronics, control and programming, in the search for knowledge and skills necessary for the development of projects that meet the main needs of the public that shows an increasing interest.

2. Mechatronics systems concept: Teaching methodology

Mechatronics, as a trendy engineering discipline requires more applied knowledge from the student graduates in order to be more skilled employees. Mechatronics systems are consisted of mechanical system, actuators, sensors and controller, followed by material, energy and information flow, as shown on the scheme in Figure 1 [2].

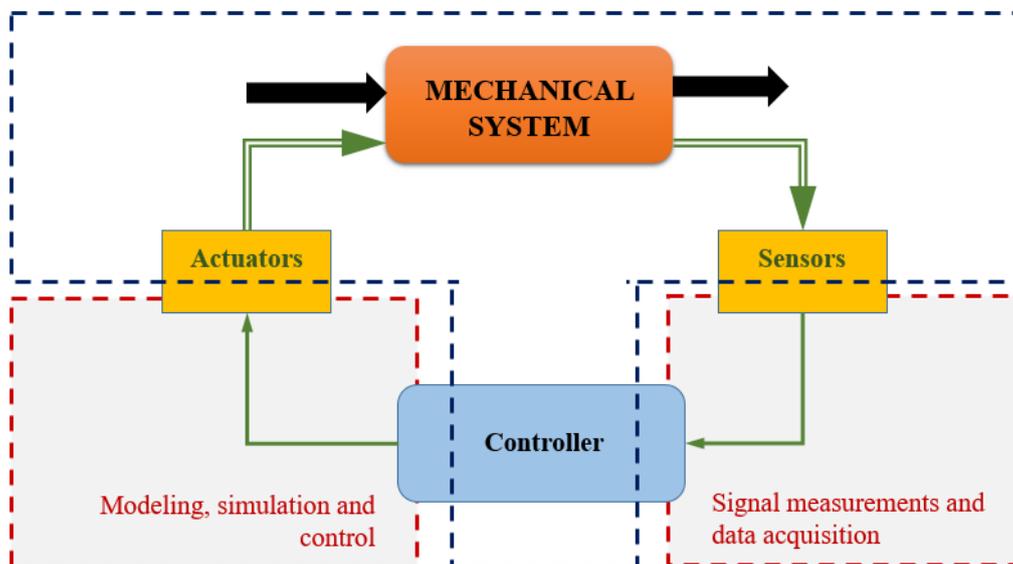


Figure 1. Mechatronics system scheme [2]

One of the methods of providing the engineering students with practical knowledge is the project based learning, which focuses on integration of modern online teaching platforms, student projects and development of mechatronic prototypes. This methodology has been implemented in the ‘Fundamentals of mechatronics systems’ course, by using different educational platforms to learn the fundamental concepts and use them in the development of real practical projects.

‘Fundamentals of mechatronics systems’ is an elective course for 3rd year students from all other mechanical engineering disciplines beside Mechatronics. Learning of the basics of the mechatronics

system is very challenging process to be taught in 15 weeks. By applying the PBL education, effective learning was established. The mechatronics was introduced to students from Thermal Engineering, Hydraulic Power Engineering, Industrial Engineering and Management, Materials, Processes and Innovation, Motor Vehicles, Energy and Environment, Automation and System Control and Industrial Design.

The course was chosen by 54 students, which were combined in 12 teams consisted of 4 to 5 people. Each team had to deliver a project task until the end of the semester. The course structure is consisted of 4 segments: theoretical study of the fundamentals of mechatronics, LabVIEW software programming, conducting a research, writing a paper and developing a real world prototype. By applying each segment using different methods, the overall concept of a mechatronic system is easier to being recognized and understood. Each of the segments equally participated in the grade formation, contributing 25% each, as shown on Figure 2.

Fundamentals of mechatronics systems			
Theoretical concepts: Mechatronic system design, electronics, sensors, actuators, controllers	Lab work (LabVIEW Software + basic electronics)	Research assignment: Kinetic sculptures (Google Scholar)	Design Prototyping and exhibition (Arduino online platform)
25%	25%	25%	25%

Figure 2. Course structure

Laboratory Virtual Instrument Engineering Workbench (LabVIEW) is a system-design platform and development environment for a visual programming language from National Instruments. The graphical language, also referred to as "G", is a dataflow programming language. The code files have the extension ".vi", which is an abbreviation for "Virtual Instrument". The graphical approach also allows non-programmers to build programs simply by dragging and dropping virtual representations of lab equipment with which they are already familiar. With the support of LabVIEW, the students can better understand the concept of measurement and signal processing.

Google Scholar is a freely accessible web search engine that indexes the full text or metadata of scholarly literature across an array of publishing formats and disciplines. By using Google Scholar, the students can easily do a research using articles, patents and citations. Using this search engine, the students did a research that helped them while writing a paper. The main idea of the project task was to combine the mechatronics with the creative side of the art, developing kinetic sculptures with the use of Arduino online platform (Figure 3). By combining these two key words, mechatronic and art, working on the design, programming and actuation, kinetic sculptures (smart structures) were created by each of the teams.

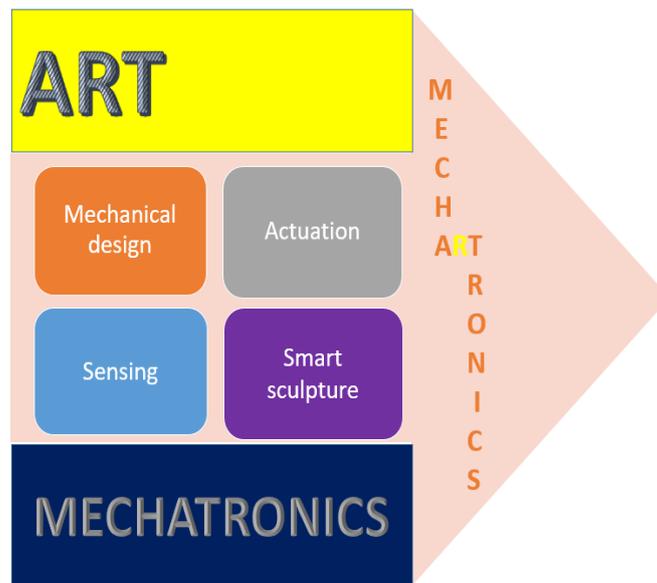


Figure 3. Smart structure design scheme

At the first stage, the students were assigned to do a research for choosing the kinetic structure. After the 2nd week, the teams presented their ideas in front of the professor and the teaching assistant and explained their vision and plans for the realization of the project. These ideas were discussed and upon approving, the students had to order the components. Their resources were limited: they were allowed to use components from the Mechatronics laboratory and spend additional 10 Euros per person. During the working process, the teaching assistant and the three teaching students supervised the teams.

The fact that the teams were consisted of students from different engineering portfolios has widened their vision and creative possibilities in terms of multidisciplinary approach to the given problem. Through developing simple, but still attractive and very useful projects, they have learned the work and implementation of the sensors, actuators and computer programming as consisting parts of mechatronic systems. They were also analysing the student's teamwork and the atmosphere among the team partners. In addition, the teams were assigned to write a paper by using Google Scholar for reviewing other papers similar to their work and writing about their kinetic sculpture work. In the meantime, the teaching and the student assistants were instructing the class in software programming in LabVIEW, which is a part of the subject content. In addition, the professor was teaching the students the fundamentals of the mechatronics systems.

In the 8th week of the semester, the students were tested over the theoretical concept, and in the 14th week, they had another test for LabVIEW exercises. In the 15th week, the students had an exhibition of their prototypes as a part of a student's project exhibition organized by the faculty of Mechanical engineering, where they showed their work. Through the evaluation of external reviewers and the exhibition of the smart structures in front of a respectful audience, along with the class colleagues and the professors, the students had an increased motivation and inspiration to present their work.

The course ended successfully and the students were very satisfied and proud with their work. The professor and the teaching assistant evaluated each student by the criteria introduced earlier. The students have learned the principles of work of the components that one mechatronic system is built of. The LabVIEW software provided introduction to the basics of the software analysis. The search engine Google scholar helped the students in learning new techniques of doing online research and writing a paper, which improved their research skills. On the other hand, by using the Arduino online platform to do the programming of the prototype, they learned the process of creating a system from

an idea to a real world prototype and progressed in developing their soft-skills through team - working on the prototype.

3. Arduino online educational platform

In order to understand the concept of a mechatronic system, the students needed to apply their knowledge in practical problems by using the Arduino online educational platform.

Arduino is a single board micro controller (Figure 4) that is used to control devices by receiving data from input devices and process it through its micro controller. Arduino could be used to create various types of physical computing products that can interact with the surrounding environment.

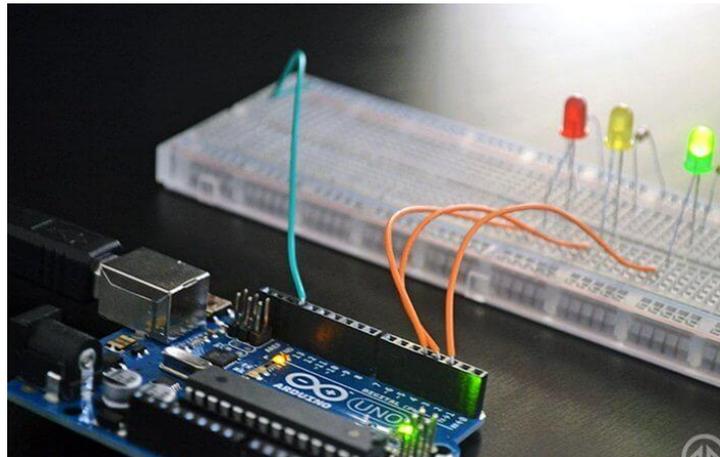


Figure 4. Arduino micro controller

Arduino's advantages are low price, small size, open source-based scalability and the ability to quickly make prototypes. This online platform quickly became popular among media artists as a tool for creating interactive works of art at a low cost, but as it was developed and became widespread among professional developers or geeks, its popularity also spread among the DIY (Do it yourself) and maker movement communities [10].

Arduino is an open-source microcontroller used in electronic prototyping. The Arduino environment is easy to use, designed to introduce programming to people unfamiliar with software development, which makes it convenient for students. There are a lot of projects that can be found online and new projects are being built almost on a daily basis. With an Arduino board, few other components and a little imagination, the possibilities are unlimited. Arduino can be used to develop interactive objects, taking in inputs to control outputs. Projects done with Arduino can be stand-alone or they can communicate with software running on a computer.

There are many advantages using the Arduino online platform, including: an active community of users, multiplatform environment development of Arduino in an educational environment, affordable hardware, open-source hardware and software and programming of Arduino via USB cable [11].

On the Arduino online platform, there is an education program designed to help the users to better understand the programming and the principles of creating a projects. The integrated platform enables developers to write code, access content, configure boards and share projects. It integrates the science, technology, engineering, arts and math.

4. Student projects

The project-based learning education is applied in the study program of Mechatronics for many years, each year changing the project's topics (wearable electronics, bio-inspired engineering, origami engineering, autonomous vehicles and many more). This year, the topic of the project was kinetic

sculpture, meaning the students have to combine their creative side with a simple engineering project in order to create successful smart structure able to produce different movements. Building a kinetic interactive sculpture can seem pretty challenging, especially from an artistic point of view, since the creators will find themselves battling primarily engineering challenges rather than creative ones.

However, with technology becoming increasingly user-friendly, as well as the wider public being more and more technologically aware, the transition toward smart living relies exclusively on the acceptance of the newest technological advancements. Art is not an exception from this rule, which paired with interior design, does come up with increasingly smart, ergonomic, unique and stylish designs that put user-friendliness and interactivity on the forefront of their purpose. Figure 5 shows the exhibition of the students projects and the three of the most successful projects (kinetic sculptures) programmed with the Arduino platform, which represent smart structures able to achieve different movements. In the next sections, the case studies of the projects are shown.

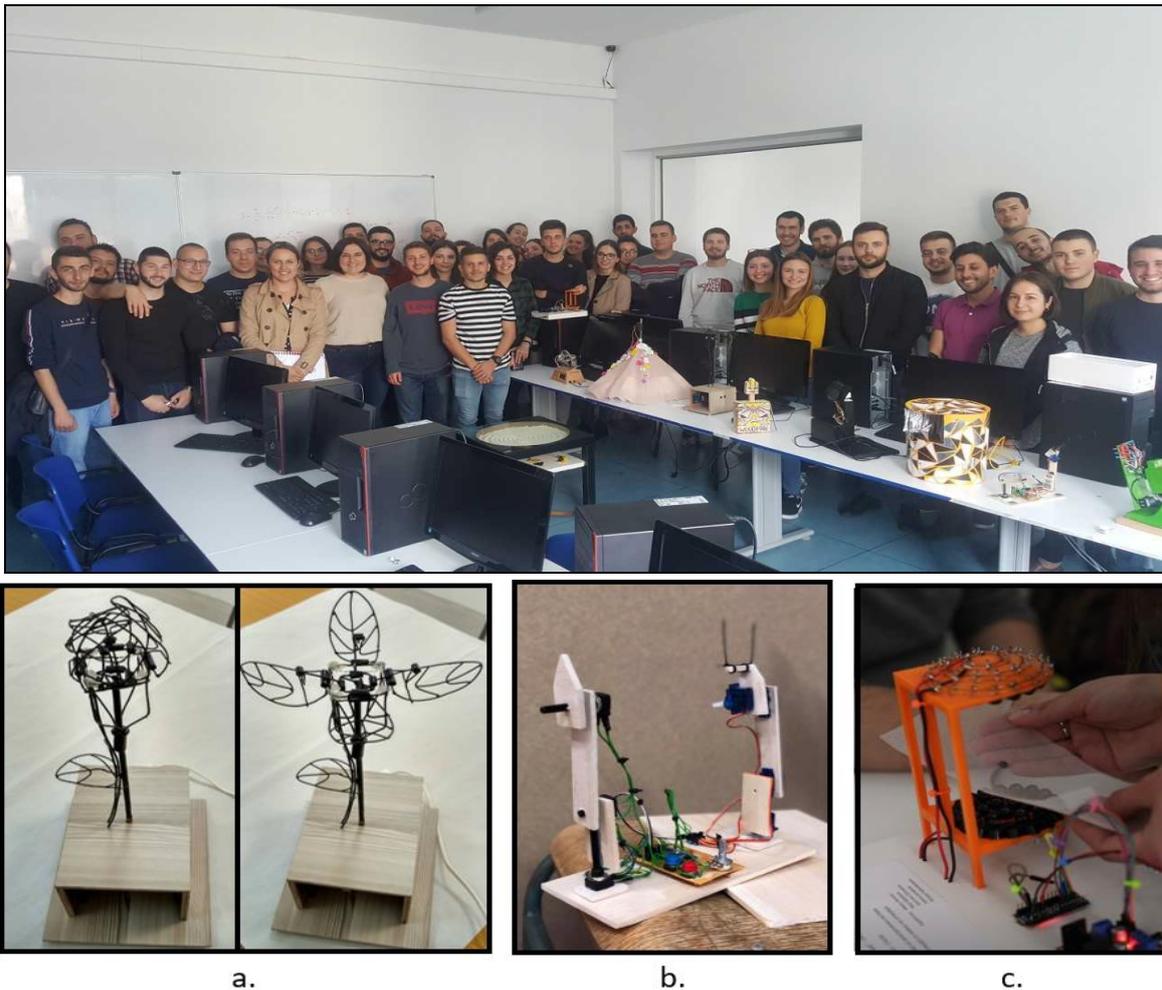


Figure 5. Exhibition of the students projects and the final most successful prototypes (a. blooming mechanical tulip; b. 21st century worker; c. acoustic levitator)

4.1. Blooming mechanical tulip

The ever blooming mechanical tulip is just a small example that serves a point of reaffirming the simplicity in combining and integrating multiple technologies, that only require limited, basic knowledge of applied mechatronics to create smart technological solutions. The main goal of this project was to create a motion activated, blooming mechanical tulip (Figure 5.a) that will represent a synthesis between mechatronics and art. The kinetic sculpture is activated by moving motion

recognized by an ultrasonic sensor and a micro-sized servomotor, connected to an Arduino control board.

When being activated, the structure blooms and shines in white color using light emitting diodes. In order to ensure for some sort of interactivity, the mechanical tulip will need an interactive element that would allow the person to make the tulip bloom. The used sensor is ultrasonic, meaning that when an object appears in front of it, it will activate and send the command to the Arduino to make the tulip bloom.

4.2. 21st century worker

Figure 5.b shows the 21st century worker, a manipulator arm that is capable of imitating the movements. This axis robot arm with 4 degrees of freedom can learn and follow functions and repeat them endlessly. One of the main goals is to provide the device imitating the movement by providing a simple, low cost and reliable mechanism capable for packing, pointing and moving. The robot motion (the movement of the robot grip from a given initial position to a given final position) is controlled on the basis of a programmed motion by using the Arduino platform. The employed platform was Arduino mini, with 4 micro servos, 4 potentiometers and a switch button.

4.3. Acoustic levitator

By combining the Arduino Nano with 3D printed structure and ultrasonic transducers, an acoustic levitator was constructed (Figure 5.c). It presents a single-axis non-resonant acoustic levitator, capable of suspending samples of interest in mid-air and manipulating with them. By shifting the phase of one of the opposing transducer arrays and keeping the other one at constant phase, the polystyrene moves upwards and downwards. To achieve the levitation, 72 transducers were used, 36 at each side. To generate the square wave signal, an Arduino Nano was used and L297N Dual H-Bridge motor driver to amplify the signals.

Based on the experiences, it can be concluded that the main features of PBL education are [2, 12]:

- *Soft skills development.* While working on projects, the students have the opportunity to develop different methods for problem solving, to make decisions and to take responsibility for their activities.
- *Learning by doing.* By working on a specific engineering problem, the students are working to solve their problem that helps in acquiring basic and specific knowledge and apply it to solve the problem.
- *Transparency.* During the semester, the students are developing the selected project. They specify the project options and priorities in the development process with the professor. In terms of motivation, it is very important for the group members to have a clear picture of each other's contribution in reaching the common goal.
- *Team work.* When working in teams, the students have ability to increase the teamwork spirit. Each member of the group has the equal rights within the team. Everyone has a responsibility towards the other members and is jointly responsible for the successful implementation of the project. The ability to work in a team is a need that is currently reflected at a professional level, where the proposal and development of mechatronic projects allows developing competences related to these.
- *Motivation.* Projects with practical outcome makes students feel success by making a real-world project and recognizing it as their own, that leads to increasing of their motivation.

5. Conclusion

The mechatronics have the ability to integrate modern technologies in establishing a development process from the initial idea to the construction and evaluation of prototypes, developed by a conceptual design. The design is based on the knowledge acquired throughout the training and supported by the correct use of modern tools for mathematical modelling, analysis, simulation and prototype manufacturing. The transition from design to construction and operation of the prototype

requires an essential orientation of the professors and the assistants to achieve good results in the process and design of the prototype assembly. The learning of mechatronics was enabled through the construction and programming of the prototype by using the Arduino open-source online platform. From wearable fashion to space research, the possibilities of using Arduino to learn and develop new ideas are endless.

Approach to the methodologies associated with problem-based learning was established through planning, execution and verification, which are indispensable in the formation of the research of future engineers. Applying the project based learning in the mechatronic course provides the students with competences that significantly rise their field of achievement and successfulness in the modern engineering world.

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Kahoot! foster students' engagement, enhance classroom dynamics, assess and improve overall students' learning

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Abstract. Higher education is going through a period of massive transition. Many educational and non-traditional institutions are beginning to sense market opportunities that didn't exist before to increase the accessibility and quality of higher education to everyone, no matter their location or state in life. These two forces are conspiring to create a massive transformation of higher education throughout the world. Game-based learning has become more common in the education, in particular game-based student response systems. Kahoot!, as an open source game-based tool, has been found to foster students' engagement, enhance classroom dynamics, assess and improve overall students' learning. This article presents the perception of students towards Kahoot! as an assessment tool, as well as the outcomes of the research that examined students' learning experience using a game-based student response system such as Kahoot!. These game-based response systems have been used in the second year of studies at the Military Academy "General Mihailo Apostolski" Skopje. The key findings revealed that Kahoot! enriched the quality of student learning in the classroom, with the highest influence on motivation.

1. Introduction

Since students do not all learn the same thing on the same day in the same way, educators are increasingly faced with the challenge of knowing students well enough to cater to their varying needs in the classroom [1]. Several researchers have studied the effects of educational games with regards to learning outcomes and effective levels. Study's respondents indicated that the game-based learning approach created more engaging, effective and active learning. They also indicated that students enjoyed a more relaxed learning environment [2].

Game-based learning approaches increase learners' interest in the subject matter because they enjoy (or experience pleasure) as they learn, and thus are more engaged and focused in the subject. Game based learning as any other teaching and learning that strives for better effects, must take place in well-managed classrooms which takes a lot of effort to create and doesn't just happen on its own. The person who is responsible for creating such a classroom is the teacher. The most important characteristic of a good class is not how hard the students work, but how well they interact with each other. It is how they talk and how they act; it is how they express their feelings and opinions that matters.

Hence, we must encourage groupwork, students' engagement, motivation and communication skills and use of technology to enhance learning.

Kahoot!, as an open source game-based tool have been found to foster students' engagement, enhance classroom dynamics, assess and improve overall students' learning. Kahoot! creates positive feelings among the students during the learning and entertains the learning process. This article presents the

perception and the learning experience of second year's students towards Kahoot!, during the realization of the course "General Tactic" in the 2016/2017 school year at the Military Academy "General Mihailo Apostolski" in Skopje.

Keeping the research in mind, we will address several questions: *How fun was it? Did you learn something? Do you recommend it? How do you feel?* To verify if Kahoot! contributed positively to learning outcomes, questions used in the quizzes were included in the final exams. The results obtained in the final exams were compared with those obtained the previous year of the course "General Tactic", which according to the curriculum is realised in third semester.

2. Students' engagement

The literature we reviewed did not agree upon a definition of what student engagement might be. Several types of engagement were noted – academic, cognitive, intellectual, institutional, emotional, behavioral, social, and psychological, to name a few [3]. The most widely accepted view of engagement in the higher education literature emphasizes student behavior and teaching practice. Student engagement focuses on the extent to which students are engaging in activities that higher education research has shown to be linked with high-quality learning outcomes. Engagement is the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes' [4].

In education, student engagement refers to the degree of attention, curiosity, interest, optimism and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education [5].

Students engagement is simply characterized as participation in educationally effective practices, both inside and outside the classroom, which leads to a range of measurable outcomes. Students engagement represents two critical features. The first is the amount of time and effort students put into their studies and other educationally purposeful activities.

The second component of student engagement is how the institution deploys its resources and organizes the curriculum, other learning opportunities, and supports services to induce students to participate in activities that lead to the experiences and desired outcome such as persistence, satisfaction, learning, and graduation [6].

Student engagement is widely recognized as an important influence on achievement and learning in higher education.

Quiz-based mobile learning application is extended with game mechanics to increase students' motivation and engagement, possibly some of the most important prerequisites for learning [7]. The learning application offers the possibility to support this process by providing volunteer benchmarks on knowledge units as milestones of the process, which – not depending on the grade of success – gives students feedback on their knowledge. Various studies have found that using technology, including computers, personal tablets, and smartphones, is effective in improving students' engagement and active participation in classrooms [8].

3. Classroom dynamics

Even though today's learners are with varying needs and capabilities, they are learning in the same classrooms. Because of that, nowadays many new teachers and even some experienced ones find it extremely difficult to maintain discipline of the students in their classrooms by following the traditional methods of teaching. Effective teaching and learning cannot take place in a poorly managed classroom. Well-managed classrooms provide an environment in which teaching and learning can take place successfully; but it takes a lot of effort to create a well-managed classroom and it doesn't just happen on its own. The person who is responsible for creating such a classroom is the teacher.

If we have to become better teachers, we need to understand classroom dynamics. Classroom dynamics means building of a classroom community and the creation of an active classroom culture. Classroom dynamics is helping students to develop skills in working together and creating an atmosphere in the classroom where students are encouraged to take risks [9]. Classroom dynamics is to set up a positive classroom atmosphere where students feel comfortable learning and

communicating with other students and with the teacher. Being dynamic is a way of being as a teacher, leader and student, not just a single lesson or a moment in the classroom. Classroom dynamics is about the ways the people within a class interact with each other. It's how they talk and how they act; it's how they show their feelings and opinions; it's how they behave as a group [10].

The most important characteristic of a good class is not how hard the students work, but how well they work in groups. It is about the way the people within a class interact with each other. This is classroom dynamics. Classroom dynamics is defined as everything beyond our expertise in our academic discipline. It includes student behaviors, emotions, and imagination; teachers' behaviors, emotions, and imagination; teachers' ways of presenting academic materials; students' interactions with teachers; and students' interactions with other students. Glenn Omatsu defines classroom dynamics as building of a classroom community and creation of a positive classroom culture [11].

For the great majority of teachers around the world the most important characteristic of a 'good' class is not how hard the students work, but how well they work together [10]. To a large extent, a classroom dynamic is a product of its own context as defined both internally with the uniqueness of its members, and externally in the cultural settings of the institution and the society in which it is located. Groups of people are very much brought together when they are aware of what they have in common. Shared experiences, values, and objectives lie at the heart of successful communities. As teachers, we can foster this awareness with activities that identify such commonalities, and then use them to enhance learning. Successful group activities involve members compromising in order to support each other. A class that has a flexible approach to how its members talk to each other is likely to have a more inclusive, and therefore participative climate. A dynamic classroom will have a balance of static and interactive elements allowing some time for individual work and cooperation and will use various tools and resources such as apps and games, everyday objects, magazines, books and toys to appeal to students' needs and preferences.

We believe that helping students to develop skills in working together and creating an atmosphere in the classroom where they feel safe enough to take risks in grappling with new and difficult ideas are essential factors for good learning outcomes. Also, a lesson which offers students various opportunities to explore and understand the topic and the application of different types of activities and teaching methods, will definitely appeal to students' individual learning styles. Group work also facilitates more informal atmosphere and encourages communication, which in turn helps students to relax. Working with friends also helps to reduce the tensions related to not understanding the task, not being able to complete it and having to struggle with it alone. To promote movement even further you may also introduce short and funny games and quizzes [12].

However, it's up to the teacher to manage and engage the learners by using various learning styles. Some students learn by moving around, others by working in groups. A dynamic classroom enables the students to move around freely while being engaged in a creative project. The easiest and most appropriate way of boosting classroom dynamics is to make sure that the students have no time to feel bored and instead they enjoy the classes [9]. One of the most employed gamification tools is Kahoot!, a free tool that has gained popularity among teachers for its simple use and its ability to establish active work dynamics in the classroom [13].

4. Assessment of the students

Assessment refers to a judgement about performance of learners based on specific weighted set goals. There are two types of assessment, i.e. summative and formative assessment. Assessment that takes place after the instruction and requires making a judgement about the learning that has occurred is called summative assessment. Whereas, assessment that provides feedback over the course of instruction is called formative assessment.

The formative assessment (assessment for learning) is increasingly being emphasised in the academic world. In order to improve students' learning on subject matters, the formative assessment should be seen as an important element to facilitate the learning process. Therefore, the formative feedback should be properly designed to improve their understanding on the subjects [14]. To avoid unhappy moments which often happen while grading the final exam and discover that what our

students have learned is not at all what we thought we were teaching, faculty and students need effective ways of monitoring learning throughout the semester.

Knowing what you know and don't know focuses learning. Students need appropriate feedback on performance to benefit from courses. Using technology can be a great way to engage students in today's classrooms and using appropriate Web sites to help in assessing learning is rapidly becoming a reality. Students bring their smartphones, tablets and laptops to class on a daily basis, so often they can be used for assessing their prior knowledge at the beginning of the class, or for the acquisition of lesson content at the end of the class. It is quite clear that the data obtained from assessment activities can be immensely useful for improving teaching and learning in a variety of ways. Assessment activities can help students learn how to study, encourage teachers to analyse objectively what transpires in the classroom, and guide students in a self-analysis of their own learning processes. Also gained results from assessment activities allow instructors to monitor students' progress throughout the term and help in answering the questions, "What are my students learning? How effectively am I teaching?" [15].

Teachers who develop useful assessments, provide corrective instruction and give students second chances to demonstrate success, can improve their instruction and help students learn. Ranking assessments are generally not good instruments for helping teachers improve their instruction or modify their approach to individual students. First, students take them at the end of the school year, when most instructional activities are near completion. Second, teachers don't receive the results until two or three months later, by which time their students have usually moved on to other teachers. And third, the results that teachers receive usually lack the level of detail needed to target specific improvements [16].

The assessments best suited to guide improvements in student learning are the quizzes, tests, writing assignments, and other assessments that teachers administer on a regular basis in their classrooms. Teachers trust the results from these assessments because of their direct relation to classroom instructional goals. Plus, results are immediate and easy to analyse at the individual student level. Teachers who develop useful assessments, provide corrective instruction, and give students second chances to demonstrate success can improve their instruction and help students learn [16]. If we fail to change our pedagogy, curriculum, and assessment strategies, we fail our students and jeopardize our own futures [14].

5. Kahoot! Introduction

Kahoot! (<https://getkahoot.com>) is a free game-based learning platform for any subject, in any language, on any device, for all ages. Kahoot! provides teachers the opportunity to: 1) create their own quizzes and surveys, or 2) use existing quizzes and surveys made accessible for public use. Kahoot! is a unique game concept, the result of the Lecture Quiz Research Project initiated in 2006 at the Norwegian University of Science and Technology (NTNU). One of the things that makes Kahoot! so unique is that it's a platform where you decide on the content, the imagery and how the game is played. The embedded graphical interfaces and audio elements present a gaming experience that can potentially promote positive fillings and learning among students, including adult ones. Kahoot! provides a tool for creating quizzes including adding pictures and YouTube videos to the questions. It also makes possible to publish and share your own quizzes, and edit quizzes made by others [17]. Kahoots are best played in a group setting, like a classroom or a conference room – or even with family in the living room. Collaborations remind us that we can all learn from each other, as can our students.

Since 2007 Jane Hart at the Centre for Learning & Performance Technologies has been compiling an annual Top Tools for Learning List from the results of an open survey. These Top Tools lists now constitute an important and interesting longitudinal study not just into the popularity of tools for learning but into learning behaviour. The Top Tools for Learning 2018 list was compiled from the results of the 12th Annual Digital Learning Tools survey and was published on 24 September 2018, and made available as an interactive table. In this list of educational apps Kahoot! is on 20th place which means that Kahoot! is well known and rated as a useful tool for learning [18]. The free online learning platform has gained wide acceptance globally with more than 30 million users worldwide,

and it is based on current user-centered and behavioral design methodologies. The real-time feedback provides opportunities for professors in various disciplines to tailor their instruction based on student understanding on quizzes while the surveys allow for anonymous classroom participation, which further engages all students [19]. KAHOOT! engages the visual with colourful, readable displays, auditory with lively music, and tactile through a response system in which players key in their answers. When students play KAHOOT! games, the energy in the classroom spikes. Even with a topic as boring as citations, students are enlivened by the friendly competition [20].

5.1. How does Kahoot! work?

When playing Kahoot!, the students are not required to register for a Kahoot! account, but all students or one student in each group need to have one from a variety of devices (computer, laptop, pad and or smartphone) with internet connection. All students or groups will be provided with a game PIN (a number) prior to joining a specific game at <https://kahoot.it/#/> as directed by their teacher (game host). Each student or group needs to put its own nick name. During the quiz, multiple-choice questions are projected on the screen so that learners have the opportunity to look at the question on the screen. After that, they have an opportunity for a short consultation with the members of the group and look for the correct answer, and at the end to answer the question. Each question offered four different answers with a single correct option, and for different answers are used different colors and shapes. The goal for the students is to choose the correct answer as fast as possible and to get as many points as possible.

After answering each question, students had the opportunity to see the correct answers, to have a short discussion on where they have made mistakes, to learn correct answer, to follow the score and the rang of each group. At the end of each quiz, they had to answer the research questions.

6. Research Objectives

Research objectives of the study focuses on examining the suitability of Kahoot!, a game-based learning platform, for use in higher education in Military Academy “General Mihailo Apostolski” Skopje. Specifically, the study looks at the effectiveness of Kahoot! in terms of its ability to:

- 1) monitor learning throughout the semester
- 2) foster and reinforce learning
- 3) create fun student learning process and
- 4) create positive atmosphere in student learning process

The present study is guided by the following research questions:

RQ1: How fun was it?

RQ2: Did you learn something?

RQ3: Do you recommend it?

RQ4: How do you feel?

During the research have been organized Kahoot! Quizzes in different subjects of the “General Tactic 1” course in third semester in academic 2016 and 2017. In the research in 2016 participated 36 students divided in 8 (eight) groups, and the quiz had 10 questions from the topic “Engineer as a branch of the Army”. In the research in 2017 participated 27 students and they had 5 quizzes. The quiz from the topic “Army as a branch of the Military” had 12 questions and students were divided in 6 (six) groups; the quiz from the topic “Navy as a branch of the Military” had 20 questions and students were divided in 5 (five) groups; the quiz from the topic “Engineer as a branch of the Army” had 10 questions and the participants took it twice, during the classes for exercise when students were divided in 6 (six) groups and during the preparation period for the final exam when students were divided in 2 (two) groups. Finally, the quiz from the topic “Infantry as a branch of the Army” had 27 questions and students were divided in 5 (five) groups.

6.1. Results

In the research in 2016 participated 36 students who were divided in 8 (eight) groups. Quiz had 10 questions from the topic “Engineer as a branch of the Army” and 91.67 % of the questions had correct answers, 8.33 of the questions had incorrect answers (Figure 1). After finishing the quiz students had opportunity to rate from 1 to 5 (1 is the lowest and 5 is the highest) by answering on research question *How fun was it?*, and all students rated 5.00 out of 5 (Figure 2). On next research question *Did you learn something?* 87.50% of the students answered YES, 12.50 % of the students answered NO. On research question *Do you recommend it?* 100 % of the students answered YES, 0% answered NO. On the last research question *How do you feel?*, 87.50 % of the students answered that they felt positive, 12.50 % of the students answered that they felt neutral and 00.00% of the students answered that they felt negative (Figure 1).

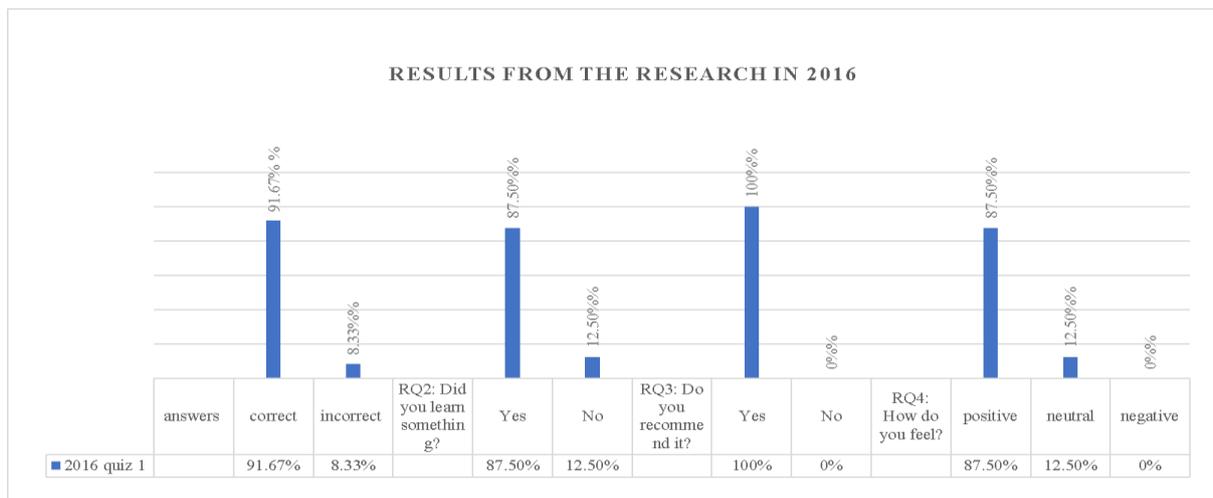


Figure 1. Results from the answers and RQ 2, 3 and 4 from the research 2016.

In the research in 2017 participated 27 students divided in groups. The quiz from the topic “Army as a branch of the Military” had 12 questions, the quiz from the topic “Navy as a branch of the Military” had 20 questions, the quiz from the topic “Engineer as a branch of the Army” had 10 questions and the students took it twice, during the classes for exercise and during the preparation period for final exam, and the quiz from the topic “Infantry as a branch of the Army” had 27 questions, results are shown in (Figure 2 and Figure 3).

In the first quiz from the topic “Army as a branch of the Military” students were divided in 6 (six) groups and 83.10 % of the questions had correct answers, 16.90 % of the questions had incorrect answers. Students rated the quiz by answering on research question *How fun was it?* and all students rated 5.00 out of 5; On next research question *Did you learn something?* 100 % of the students answered YES, 0 % of the students answered NO. On the third research question *Do you recommend it?*, 100% of the students answered YES, 0% answered NO. On the last research question *How do you feel?* 100% of the students answered that they felt positive, 0% of the students answered that they felt neutral and 0% of the students answered that they felt negative.

The second quiz from the topic “Navy as a branch of the Military”, 71.13 % of the questions had correct answers and 28.87% of the questions had incorrect answers. On research question *How fun was it?* the students rated it 4.75 out of 5; On next *Did you learn something?* 100 % of the students answered YES, 0% of the students answered NO. On third research question *Do you recommend it?* 100% of the students answered YES, 0% answered NO. On the last research question *How do you feel?* 80.00% of the students answered that they felt positive, 20.00% of the students answered that they felt neutral and 00.00% of the students answered that they felt negative.

The third quiz from the topic “Engineer as a branch of the Army” was conducted during the classes for exercise; 61.67 % of the questions had correct answers and 38.33% of the questions had incorrect

answers. Answering on research question *How fun was it?* students rated 5.00 out of 5; On next research question *Did you learn something?* 100 % of the students answered YES, 0.00% of the students answered NO. On third research question, *Do you recommend it?*100% of the students answered YES, 00.00% answered NO. On the last research question *How do you feel?* 100% of the students answered that they felt positive, 0% of the students answered that they felt neutral and 0% of the students answered that they felt negative.

The fourth quiz from the topic “Engineer as a branch of the Army” which was conducted during the classes for preparation for final exam, 100 % of the questions had correct answers, 0% of the questions had incorrect answers. After finishing the quiz, by answering the research question *How fun was it?* all students rated it 5.00 out of 5. On next research question, *Did you learn something?* 100% of the students answered YES, 0% of the students answered NO. On third research question, *Do you recommend it?*100% of the students answered YES, 0.00% of the students answered NO. On the last research question *How do you feel?*100.00% of the students answered that they felt positive, 00.00% of the students answered that they felt neutral and 00.00% of the students answered that they felt negative.

On the fifth quiz from the topic “Infantry as a branch of the Army” which was conducted during the classes of exercise, 61.98 % of the questions had correct answers, while 38.02% had incorrect answers. Answering on the research question *How fun was it?*, the students rated it 5.00 out of 5. On the next research question *Did you learn something?*, 100 % of the students answered YES, 0.00% of the students answered NO. On third research question, *Do you recommend it?*100% of the students answered YES, 00.00% answered NO. On the last research question *How do you feel?*, 33.33% of the students answered that they felt positive, 33.33% of the students answered that they felt neutral and 33.33% of the students answered that they felt negative.

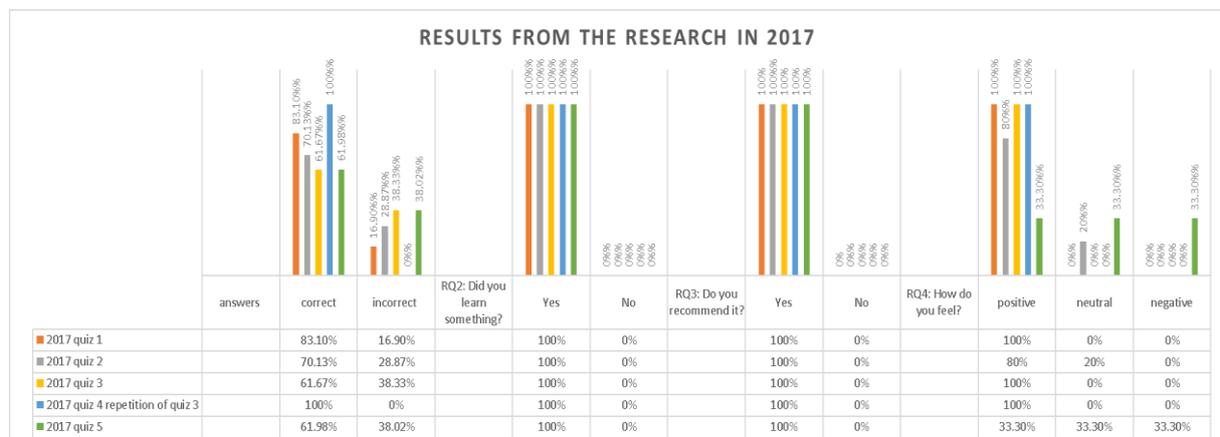


Figure 2. Results from the answers and RQ 2, 3 and 4 from the research in 2017.

The results from the research show that when students have quiz during the exercise classes, they have less correct answers than when they have quiz during the classes for preparation of the final exam when they had quiz the second time, which means that they have improved their learning. Another confirmation of students learning improvement by using Kahoot! quizzes can be seen from the results of the second research question, where in 5 quizzes 100.00 % groups of students answered YES, while only in one quiz 87.50% of the groups answered YES while 12.50 answered NO. That the learning of students has been gradually improved year by year after using of Kahoot! game-based tool as a learning platform, can be seen by comparison of the average results from the final exams of the students in 2015, 2016 and 2017 (Figure 3). Average results of the students in the final exam in 2015 when we did not use Kahoot! was 70.21 (7out of 10). Average results of the students in the final exam in 2016, when we used Kahoot! only for one subject and conducted one quiz was 70.34 (7out of 10). Average results of the students in the final exam in 2017 when we used Kahoot! five

times on four different subjects was 80.39 (8 out of 10). Also average results of the final students' exam show the usefulness and correlation of Kahoot! and students learning. The biggest improvement in learning we had in 2017, when students had the biggest number of quizzes on different topics.

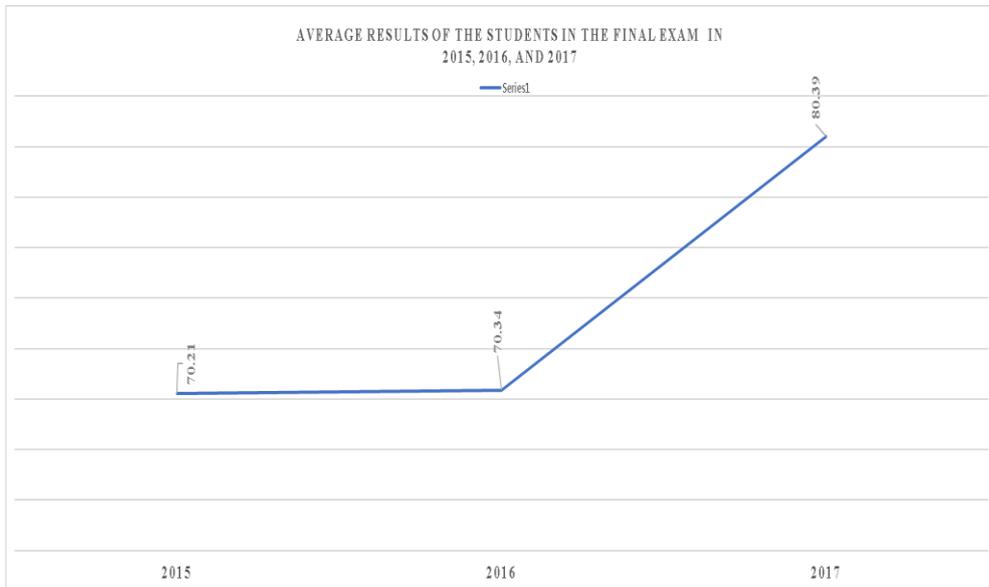


Figure 3. Average results from final exams of the students in 2015, 2016 and 2017.

Results from the research questions show that in 5 quizzes, groups of students rated quizzes 5.00 out of 5, only in 1 quiz students rated it 4.75 out of 5. This would mean that a great number of students enjoyed playing the Kahoot! game-based quizzes (Figure 4). Also from the results of this research, we can conclude that although during the Kahoot! game-based quizzes only one of the groups had the highest score and others had lower scores, from all 6 (six) quizzes only in one quiz 33.33% of the groups of students answered they are neutral and in one quiz 33.33% of the groups of students answered they had negative feelings of the quizzes (Figure 4). The variance that appears in the results could be explained with the personal taste and preferences that can differ from student to student.

Student responses on research questions in the quizzes in the third semester (second year) and our experiences using Kahoot! indicate that students welcome the use of this game. Also recent research reinforces the idea that, beyond fun and extra practice, games can be a meaningful educational innovation [16].

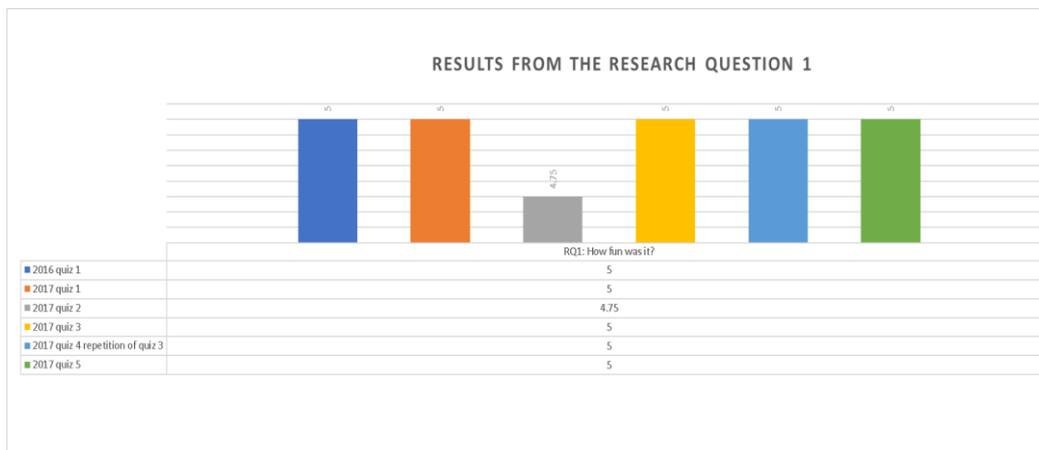


Figure 4. Results from the research question 1 from the research in 2016 and 2017

7. Conclusion

At various points during studying, and at the end, students need chances to reflect on what they have learned, what they still need to know, and how to assess themselves. Although the findings of this study cannot be generalized to the entire population of students in Military Academy „General Mihailo Apostolski“ Skopje, partly due to the diverse nature of different courses, the key findings offer significant insights into the effectiveness of using Kahoot!. Students perceived Kahoot as making their learning enjoyable, interactive and helping them to understand their subjects better. In other words, Kahoot motivates them to take up challenges, be able to control it, absorb the activity, stimulating their essential interest and they value the session as a useful activity for learning.

This study also supports the fact that the students perceived assessment through Kahoot! as a fun learning activity. It is, however, recommended that future studies employ samples from other academic courses and also from other universities. As a more thorough understanding of the benefits of using Kahoot!, the key findings revealed that Kahoot! enriched the quality of student learning in the classroom with highest influence on emotions.

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Online and distance learning program evaluation: a call for action

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Abstract. Evaluation of online educational programs are essential in today's expanding Automated Distributed Learning (AdL) environment. Without valid evaluation methods, making informed adjustments in course design, development, and execution is difficult. While program learning outcomes can be the same for distance learning (dL), online, and traditional academic programs, the assessment and evaluation of those outcomes requires consideration of the characteristics of the online delivery modality. The US Army's Command and General Staff College (CGSC) Department of Distance Learning's (DDE) recent Program Evaluation Plan Report (PEP) analyzed dL delivery concerns that are unique from traditional resident courses. The PEP's findings emphasized distinctive dL and online learning concerns associated with time management, peer-to-peer engagement, and technology challenges. This paper compares the PEP's evaluation processes and instruments with select civilian and air force online graduate programs. It offers a qualitative analysis of common concerns associated with professional military and civilian online program evaluation efforts. Some of the parallel concerns include separate evaluation processes for dL and online programs from traditional residence counterparts and various indirect assessments that address the dL learning environment and experience more holistically. In sum, common issues associated with online program evaluation in military and civilian distance learning are identified to generate debate and future study.

In his 2006 article in *eLearn Magazine*, John Senner observed, "effectively evaluating online learning programs starts with two simple ideas: Apply tried-and-true approaches, and take advantage of the opportunity to use new ones. In practice, while there are many effective approaches to evaluating online learning programs, many organizations do not know these approaches or how to apply them." [1] While there is truth in Senner's statement, the last part of Senner's comment, if accurate, is especially troubling. Although Senner wrote this observation over 13 years ago, is it still possible that civilian and military educational institutions do not use proven evaluation methods or know how to apply those approaches to online or distance learning programs. Do we as an ADL community really know any more about online evaluation processes and their application than we did in 2006? This paper briefly addresses these questions by examining one civilian and two military educational institutions and how they evaluate online graduate level programs. More specifically, this paper examines the status of online evaluation approaches by identifying and analyzing current practices at Angelo State University (ASU) in San Angelo, Texas, the Command and General Staff College (CGSC) at Fort Leavenworth, Kansas and the Air University's (AU) eSchool at Maxwell Air Force Base, Alabama. In sum, what can we learn from ASU, CGSC, and the AU eSchool that will help us understand the difficulties of dL evaluation and how we might address those concerns as a community of practice?

To answer these questions, the paper compares and assesses each school's current academic program evaluation processes and determines what if any best practices exist. While the research is limited to three schools, the primary goal is to generate debate and discourse regarding the need to address the evaluation of online and dL programs. The study uses the Analyze, Design, Develop, Implement, Evaluate (ADDIE) curriculum model and the Kirkpatrick Framework (Level 1 - Satisfaction, Level 2 - Learning, Level 3 - Impact, Level 4 - Results) [2] as the primary constructs to assess evaluation processes at each institution. The conclusions suggest that while some schools have

not progressed beyond basic assessment techniques as Senner emphasized, others, especially CGSC, have made significant progress towards establishing an online evaluation benchmark for others to use. Although CGSC's efforts are too recent to make sound judgments or predictions, but they do provide a solid trajectory for additional discussion and research.

The paper focuses on the last phase of the ADDIE process and its relationship and significance to the analysis step. The depth and accuracy of the evaluation phase is crucial to a productive analysis segment of the ADDIE cycle. This process is like NATO's Systems Approach to Training (SAT) model that "integrates instructional strategies and learning theories to help ensure quality instruction and aids in the transfer of learning—the transfer of knowledge, skills and attitudes from the learning environment to the real world." Like CGSC and AU, the NATO approach "provides educators with a standardised, repeatable process to develop a course of instruction." The NATO SAT uses the ADDIE model "to ensure a quality programme of instruction." [3] While most educators would agree that evaluation is an important part of the education process, my experience and Senner's analysis suggests that most institutions commit little time, effort, or resources to established or new evaluation approaches.

Program evaluation and validation are essential if educational and training facilities want to ensure its students achieved program learning outcomes and that decision makers have the best program evaluation data available to implement necessary changes. As A Frye and P Hemmer have stated, "Educational programs are fundamentally about change; program evaluation should be designed to determine whether change has occurred." [4] Change is not limited to curriculum alterations, but also how the students changed because of the program they completed. Regardless of the delivery method, educators and administrators should create and sustain an effective evaluation program to ensure program relevancy, determine outcome achievement, adjust student learning outcomes, and provide solid evidence to educational administrators and decision makers regarding program continuities and needed improvements.

Without valid evaluation methods, it is difficult improve course design, development, and implementation. Most importantly, it is impossible to validate program outcomes without employing best practices appropriate to the online/dL environment. This paper identifies common concerns associated with current dL/online evaluation practices. An analysis of Angelo State University's (ASU) Kay Bailey Hutchison Centre for Security Studies (CSS) online graduate programs served as the civilian sample for this paper. ASU's graduate online program evaluation processes are described and then compared with current practices at the US Army's Command and General Staff College (CGSC) Department of Distance Education's (DDE) Advanced Operation Course Distance Learning (AOC dL) program and the Air University's e-School of Graduate PME programs to establish a benchmark for "best practices" consideration. The results of this limited study suggest that while there are many similarities in evaluation approaches to civilian and military graduate level education; there are notable differences. The initial findings also suggest the need for distance programs to have discreet and autonomous evaluation processes to provide relevant and focused feedback for dL/online courses. The CGSC DDE's 2018 initiative to conduct a holistic evaluation of its AOC dL program has established an impressive example for the other military and civilian institutions to consider as a solid evaluation model. [5] While evaluation methods should reflect the specific needs of a civilian or military academic institution's outcomes and delivery methods, the CGSC DDE 2018 study is a great starting point for consideration.

One of the first challenges regarding evaluation of civilian and military graduate level dL/online programs concerns the variety and combination of program design methods. Is the online program primarily synchronous, exclusively asynchronous, or is it a blended or hybrid version of the two approaches? Another concern is the learners' physical location – are they remotely located or collocated. These variables are important when developing an evaluation approach because not all assessment instruments can be used the same way in each situation. For example, all the CSS's online graduate programs are designed for asynchronous delivery to a remote and widely distributed student population. Many of our graduate students are serving military officers and they are deployed across the globe. The CSS's original charter was to design and deliver specific graduate programs to military students regardless of location that allowed them to engage with the course content at the learner's

convenience. As Audrey Heron observed in her study of ASU education department online programs, “it appears that participants in this study perceived a high level of autonomy in their online courses. This is not surprising,” Heron concluded, “as one of the attractive characteristics of online education versus the traditional, face-to-face instruction is its flexibility; students are able to engage in their course from virtually anywhere in the world and can make choices about when to complete assignments and study content in asynchronous courses,” such as those involved in the current study. [6] The CSS charter, Heron’s conclusions, and the university’s marketing strategy justified the CSS’s completely asynchronous online graduate program. This approach is ideal for many of our graduate students, but it also begs the question of academic rigor, program equivalency between asynchronous online and traditional classes, and outcome achievement.

Each CSS course of every program consists of three basic components – the content, the learner, and the instructor. Students interact with lesson content, their instructor, and their peers through structured discussion boards on ASU’s Blackboard Learning Management System (LMS). The CSS approach most closely resembles pure distance learning with a significant emphasis on self-learning. This approach assumes students are intrinsically motivated and they possess the self-discipline to complete the assigned readings or projects within the mandated timelines. Most of CSS’s online courses are delivered in eight-week sessions to accommodate our military and other distance students who are employed full or part time. CSS faculty generally assess their learners through three standard methods - their discussion board presence, a midterm, and a final. The CSS discussion forums are consistent with the NATO definition. The discussion board is an “asynchronous tool in which students can post and reply to comments published by an instructor or other classmates. Students reply on their own schedule and do not need to be present while posts are being submitted. It permits interaction and collaboration through threaded discussion postings.” [3] These are graded but the weight of the course grade for graduate programs is on the midterm and final assessment instruments. These are generally a written instrument such as an essay.

To provide quantitative data for program assessment and evaluation, each of the online master’s programs has a designated capstone or summative assessment/evaluation instrument. All graduate programs require a cumulative 3.0 grade point average (GPA) to graduate. Two of the four CSS programs also require completion of an end-of-program research paper in the designated capstone class. The average grade of students in the capstone course serves as the direct assessment of the program and its associated outcomes. The other two graduate programs use oral comprehensive exams or a thesis defence as the summative program evaluation measure. Because of the asynchronous nature of the online programs, there is no structured opportunity for the student to conduct verbal or oral interactions with peers or faculty. Except for telephonic communications between students and faculty, learners do not have the opportunity to develop their verbal communication skills even though those abilities are part of each program’s stated outcomes. Students are limited to written discussion board posts and peer responses as the primary method of communication. This format is appropriate for asynchronous courses but does not necessarily prepare the student for oral exams. It also creates other concerns that necessitate additional evaluation research.

Anecdotally, I have observed a disturbing phenomenon with several of my online students that suggests some learning limitations associated with exclusive reliance on discussion board’s as the primary means of student collaboration and social interaction. Several students have developed specific writing skills as they progress through their program that meet discussion board posting requirements. These stipulations vary by instructor, but a 500-word initial post to the week’s discussion question with two replies to other student’s posts is common. The scope and quality of the replies depends on the learner, but even with 250 words in each peer response, a student who writes the minimal amount averages around a 1,000 words per week. If one converts the word count into the rough equivalent amount of time speaking what they wrote (based on an average of spoken 150 words per minute), that is less than seven minutes of class time a week in a face-to-face course. [7] Of course, many students exceed the minimal requirements and achieve higher learning levels in their submissions, but we rarely have students fail a course if they submit minimum discussion board posting requirements. Some students master the art of the discussion board post, but they also have

difficulty writing a sustained argument beyond 500 words. For example, students often construct an 8-10 page analytical or argumentative essay for their midterm or final graded project. Several in my classes who performed well on the short discussion board requirement could not write a coherent and cohesive essay. There are certainly other reasons and factors for this occurrence, but without documentation or evidence of student performance directly correlated to program outcomes, it is challenging to draw useful conclusions regarding the student's ability to write effectively.

Two programs offer a thesis and a non-thesis option. Students that opt for the thesis track must defend their research as they would at a traditional university. Most often, they complete the defense remotely via a telephonic conference call. The thesis student coordinates with his or her committee and calls in at a designated time.

The thesis committee determines if the student has met program expectations at the end of the defence. For non-thesis track students, they too complete an oral exam but it is based on their courseware for one program and on a capstone paper for the other. Both evaluations are pass-fail. While the students receive verbal feedback from the committee, there is neither a rubric nor other formal documentation that captures how well or how poorly the student met program outcomes. Without such evidence, it is impossible to assess how well the program is achieving its outcomes. A pass suggests the student met standards, but there is no evaluation data to use to improve or change the current curriculum or teaching methods. The same occurs when a non-thesis student fails the oral comprehensive exam. Recently, we had a student fail the oral examination twice, which necessitated the student's dismissal from the program. The committee's vote was unanimous during both attempts. Unfortunately, there was no documentation identifying the areas of concern or possible strengths and weaknesses related to the student's failure or program outcomes. This does not negate the committee's judgment, but without such information or documentation, it is difficult to make substantive improvements and productive changes to any dL/online or face-to-face program.

Each of the four CSS graduate programs has a summative evaluation that provides direct assessment data, but the results do not offer any actionable evidence to change or improve their associated program curriculum or to evaluate program outcome success or relevance. Ideally, these programs would combine direct assessment results with various indirect assessment measures as other institutions use.

These indirect instruments include such measures as end-of-course faculty and student surveys; faculty focus groups; follow up surveys of graduates one to five years after completing a program; and stakeholder surveys. ASU has indirect assessments of specific courses within a program; but no end-of-program survey that captures graduates' feedback regarding outcomes or online delivery exists. ASU administers IDEA end-of-course surveys that address many of the course and program outcomes, but the results are limited to assessing faculty performance and concerns within specific courses. [8] One positive aspect of the IDEA surveys concerns the comparative data with other IDEA participating institutions. The CSS can compare all its graduate programs with other IDEA participants. The survey questions, however, are loosely related to most of our programs' outcomes, but we do not know what institutions participate in IDEA or what delivery modality those institutions use. The data provides insight into how the CSS compares with a national database but there is no granularity in the comparisons. While useful to a degree, the sum of the course feedback data captured via IDEA does not necessarily equate to a quality method of program evaluation.

As chair for the department of security studies and criminal justice, one of my primary duties is to capture and input program assessment data into the university's Strategic Planning Online (SPOL) system and to construct an annual program assessment report (PAR) for each of the department's three undergraduate and four graduate programs. The aim of this systematic process is to assess how well each program achieved its program-level student learning outcomes (SLO). [9] This analysis helps determine program effectiveness and make necessary adjustments to the curriculum and other aspects as needed based on the evidence provided by direct and indirect assessment data. Each program has a designated faculty coordinator that identifies, as described earlier, a single summative assessment instrument designed to assess the program's SLOs. The department chair uses the results from these instruments to evaluate to what degree the program achieved the stated SLOs and the program's overall effectiveness. To make these evaluations, each program coordinator established a numeric

baseline or benchmark to determine program success. A significant portion of the assessment process involves articulating intended results, capturing actual results, and identifying the use of results for each program. Ostensibly, these are the basic needs of any program evaluation, but the reliance on a single quantitative or qualitative assessment instrument fails to provide enough information to make useful evaluation conclusions or to implement needed program changes.

The other indirect assessment method employed is the state of Texas mandated Graduate Program Assessment (GPA). These assessments are required every seven years for graduate programs. They are primarily a self-assessment of specific criteria stipulated by the Texas Higher Education Coordination Board (THECB). [10]The THECB first notifies the institution of the requirement to complete the GPA. The affected departments and programs have ten months to complete the process. The program coordinators and faculty acquire and provide the required data in a standardized report. The assessment contains information related to faculty qualifications, faculty publications, grants, teaching loads, faculty student ratios, student demographics, retentions rates, graduation rates, placement information, and degrees conferred. Most importantly for the study, it asks for alignment of the program outcomes with institutional goals and purposes. Additionally, it requires a comparison of the curriculum and program duration with peer institutions. While it is useful to align our program outcomes with those of the institution, the evidence used to demonstrate outcome achievement was limited to the direct assessment data associated with each programs summative evaluation discussed earlier.

Once the report was completed, the CSS identified an external reviewer from a similar institution that offered comparable programs to conduct a review of the GPA's findings. The reviewer compiled his or her report and returned it to the department. The faculty reviewed the report and provided responses to the reviewer's comments that usually highlighted program strengths, weaknesses, and areas for improvement. The reviewer's comments supplied recommendations and observations, but there is no compulsion to act on those suggestions. Once the program faculty responded to the reviewer's observations, the department combined and formatted the base report, the reviewer's report, and any rebuttal and forwarded the assessment to the THECB for review. In theory, once the THECB reviews the assessments, it provides feedback to the institution. The CSS submitted it assessment in June 2018 and we are still awaiting feedback.

Given the CSS's approach and apparent limitations in its program evaluation processes, it raised significant questions regarding the utility of current approaches. Is there a better way to conduct online program evaluation? How do other online master's programs or equivalents conduct program evaluation? What are the best practices for distance learning program evaluation? These questions led to a comparison of the CSS's programs with those of the US Army's Command and General Staff College's department of distance education (DDE) and the Air University's e-School of Graduate PME programs. Both institutions are recognized proponents of and experts in distance education. Through face-to-face discussions with Air University e-School leadership, various Air University faculty, and designated assessment staff and similar discussions with Army University's distance learning faculty and staff, CGSC residence faculty, and the CGSC DDE AOC dL program coordinator, several evaluation methods and ideas used by these institutions presented themselves for future use and considerations as standards for online program evaluation.

In addition to the discussions with DDE and AU, the most informative source was a recent DDE study on its Advanced Operations Course (AOC). The "Program Evaluation Plan Report of the Advanced Operations Course by distributed Learning (PEP)" completed in August 2018 contains a wealth of information on CGSC DDE evaluation methods and approaches. The PEP's purpose "was to determine if the course graduates achieved the course learning outcomes and what improvements could be made to reduce learning obstacles, improve instruction, and enhance curriculum development." [5] The PEP's objectives constitute a more holistic evaluation of the AOC dL course compared to the current CSS approach to its online programs. "The PEP [also] provides an opportunity to make positive, evidence-based decisions and adjustments to AOC dL that impacts the professional education of 800 officers annually. As noted, this is first stand-alone evaluation conducted by and for the program, so the results can establish a benchmark of performance for future

years.” Moreover, “[t]he PEP further helps DDE establish protocols for regular data collection and analysis so that evidence-based research and recommendations occur habitually.” [5]

To answer the evaluation questions, the PEP used a mixed method approach that relied heavily on the Kirkpatrick Framework and the evaluation phase of the ADDIE model. Historically, CGSC has used a systematic approach to fulfil its program evaluation and assessment needs. CGSC’s Accountable Instruction System (AIS) consists of two continuous processes. The first element is the Post Instructional Conference (PIC) that reviews blocks of courses shortly after they are completed and as soon as direct and indirect data are available. The PIC is essentially a “hot wash” of the most recently completed courses. It provides a baseline for overall program evaluation and feeds the annual Curriculum Design Review (CDR). The CDR is the final review of the academic year’s curriculum and this is where the college leadership makes informed decisions based on the previous PICs recommendations regarding program changes for the following year. The data used for the PICs and CDRs comes from the school’s residence programs. This includes data from the residence course at Fort Leavenworth and the four face-to-face satellite campus locations. The AIS is a methodical approach to program evaluation that facilitates program review and identifies suggested improvements based on actionable data collected and analyzed throughout the academic year. Perhaps most importantly, all the college’s stakeholders are actively engaged in the process.

One of the primary limitations of the AIS is the exclusion of data from distance learning modality.

There are reasons for this exclusion. All DDE courses, until recently, were based on residence curriculum that was one to three years old. Distance education policy was to replicate the residence curriculum and the CGSC experience as much as possible for its students. No separate evaluation process, however, was necessary since all delivery methods had the same terminal learning outcomes and similar assessment instruments. Because the curriculum was the “same,” the delivery method did not matter when evaluating the curriculum and program outcomes. Moreover, the use of older curriculum for distance learning programs could not contribute to current program evaluation needs. While there is logic to these assumptions, the greatest concern from a distance learning perspective concerned the actual delivery method and the learning environment. The differences between the residence and distance learning environments are noteworthy and the student demographics associated with each delivery method differed significantly. These differences justified a separate evaluation of DDE’s online courses and programs. These observations contributed to the decision to conduct a separate evaluation the dL Advanced Operations Course. [5] The PEP is a manifestation of that decision.

The PEP offers a variety of approaches that provide a much better evaluation of dL and online programs than what the CSS currently employs to evaluate its online graduate programs. Table 1 identifies the specific objectives and key stakeholders linked to those objectives. These objectives stipulate the what and who of the of the evaluation process.

Table 1: PEP Objectives and Key Stakeholders [5]

Objectives	Key Stakeholders
1. Identify obstacles affecting student learning.	Students; AOC dL Faculty
2. Improve faculty development so instructors can assess and adjust student engagement, course management, and instructional approaches.	AOC dL Faculty; Army University and College Faculty Development
3. Improve the DDE curriculum development process to ensure learning activities achieve learning outcomes in the dL modality.	Department Leaders; Curriculum Developers and Integrators
4. Provide data to decision-makers in DDE, CGSS, and CGSC.	College and Department Leaders
5. Create a database of student perceptions of the course, which can be used to support an AOC dL PEP and faculty scholarly research.	College and DDE Faculty

The PEP evaluation objectives go well beyond direct assessment data and learning outcomes achievement to judge program effectiveness and address specific needs unique to the distance learning modality. These objectives are certainly appropriate for military ADL programs, but they can be useful for civilian application as well.

While the PEP objectives are important and certainly relevant to dL evaluation, the methods used to address these objectives are also critical to the creation of a more holistic and useful program evaluation process. The PEP used six data collection instruments in a mixed methods approach to address the report's five objectives.

These included:

- (1) student demographical data,
- (2) student performance data from the Blackboard LMS,
- (3) an AOC dL End-of-Course Survey,
- (4) a CGSC Instructor Feedback Survey,
- (5) Faculty Focus Group Interviews, and
- (6) a Post Graduate Survey for AY12 and 16 graduates.[5]

These six instruments are excellent tools for evaluating online or dL programs. Cumulatively, they address the first three levels of Kirkpatrick's evaluation framework. Both the CSS and DDE use direct assessment data to evaluate student learning. CSS uses specific quantitative results from specified assessment instruments to address Kirkpatrick's level two analysis. DDE uses the overall GPAs of its students to judge program outcome achievement. Unfortunately, some of these instruments may not be available or appropriate for civilian institutions. The demographic data that is readily available for military institutions, for example, may not be obtainable by civilian universities because of Title IX restrictions on students' personal data. While the CSS has access to generic end-of-course surveys through IDEA, those surveys are not as specific to the eLearning environment, or as holistic as the ones employed in the CGSC DDE AOC dL EOC survey.

Additionally, the CGSC has a dedicated cadre of experts in its Quality Assurance Office (QAO) that can design and analyze a variety of program-related surveys. Presently, ASU has one professor that manages the university's assessment program as an additional duty. The CSS does not have an instructor feedback survey system nor does it convene faculty focus groups to evaluate online programs. The CSS conducts periodic program faculty meetings to address curriculum, program outcomes, and address student concerns, but to date this process has had limited success in making changes based on limited evaluation data. Unlike the various PME dL programs, ASU does not have a formal online or dL training program nor does it offer a basic faculty development program focused on developing teaching skills and methods for either traditional or online delivery methods. Lastly, ASU does not have a system to survey recent or long-term graduates. The military service's ability to track its residence and dL graduates is a definite advantage when it comes to assessing level 3 of Kirkpatrick's evaluation framework.

As a civilian university, ASU adheres to the student assessment and distance learning guidelines established by its regional accrediting body. The regional accrediting body for ASU is the Southern Association of Colleges and Secondary Schools Commission on Colleges (SACSCOC). SACSCOC guidelines do not require its institutions "to report separate student achievement data by location of instruction or by mode of instruction. However, it should be clear from narratives how these sites and modes are incorporated into broader institutional statistics and into outcomes assessment measures." [11] SACSOCC also suggests that schools "with a broad array of distance learning programs may find it helpful to consider location or mode of delivery as a key variable in developing ways to use assessment results for program improvement . . . It should be noted that an institution does have an obligation to establish comparability of instruction across locations and modes." [11] While not mandatory to complete separate evaluations for online or dL programs, this study suggests that it is a worthwhile endeavor for civilian and military dL programs to do so.

When I met with the dean of Air University's eSchool of Graduate PME, he adamantly supported the separation of the dL programs from the residence ones. While the program standards and outcomes are the same, the delivery methods justified the change. As one dL faculty member stipulated in the CGSC DDE PEP Faculty Forum, those who have not taught online courses do not understand the dL environment. One reason was "resident [CGSC] curriculum developers do not have a clear understanding of DL instruction delivery." [5] A recommended solution from the faculty forum was for DDE to have its own curriculum developers. While this has not occurred at CGSC, Air University adopted this change in 2016, and the eSchool is quite pleased with this and other changes associated with its autonomous operations.

In sum, the CGSC DDE PEP appears to be an excellent means to evaluate dL and online programs. The breadth and depth of the direct and indirect evaluation instruments and the systematic approach to program evaluation has established a solid benchmark for future studies and provides actionable data for the analysis phase of the ADDIE process. Seeking, capturing, and integrating feedback from the first three levels of the Kirkpatrick Framework for evaluation adds significant value to the analysis phase of dL/online curriculum design, development, and implementation. The Air University's eSchool of Graduate PME's decision to operate autonomously from resident PME also establishes an important precedent for the e-learning community. While the eSchool is still developing its evaluation processes, it has hired experts in assessment techniques, program accountability, and it has committed appropriate resources to evaluate its growing dL programs. There are, however, notable differences in how and why military PME institutions have developed and implemented more effective program evaluation methods and concepts than civilian universities such as ASU. On the other hand, there is no reason why ASU cannot adopt some of the indirect evaluation methods to create a more robust and effective evaluation of its online CSS programs.

To rely almost exclusively on limited direct assessment data to make informed decisions on program changes is antiquated at best and potentially dangerous to our students and the quality of our online programs at worst. The CGSC and Air University efforts to initiate actionable evaluation programs is commendable, but it will take time to see the results of these developing programs. Until then, let the civilian and military ADL community recognize these efforts and let us continue to discuss and debate on how best to evaluate online, dL, and ADL programs to ensure our curriculums are the best they can be, and we have the best evidence we can acquire to ensure our students achieve the necessary learning outcomes.

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Some aspects of using the ship's stability stand bed

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Abstract. In the paper a description of the ship stability laboratory stand bed designed and built in the Polish Naval Academy of Gdynia- has been presented. The aim of this paper is to present the possibilities of a laboratory station in the training of crews from damage control. Some scores of preliminary research of ship's model stability have been presented as well. The range of research and training of ship's crew can include static and dynamic stability. In addition, on the presented stands it is possible to simulate damages to the ship's hull and their impact on the safety of the ship. The presented laboratory offers a possibility not only to analyse the influence of free water surface effect in the compartments or tanks but also to analyse the influence of taking on, moving and removing cargo loads on the initial stability of the ship. Experience acquired in the research station can lead to a better phenomenon recognition occurring in the everyday ship operations and cause an increase of sea safety.

1. Introduction

Transport of large amounts of cargo is characterized by high risk, even if the latest technologies are employed. Thousands of people lost their lives in catastrophes of ships, off-shore oil rigs and other marine objects. It is estimated that around 80% of accidents at sea are caused by making wrong decisions by persons keeping watch on the bridge, especially during difficult navigational and weather conditions. Accidents can also be caused by lack of skills necessary for crews or absence of appropriate tools at training centers. Therefore, it is important that seafarers should be trained in accordance with the highest standards. The scope of crew research and training may include both static, dynamic and damage stability.

This stand bed also enables the analysis of the influence of the free surface effect of the liquid occurring in the compartments or tanks after damage to the ship's hull and the analysis of the impact of cargo operation on the ship's initial stability. Experiences gained on the research stand lead to a better understanding of the phenomena occurring in the current operation of the ship and improvements in the safety of swimming.

The aim of this article is presentation of selected scenarios for the test models of vessels and familiarization with the construction of selected types of ship models and the capabilities of stability test stands in the aspect of improving the safety at sea.

2. Description of stand beds research

Model tests of the naval properties of the ship and their results must be conducted and interpreted in accordance with the requirements of similarity laws.

Geometric similarity includes the underwater part of the ship, its watery part of the hull to the upper deck. If phenomena related to the impact of water on the deck and elements on board are investigated, it also will be required additional geometric similarity with respect to the deck, bulwark, lower parts of superstructures, etc. The presented ship models included in the research stand for training purposes were built keeping the geometric similarity of real warships. In the following sections of the chapter, descriptions of individual research stands will be presented.

2.1. Main stand bed for stability research

The model of the type 888 training ship was made for tests related to the stability and damage control of the ship. The basic technical data of the model are as follows [6,7]:

- length of the model	$L_{cm} = 1,444 \text{ m,}$
- length between perpendiculars	$L_{bpm} = 1,284 \text{ m,}$
- breadth	$B_m = 0,2332 \text{ m,}$
- displacement	$D_m = 13,15 \text{ kg.}$

In order to maintain geometric similarity of the model, having an effect on the quality of investigations, the hull construction was based on body lines in scale, whereas elements of the superstructures and deck equipment were appropriately simplified. All elements, whose size have an effect on the lateral area used in stability calculations, were placed aboard the models.

The ship model 888 used as the main investigation object was equipped with specialized instrumentation for simulating hull damage, fixing position and analyzing model's performance in various operation conditions hazardous to ship safety. The array of the main elements of the model measuring system is presented in Figure 1[7,8].

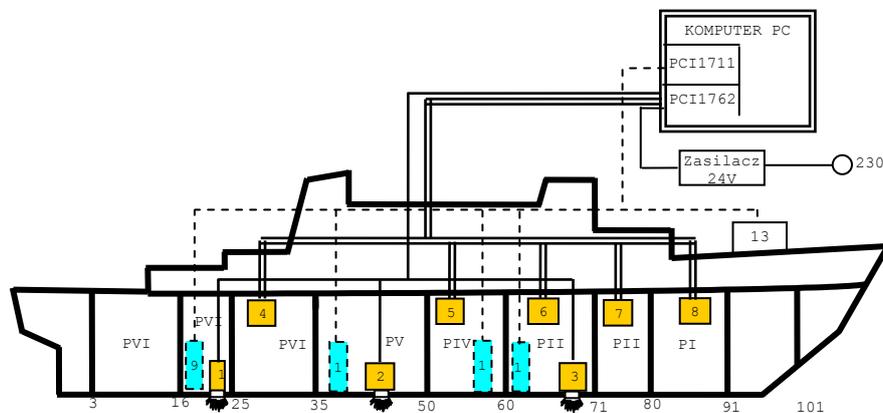


Figure 1. The array of sub-assemblies in the model of ship type 888 [8]

1. Valve for simulating penetration of compartment VII; 2. Valve for simulating penetration of compartment V; 3. Valve for simulating penetration of compartment III; 4. Valve for flooding compartment VI; 5. Valve for flooding compartment IV; 6. Valve for flooding compartment III; 7. Valve for flooding compartment II; 8. Valve for flooding compartment I; 9. Sensor of water level in compartment VII; 10. Sensor of water level in compartment V; 11. Sensor of water level in compartment III; 12. Sensor of ship draught; 13. Heel indicator.

Single compartments PIII, PV, PVII, which have the largest volume and whose flooding has significant effect on stability and water-tightness, were selected for the investigations. The process of flooding the compartments to the level of the overboard water is realized after remotely controlled bottom valves marked with numbers 1,2,3 are opened. The other group of valves is designed to flood the compartments used in a refloating process or righting a ship in cases of asymmetric damage. The ship model is also equipped with a water installation and sensors used e.g. for measuring the water level in compartments.

These valves, fitted in compartments PIII, PV, PVII, measure the water level using hydrostatic pressure measurements. A heel indicator, fitted in the fore of the model, was used in order to measure the heel and trim of the model. Signals received from the sensors, are transmitted, in the wireless manner, to a computer fitted with two analogue-digital cards, and then are read from a display in the form of ready-made results.

The measuring instruments and execution elements fitted in the model are connected to the computer by means of cables having low unitary mass. The computer is used for reading measurement

data shown on the display. Using the computer software it is possible to flood selected compartments in the model and to drain them. To carry out these operations a software package was developed in the Delphi environment. The image on the display is presented in Figure. 2. [7,8].

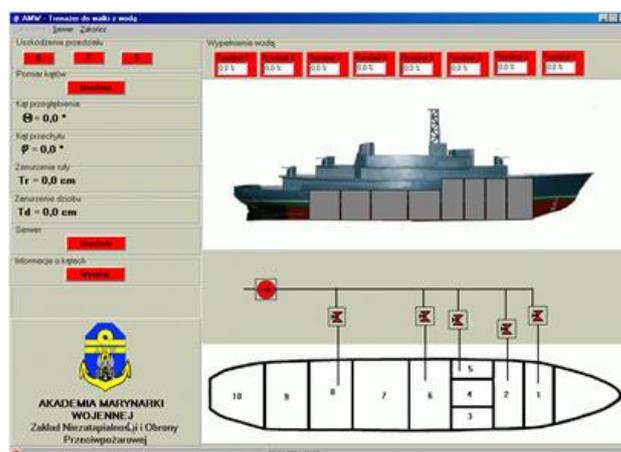


Figure 2. The window of the main software

The amount of water in the compartment seen in the upper part of the window on the display of the computer software is given in per cent. The data relating to the model's position such as heel angle, trim angle, forward draught in the perpendicular, after draught in the perpendicular are displayed in real time [8].

A strong wind and wave pose a large hazard to maritime transport safety in everyday operation of floating vessels and a frequent cause of accidents at sea. In order to take into account the effect of the natural environment on safety of floating vessels in the investigations it was necessary to add a set of ventilators simulating air movement to the described test site. Two type of ventilators with variable adjustment were fitted. They worked in the range from 0 to 2775 rpm – ventilators type HRB/2-250-AN and from 0 to 2685 rpm – ventilators type HRB/2-200BN. The ventilators generating air movement can be started in three configurations:

- low power generators,
- high power generators,
- combined work of high power and low power generators.

The maximum air velocity recorded during the work of all the ventilators was 9 m/s. Due to safety reasons the ventilators were placed in a casing protected with a net. Such a solution makes it impossible for any objects to access the area of rotating ventilator blades. A general view of the set of ventilators is presented in Figure 3 [6,7].



Figure 3. The view of the set of ventilators fitted in the laboratory site

Another investigation problem was to determine the axis of model rotation during wind action. The position of the axis of model rotation is important to calculate the heel moment caused by wind action. In these investigations, the height of the center of the lateral area measurement in relation to the floating water plane was assumed in accordance with the regulations of the Polish Registration of Ships.

The draft corresponding to this water plane was marked with a white line. At this height seats were installed on the ship hull. Rods which make it possible to rotate the hull are placed in the seats. The way the model is fitted in the rods is shown in Figure 4 [8]. The solution presented in Figure 4 also allows for free vertical movement of the model owing to the rod ways in which the rods move. In order to obtain the appropriate velocity of air flow the structure of the ventilator casing was reduced to an aerodynamic tunnel.

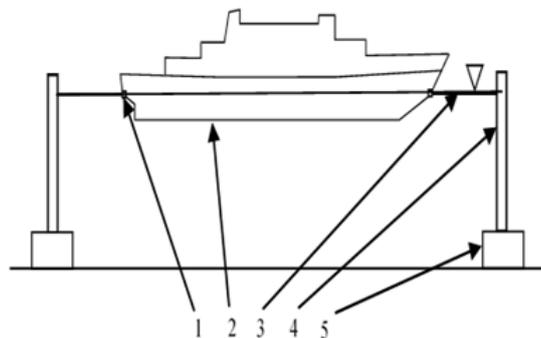


Figure 4. The design of the rotation axis of the ship model
1 – road seat; 2 – ship model; 3 – rotary rod; 4 – rod way; 5 – mount

Air velocity measurements were made using a portable measuring device type CTV 100, in which magnitudes are measured in the range from 0 to 30 m/s. In order to make air velocity measurements at different points of the cross-section of the control aerodynamic tunnel a holder was designed and built for fitting the measuring device in the air flow velocity sensor. Owing to this structure it is possible to measure air velocity at various ranges from the aerodynamic tunnel, shown at the Figure 3, and any height above water surface.

The initial tilting tests of the model were made on such equipped and prepared station. It required heeling the model to windward side reaching the heel angle magnitudes of 50. The angle magnitudes are derived from the weather criterion calculations made for the model following IMO regulations.

While recording the heel angle, the ventilators were working with constant rotary velocity, which corresponded to the constant characteristic of the heel moment. Examples of the measurement results of the heel moment of the model ship are presented in graphic form in Figure 5.

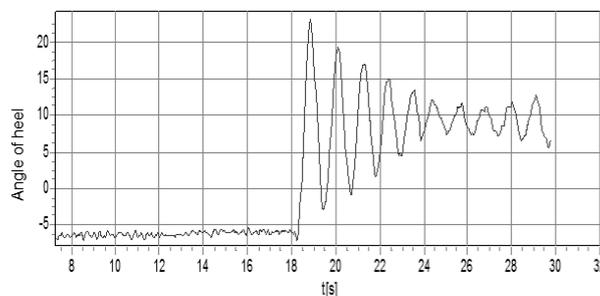


Figure 5. Sample results of measurements of the heel angle of the model

By employing the developed investigation methodology it is possible to carry out experiments aimed at determining heeling moments which pose hazard to navigation safety in various stages of ship operation.

2.2. Stand for testing the vitality of the ship model type 660

The research on stability and vitality includes numerous issues whose presentation on one model only is impossible. Therefore, the station was provided with a second model of the ship type 660 which is designed to conduct the research, especially from vitality domain. The model of this ship is shown in Figure 6 [6,7].

The model is adapted to flooding the compartments in any way and to any level. On the hull of the model the draught line and draught signs are plotted. Moreover, the position of bulkheads is marked, which helps the user to locate a damaged place.

The model of ship type 660 was adapted to the presentation of the problem of influence a free surface effect of the liquid on the stability. In this connection a special superstructure was designed. In its higher part there is a hole used for providing water inside. The water from the high placed compartment can be moved out or moved to the lower watertight compartment. Such operations are carried out while restoring or correcting the stability. In this way it is possible to demonstrate a change of stability after changing the position of the gravity center and to conduct research on flooding time either of damaged compartments or of the whole model.



Figure 6. Model of the ship type 660

2.3. Stand for testing the stability and vitality of the submarine model

The Research on stability and vitality of submarines make a source of knowledge about the watercraft's performance after its compartments have been flooded [1]. Possibility to simulate punctures of hulls on models of real objects adopted for this reason is an advantage of that research executed in the laboratory station. A simplified scheme of the stand for tests on the submarines' stability and vitality is given in Figure 7 [6,7]. The research on stability and vitality includes numerous issues whose presentation on one model only is impossible.

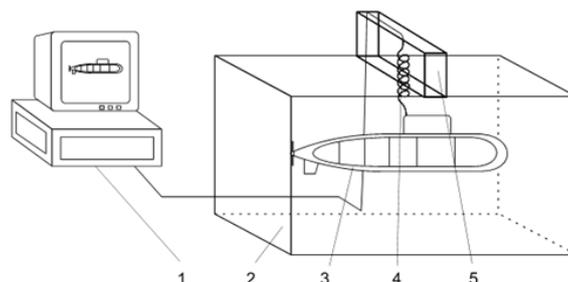


Figure 7. Scheme of stand for tests on stability of submarine's model

1- operator's stand, with computer controlling and registering parameters of model's position, 2 – basin of submarine's model, 3 – submarine's model, 4 – feeding cables, 5 – grip of feeding cables.

The main components of the test site are: a submarine's model, a computer used to control processes of submerging and surfacing and record basic data relating location of the model, and a basin. In the site presented operations of diving and surfacing of a submarine are carried out like in a real object. The device controlling the submersion and ascent of the model is a PC.

Its hull was made using body lines in an appropriate scale. The model is equipped with specialized instrumentation for measuring location in different operating conditions. The inside of the hull was divided into five watertight compartments.

Total volume of all the model's compartments is 55.53 dcm³. It is equipped with - located in bow and stern compartments - ballast tanks enabling diving and emerging of the watercraft and with a ballast system for piping water in and from the tanks.

Correction of trim and the model's position at assigned depth are shall be executed by means of two regulation tanks and the ballast system. The ballast system is functionally connected with a system of compressed air. Filling and expelling water from the tanks shall be executed with an appropriate sequence of opening and closing BURKERET type electromagnetic valves installed on the submarine's model. The system of filling and expelling water from the model's tanks designed in such a way has allowed minimization of a number of applied operating elements. Hence, it has decreased degree of complication of electrical and pneumatic systems and resulted in reduction of the model's weight. The image of the submarine model's is given in Figure 8.



Figure 8. Model of submarine [7]

In order to measure heel and trim angles, a clinometers type ISA P20 working having the range ± 600 was used. The measuring devices and actuators mounted on the model are connected to the computer by wires of low unit weight. The computer performs operations of embedding selected model ranges and drying them. Signals from sensors, transmitted by wire to a computer, are read on the monitor in the form of ready parameters of the position of the ship. The image of the display is presented in Figure. 9.

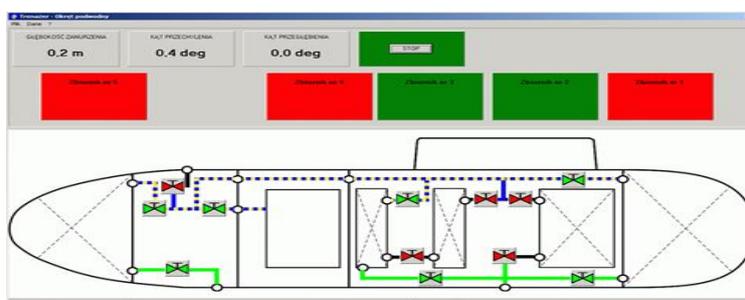


Figure 9. The window of the main software of the submarine model

3. Conclusion

The experience gained on the research stand leads to a better understanding of the phenomena occurring in the current operation of the ship and to improve the safety at sea. A modern method of testing the stability and unsinkability of vessels with the use of physical models of real objects made on an appropriate scale has been presented. The tests carried out on the described research stations allow the measurement of heel angles depending on the wind speed, load shift, time of flooding of ship compartments after their damage affecting the buoyancy safety of vessels. Conducting research and laboratory exercises in such a prepared position will enable continuous improvement of qualifications and level of training of persons responsible for reliability and safety of ship operation.

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Face recognition technology in the exam identity authentication system - implementation concept

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Abstract. Key challenge in online education is the difficulty in ensuring the authenticity of remote test takers during online exams. Nowadays, the identity forgery technologies used in exams are becoming more and more advanced. Test taking is a common method used for cheating in exams. Therefore, how to correctly recognize those forged identities has become a difficult issue in exam management. Human face is unique for everyone. Therefore, it can accurately and conveniently authenticate a person's identity. This paper aims to design a face recognition based system that can be used in the exam identity authentication system. Online examination system is based on web server composed of several modules, among which is authentication system module. After initial authentication of the student and exam registration, system is conducting continuous authentication based on facial recognition. Continuous authentication is an emerging technology which is proving to be appropriate in handling a variety of security threats. Concrete applications range from forensic analysis, detection of insider threat and session hijacking, and various forms of illegal identity sharing. Cheating in online exams falls in the latter category.

1. Introduction

Nowadays, an Electronic Examination Online (e-Exam) has become one of alternative for examination platform in education and teaching domain. However, security is still lacking in the implementation of e-Exam such as the reliability of the examination questions or modules, free e-Exam fraud, unauthorized question answers making the e-Exam system fail [3]. Key challenge in online education is the difficulty in ensuring the authenticity of remote test takers during online exams. Nowadays, the identity forgery technologies used in exams are becoming more and more advanced. Test taking is a common method used for cheating in exams.

Therefore, how to correctly recognize those forged identities has become a difficult issue in exam management. Human face is unique for everyone, it can accurately and conveniently authenticate a person's identity. This paper aims to design a cost-efficient facial recognition system that can be used in the exam identity authentication system.

1.2. Related work

The protection of the integrity of online exams through continuous using biometric technologies is an emerging area of research with relatively few papers (Traoré I, Nakkabi Y, Saad S, Sayed B, Ardigo D J, Magella de Faria Quinan P, 2017 [1], Fayyoubi A, Zarrad A (2014) [7]). Furthermore most of the publications, actually, use static biometric authentication. Although a biometric technology is used, exam participants are authenticated only statically at login time. As mentioned before, this is not enough to prevent cheating from occurring during the course of the exam. This work takes advantage of developing technologies on all platforms and development of new facial recognition algorithms.

2. Implementation concept

Online examination system is based on web server composed of several modules, among which our focus is on authentication system module.

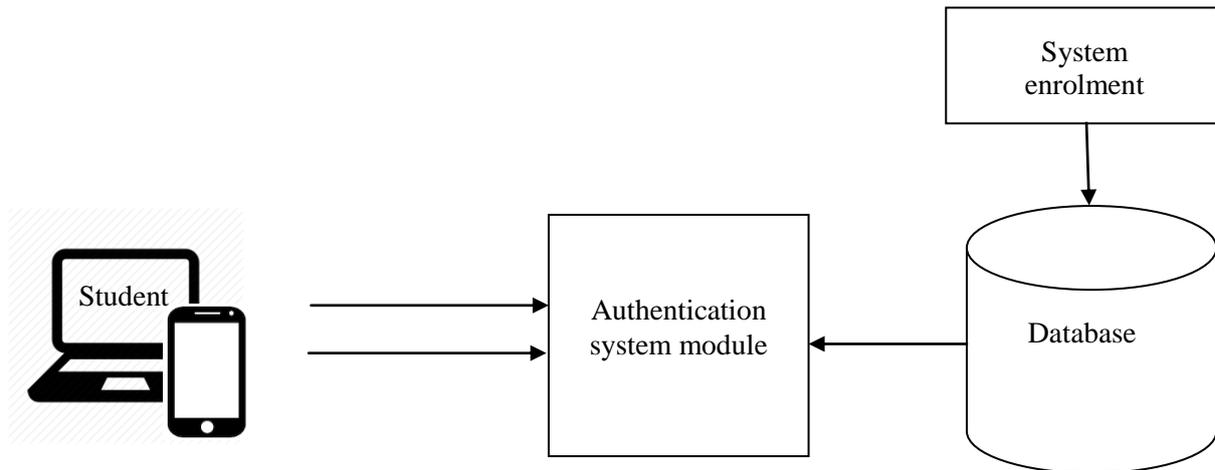


Figure 1. Simplified diagram of exam authentication system

Exam Authentication system is composed of four parts

- System enrolment
- Remote Authentication System
 - Exam registration certification
 - Continuous Authentication Service
- Authentication System Module
- Face Detection and Recognition

2.1. System enrolment

The purpose of enrollment is to collect and archive raw samples and biometric samples and to generate numerical templates for future comparisons. By archiving the raw samples, new replacement templates can be generated in the event that a new or updated comparison algorithm is introduced to the system. Practices that facilitate enrollment of high-quality samples are critical to sample consistency, and improve overall matching performance. Biometric system enrollment is performed during enrollment of the student in the education institution. During the process, biometric features are collected and stored in database.

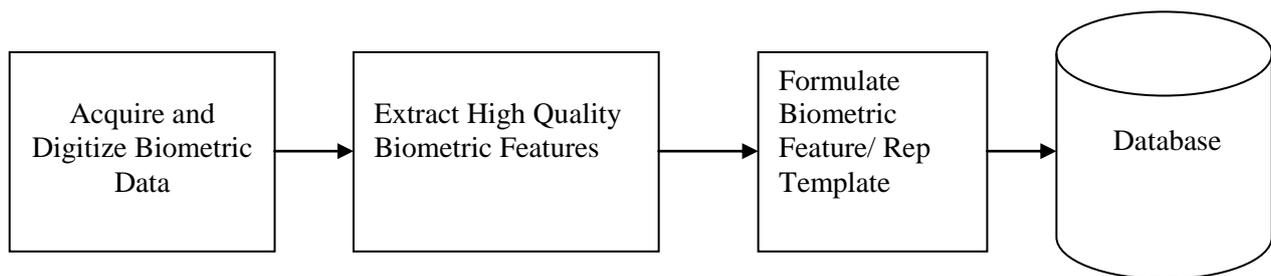


Figure 2. Simplified System enrolment process

Facial recognition algorithms create a biometric template by detecting and measuring various characteristics or feature points, including location of the eyes, eyebrows, nose, mouth, chin, and ears.

2.2. Remote Authentication system

Student must be equipped with camera enabled device and logs into the system through web browser. Thanks to expansion and popularity of the social media, on the mobile devices market in the last five years, nearly all mobile devices (smartphones, tablets, and laptops) have built-in front-facing cameras that enable high-quality “selfie” shots. In order to use desktop PC students must be instructed

to upgrade their systems with web camera, which will be mounted on top of the computer monitor. This makes it convenient to collect a live facial recognition sample for comparison. This system integrates exam registration certification and Continuous Authentication Service.

2.3. Exam registration certification

A candidate must be authenticated before taking an exam. This is performed in two steps. Each candidate must input relevant information in online exam registration form, such as personal information, and exam registration number. The system will take the photo of the candidate. After validating the personal data, if all are correct, system will retrieve biometric data from the database accordingly, and will send biometric data and the taken photo to the facial recognition software for comparison (authentication). If the authentication fails, the exam identity authentication system will immediately notify exam supervisors to perform subsequent measures. My recommendation is that there should be two or three fail attempts in order to give student opportunity to correct camera angle or backlight. If the authentication succeeds, the system will make the candidate pass. The specific information about a candidate, such as exam room entrance time and image, can be queried on the background server of the system. This enables the exam organizer to learn about all candidates of the exam. To achieve this target, the exam identity authentication system is designed with two parts, personal information collection system via Internet connections and personal information identification system. For communication between browser and server use of HTTPS protocol is advised.

2.4. Continuous Authentication Service

Continuous Authentication Service continuously validates the identity of the test taker throughout the exam using biometric platform. Automatic authentication system is collecting images from the camera on random time intervals and sends them to server, where authentication is performed by comparing them to base image stored in the database and to the image from exam registration certification. System flags every check as success or false.

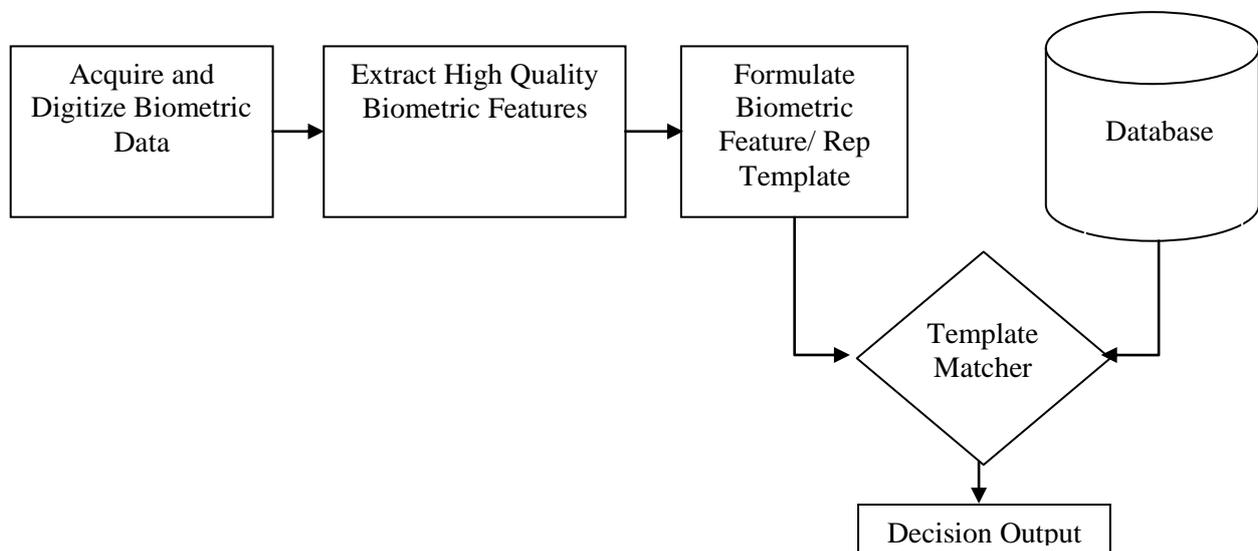


Figure 3. Continuous Authentication Service Diagram

In the students exam form system is pairing submitted answer with authentication flag and the photo taken for authentication. If there are more false flags than predefined default number system flags the exam for the exam organizer to perform subsequent measures.

If the student is using smartphone or tablet generally there are no limitations on when photo will be taken in the time interval between appearance of the question and submission of the answer, because the test taker is always facing the camera. There is a problem when student use laptop or desktop PC.

Not all students are touch-typing able (typing without looking at the keyboard). In order to reduce false flags photos should be taken in time interval in the first 10 sec after between appearance of the question, while the student is reading the question and is faced toward the camera.

Recommended technology for transferring camera images from student device browser to authentication system module is Web Socket. After initial connection established at the start of the exam it can transfer images without any additional interface on the student side. Because over that connection are transferred single images in time intervals it should not consume browser resources (CPU, memory).

2.5. Face Detection and Recognition

Face Detection and Recognition is the core of the entire system. Facial recognition is the automatic processing of digital images which contain the faces of individuals for the purpose of identification, authentication/verification or categorisation¹ of those individuals. The process of facial recognition itself is comprised of a number of discrete sub-processes:

a) **Image acquisition:** The process of capturing the face of an individual and converting to a digital form (the digital image). In an online and mobile service the image may have been acquired in a different system, e.g., taking a photograph with a digital camera which is then transferred to an online service.

b) **Face detection:** The process of detecting for the presence of a face within a digital image and marking the area.

c) **Normalization:** The process to smooth variations across detected facial regions, e.g., converting to a standard size, rotating or aligning color distributions.

d) **Feature extraction:** The processing of isolating and outputting repeatable and distinctive readings from the digital image of an individual. Feature extraction can be holistic², feature-based or a combination of the two methods. The set of key features may be stored for later comparison in a reference template.

e) **Enrolment:** If this is the first time an individual has encountered the facial recognition system the image and/or reference template may be stored as a record for later comparison.

f) **Comparison:** The process of measuring the similarity between a set of features (the sample) with one previously enrolled in the system. The main purposes of comparison are identification and authentication/verification. A third purpose of comparison is categorization which is the process of extracting features from an image of an individual in order to classify that individual in one or several broad categories (e.g., age, gender, color of clothes, etc.).[6]

Face Detection is the process computer software needs to go through to determine whether there actually is one or more faces in a photo or video image. It does not determine whose faces are in the picture, only whether there actually faces there. Therefore facial detection by itself does not remember or store details of faces.

Face localization, will detect where the faces are located in the given image/video, by use of bounding boxes.

Face Alignment is when the system will find a face and align landmarks such as nose, eyes, chin, mouth for feature extraction. Feature extraction, extracts key features such as the eyes, nose, mouth to undergo tracking. Face recognition, gives a positive or negative output of a recognized face based on feature matching and classification from a referenced facial image.

Template Matching Methods uses standard facial patterns stored for use to correlate an input Template extraction requires signal processing of the raw biometric samples (e.g. images or audio samples) to yield a numerical template. Templates are typically generated and stored upon enrollment to save processing time upon future comparisons. Comparison of two biometric templates applies algorithmic computations to assess their similarity. Upon comparison, a match score is assigned. If it is above a specified threshold, the templates are deemed a match.

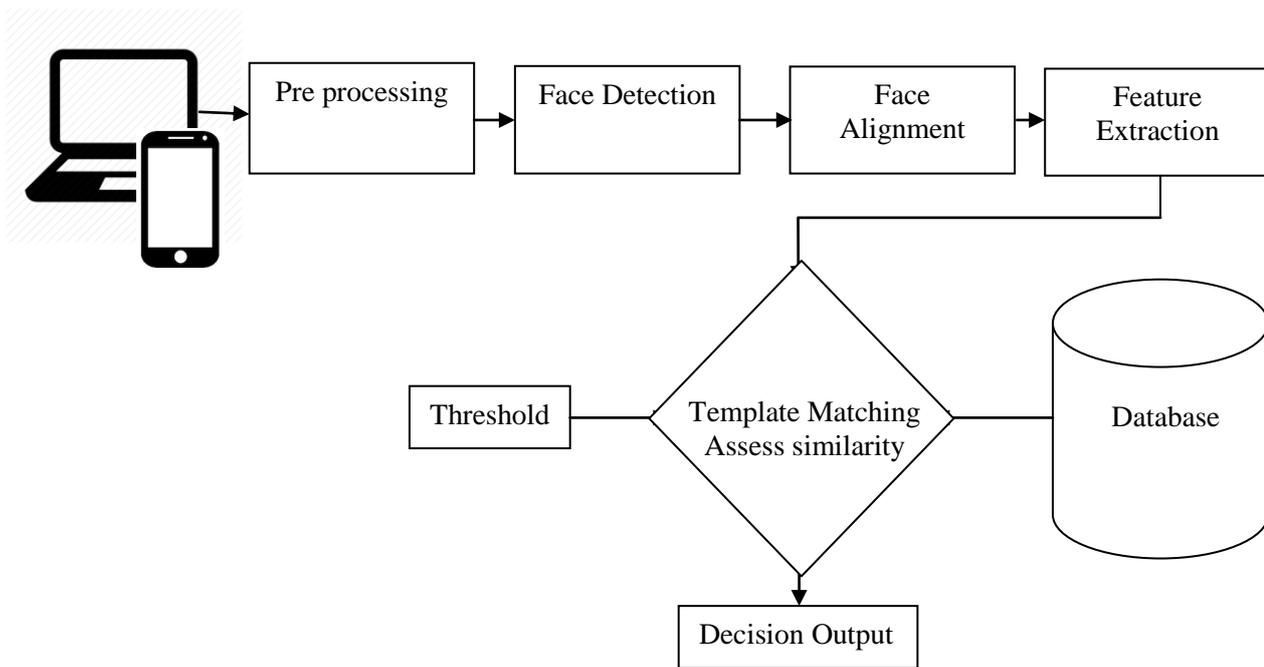


Figure 4. Face Detection and Recognition Flow Diagram

The aim of face recognition software is to make a positive identification of a face in a photo or video image against a pre-existing database of faces. For face recognition to be successful faces need to be enrolled into the system, to create the database. At this point, the software will determine unique facial identifying features, which is what it will actually store in the database. Later, when other pictures are used to establish identity, the software will break the new picture down into its key features and compare these features against the information stored in the database. If it finds a match, at a high enough level of confidence, it will have “recognized” that particular face in the picture.

3. Conclusion

Continuous authentication is an emerging technology which is proving to be appropriate in handling a variety of security threats. Concrete applications range from forensic analysis, detection of insider threat and session hijacking, and various forms of illegal identity sharing. Cheating in online exams falls in the latter category.

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How to improve students' motivation in online education?

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Abstract. One of the most important aspects of the education process is students' motivation. Motivating students is a challenge that professors have to face every day. This is even more challenging in online education where professor-and-student connection or interaction is greatly limited. Motivation to learn is characterized by long-term, quality involvement and commitment to the process of learning. Having in mind that the future of online education is coming and that it will incorporate adaptive technology as well as fusion of virtual and old-fashioned reality, online students' motivation will remain an important aspect of the contemporary educational process. This paper is focused on the ways and specific methods that professors or instructors should apply in order to provide students' motivation with a special focus to online students' motivation. Professors should use appropriate ways and should give a frequent, early, positive feedback that supports students' beliefs that they can do well. In order to improve students' motivation, particularly in online education, professors should provide opportunities for students to set their own goals, as well as to establish a system for self-monitoring and progress-tracking. In this regard it is also important if professors demonstrate how the subject is related to students or how it is related to real life. Finally, getting students involved and giving them a sense of control, will certainly improve their motivation.

Introduction

We live in a modern society where information technology and communication media are essential parts of our lives. The modern information and communication technology also influence contemporary education. Current trends show the rapid growth of online enrollment in higher education.

Many universities, academies and colleges have been expanding online education or considering offering online education courses or programs. The growth of the Internet and related technologies has resulted in a merging of online teaching and learning into the routine practices of education institutions. Online education is particularly appropriate for those learners, especially the adult students, who have no opportunity to attend face-to-face classes due to work or family obligations.

Online classes during a period of 24 hours a day, and 7 days a week, gives participants an expanded, flexible forum for networking, discussing, and debating all the time, whenever they want. A huge number of authors suggest that the most important factors that influence students' success are student motivation, the nature of learning tasks, learner characteristics, and the instructor. However, at the same time, a variety of factors has been identified as crucial to the success of online courses. One of those factors is certainly online students' motivation. Since this is a specific online learning environment, poor motivation sometimes could be a decisive factor in contributing to the high dropout rates from online courses.

Having in mind that the future of online education is coming and that it will incorporate adaptive technology as well as fusion of virtual and old-fashioned reality, students' motivation will remain an important aspect of the contemporary educational process. Motivating students as a challenge that professors have to face every day. This is even more challenging in online education where professor-and-student connection or interaction is greatly limited.

Motivation is not synonymous with achievement, and student motivation cannot necessarily be inferred by looking at achievement test scores, because immediate achievement and test performance are determined by a variety of factors and may even be assured through a variety of ways, and some practices that serve to increase immediate achievement may actually have the effect of diminishing students' interest in learning as well as their long-term involvement in learning [1]. In order to build a more engaging environment for online discussion that promotes active student participation, it is necessary to identify which characteristics promote learner engagement during online course discussions [2].

Why is students' motivation so important?

Student motivation naturally has to do with students' desire to participate in the learning process, but it also concerns the reasons or goals that underlie their involvement or noninvolvement in academic activities [3]. The best lessons, books, and materials in the world won't get students excited about learning and willing to work hard if they're not motivated [6]. However, if students are motivated, they will feel they belong more to the class courses and will certainly put more effort in their work. Teaching in a class full of motivated students is enjoyable not only for the teacher, but also for the students or participants in courses. Motivated students are more excited to learn and to participate. Many times, if not always, motivation is a precondition not only for choosing to learn, but also for what we learn as well as for how we learn. It is more likely that motivated learners undertake challenging activities and are actively engaged. At the same time, motivated students enjoy their learning, and because of that exhibit persistence and creativity.

As one of the foremost problems in education, motivation is important because it contributes to achievement, but it is also important itself as an outcome [1]. As an outcome motivation is important to all students and this view gives student motivation a central place as an educational outcome, important in its own right [1]. Moreover, motivation is very important because university students can learn very well if they have high level of learning motivation, or as opposite, cannot learn well if they have a low level of learning motivation.

Motivation is so crucial in teaching and learning that is almost impossible to teach effectively someone who is unmotivated to learn [4]. Motivation, both intrinsic and extrinsic, is a key factor in the success of students at all stages of their education, and teacher can play a pivotal role in providing and encouraging motivation in their students [6].

Motivation in e-learning environment

Learner's motivation is very important in an online coursework environment because it can influence not only students' decisions to stay in or drop out of a course, but it also influences learners' degree of engagement in the course as well as the quality of student's work, and their level of achievement in the online course. In the same time motivation is an important variable related particularly to adult distance learner success. Students with high intrinsic motivation often outperform students with low intrinsic motivation and although little is known about the processes that lead to these differences, in education based on simulations or authentic electronic learning environments, this lack of insight is even more clear [7].

Some authors underline student motivation as the single most important predictor of student success in distance education [5]. The results of some analysis which investigated what students actually did in an electronic learning environment, showed that students with high intrinsic motivation did not do more, but they rather tended to do different things. Analysis of log files showed the increased curiosity that students with high intrinsic motivation have which resulted in proportionally more explorative study behavior. However, the learning outcomes of students with high intrinsic motivation were not better [7].

In another research the classical and electronic learning was compared and results showed that e-learning students are more intrinsically motivated than traditional students. Moreover, e-learning students manifested significantly stronger intrinsic motivation than traditional classroom students at all three intrinsic motivation measures: (a) to know, (b) to accomplish things, and (c) to experience stimulation [5]. According to author, one possible explanation of these findings is that more

intrinsically motivated students self-select online versus traditional classroom courses where self-selection can apply both new and continuing students. In mentioned research, e-learners also report learning to be more pleasurable and they have greater satisfaction with the process of learning. These results suggest that student's subjective or perceived task value of e-learning may be an important consideration. The state of motivation to learn exists when student engagement in a particular activity is guided by the intention of acquiring the knowledge or mastering the skill that the activity is designed to teach [8].

Research has shown that good everyday teaching practices can do more to counter student's apathy than special efforts to attack motivation directly [3]. Thus, they find out that they are a part of well-organized online course led by a dedicated and enthusiastic professors or instructors, interested in what their students learn and how they learn.

Why can students be unmotivated?

Motivation can be a complex and multifaceted phenomenon that cannot be fully explained from the perspective of motivation as either a learner characteristic or an effect of learning environment design [9]. Although students may be equally motivated to perform a task, the sources of their motivation may differ [3]. There are really a lot of factors that affect students' academic motivation for success. Some of these factors are related to genetic attributes of students and some of them are related to environmental conditions provided to students [4]. However, motivation remains one of the most important factors of learning and a lot of studies have been performed to find some ways to motivate learners for improving their learning levels. But, while some students are self-motivated, with a natural love of learning, other students do not have this natural self-motivation. Some of the students are motivated by a drive for personal success (intrinsic motivation) and others from their peers or by challenges in the classroom itself (extrinsic motivation).

A person is more in control and more vested in their learning if they are internally motivated [4]. They seem to have a stake in the outcome. However, according to Stirling, such definite dichotomous approach to determining the nature of motivation might not yield the real image of learners and the process of learning in this context. A third perspective is also possible: the view that some motivational traits are inherent, but that their expression can be supported or thwarted based on the environments in which a person functions [14]. Having this in mind, intrinsic motivation cannot be analyzed in isolation, i.e. it is profoundly influenced positively or negatively by the specificity of the learning environment per se, including teacher/instructor role, reward/sanction system in place, etc.

One of the main factors that can influence students' motivation is the nature of the academic tasks, the instructional methods and the instructor's behavior, as well as the reward and goal structures. But why can students be unmotivated? Students may be unmotivated for a variety of reasons. Students seem to be particularly unmotivated to learn material that appears uninteresting to them or unrelated to their own life experiences and career goals. For example, they may feel that they have no interest in the subject, or they may find the teacher's methods un-engaging. Therefore, the instructor should focus on teaching in a way that the students feel intrinsically satisfied in the classroom. Internally motivated students are able to decide for themselves if and when they will become engaged in the learning process. It is the same in online education. Students or participants in online courses could simply be distracted for different reasons, external forces, etc. Due to some of these reasons, some students could drop out of online learning.

Even though the benefits of online discussion and online courses and education are obvious, this is not guaranteed, because some research shows a number of factors that result in low levels of student participation. Moreover, results from some researches provided evidence that students' participation in online discussion was related to their intrinsic motivation and that over time, students' intrinsic motivation for participating in online discussion dropped steadily [10]. One of the biggest reasons for this is a feeling of isolation and lack of social interaction, as well as a feeling of disconnection because of lack of contact, interaction and cooperation with professors and with other participants. There are also differences between intrinsically and extrinsically oriented students. Intrinsic orientation students use more logical information - gathering and decision-making strategies and they tend to prefer tasks that are moderately challenging. Extrinsic orientation students are inclined to put forth the minimal

amount of effort necessary to get the maximal reward and they gravitate toward tasks that are low in degree of difficulty [3].

How to improve students' motivation?

One of the most difficult aspects of becoming an educator (professor, teacher, instructor, etc.) is learning how to motivate students. At the same time, it is also one of the most important aspects of the educational process. Motivating students can be a difficult task that takes time and a lot of effort. Designing a motivating learning environment deserves attention and requires great dedication. Motivation comes from many different factors. Teachers play an important role in inspiring motivation among their students and in encouraging them to be actively involved during classes. The professor's behavior and teaching style are some of those factors. Motivation even comes from inspiring teaching materials. Results from some studies validate the importance of three factors which influence motivation in online education such as: online participation, social presence, and collaboration [11]. These factors are crucial for the creation a proper instructional design that promotes learners' motivation and those factors could imitate the traditional engaging learning environment to some extent.

However, motivation to learn needs long-term, effective involvement and commitment to the process of learning. In that process, teachers should always have in mind that all students are motivated differently. Moreover, when designing learning activities professors and instructors need to be aware of the important role they play in influencing student or learner motivation. According to Brophy, no motivation strategies can succeed with students if some preconditions are not in effect [3]. He lists more than thirty preconditions and we completely agree that all the listed preconditions are important for students' motivation. Some of those preconditions are the following: Creating a supportive environment; Appropriate level of challenge/difficulty; Meaningful learning objectives; Helping students to recognize linkages between effort and outcome; Offering rewards for good performance; Structuring appropriate competition; Providing immediate feedback to student responses; Adopting tasks to student interests; Including novelty/variety elements, etc.

How to improve students' motivation in online education?

We should be aware that many of the factors, tools and methods applied in traditional education, could also be applied in online education in order to motivate students. Moreover, a major concern in the field of online education is how to provide students with an effective online education experience. At the same time, there are some specific methods that can be applied in online education and that can improve online students' motivation and dedication to process of learning. Those methods are particularly appropriate for adult students who normally expect to be treated like unique individuals with defined goals and specific personal interests. Once they realize that you are on their side, they will feel more comfortable contributing to class discussions and relating the subject matter to their own lives [13]. Nevertheless, without a good engagement strategy, online learners could easily drop out losing their interest in the lesson, feeling isolated or disconnected [12]. In order to motivate online students, professors or instructors should provide them opportunities to personally connect with the subject matter. They should also ask online students to set their own goals as well as to set up a system for self-monitoring and progress-tracking [13]. Professors and instructors should encourage their students to take part in creating syllabus reading material.

Engagement strategy could include two main ways or achievements. Firstly, professors and instructors should give students frequent, early, positive feedback that supports their beliefs that they can do well. The relevance and the value of the task need to be clearly identified and linked to learning objectives in order to help learners understand how the activity can aid in the realization of personal goals, aspirations, and interests. By establishing frequent, ongoing communication with learners, where they feel able to discuss issues in an open and honest manner, practitioners are in a better position to accurately monitor and respond to situational factors that could potentially undermine learner motivation [9].

Professors and instructors should help students find personal meaning and value in the material and assign tasks that are neither too easy nor too difficult. In particular, students are more likely to want to learn when they appreciate the value of classroom activities and when they believe they will succeed if they apply reasonable effort [8]. Professors should also use some appropriate methods in order to motivate their students and to encourage them to live up to their true potential. To facilitate active participant engagement in online discussions, teacher education programs can recognize the interplay between intrinsic/extrinsic motivation when designing and implementing online courses [2]. In addition, professors and instructors should encourage their students to be active participants in online class discussions as well as to offer them choices in terms of research projects and essay assignments, and finally to give constructive feedback. This shared responsibility helps students stay involved and feel connected to the subject matter, the other students in the class, and themselves, as learners [13].

Motivation of learners in online environments can be represented through the John Keller's ARCS Model. Keller's ARCS model refers to four key components related to learners' motivation, i.e. attention, relevance, confidence and satisfaction. Within this paradigm the successful motivation relies on gaining and maintaining learners' attention, making a strong connection between the learning process and real-world application – relevance. Furthermore, the success of the learning process is associated with creating conditions by teachers/instructors for learners' confidence that they can achieve the goals regarding the taught subject, whereas, satisfaction arises from learners' feeling of accomplishment [15]

To further support working adults within large online classes, professors and instructors may choose to focus on quality rather than quantity. For example, they may require fewer online discussions, and when they take place, instead of having an open discussion, they can be focused on applying a course concept to the classroom. Moreover, adding the element of fun to courses with multi-media channels like animations, videos or games, will certainly develop learners' creativity and will engage them to actively participate in online work. Those elements will give the students a short break during classes.

Conclusion

Online learners' motivation has been considered as one of the important factors that drives online learning. Many different factors influence students' motivation in classical education, but also in online education. However, there are some specific factors that influence students' motivation in online education. Thus, different methods can be used in order to motivate students and to encourage them to live up to their true potential. Online participation has been argued as the strongest factor that contributes the most to learning effectiveness in online environment. Two key components that influence active participation during online class discussions are the professors/instructors and the students/learners.

Altogether, students expect to learn if their professors expect them to learn. Having this in mind, at the mere beginning of a course, students/learners should be familiar with the value of online education. Course requirements should be clearly established, as well discussion topics. Those requirements are a precondition for a positive class environment, which is very important. At the same time, one of the certainly most important factors for motivation is related to students' participation in online discussion. Having this in mind, professors should encourage students' participation, when they decide to use it in a class activity. Students' participation could be improved with some methods that encourage them to get involved in discussion, such as work in pairs, syndicate group, competition, offering rewards, using positive reinforcement, giving them a chance for improve, etc. even in online classes. In online courses as well as in a traditional classroom, students should understand the relevance of what they learn.

Students are more often interested in learning subjects that have immediate relevance and impact to their job or personal life, particularly adult students. Hence, in order to motivate students, professors should demonstrate them how the subject relates to their everyday lives and how it will impact their future careers. It is important to explain them that what they learn in online courses can be implemented in their careers.

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E-learning platforms: The future of education

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Abstract. In many countries, the use of e-learning platforms has become increasingly popular. E-learning platforms typically enable the creation of “virtual classrooms” where teachers can distribute learning materials and conduct tests. Additionally, many of these platforms facilitate collaborative learning and allow students and teachers to communicate with each other. As these platforms become embedded in the curriculum, their use is becoming common place. The use of e-learning platforms, however, has led to an increase in the amount of personal data available about students. These data range from information about the way electronic teaching materials are used and how tasks are fulfilled, to class participation and other educational activities. The more the teaching is based on virtual classrooms or electronic devices, the more specific and detailed digitized data about students and their behaviour and performance will be generated. Overall, traditional learning is expensive, takes a long time and the results can vary. The importance of e-learning is now a given fact and it can offer an alternative that is much faster, cheaper and potentially more effective. This paper aims to be easy to read and understand by proving the importance of using e-learning platforms in higher education.

1. Introduction

E-learning is a general term used to refer to a form of learning in which the teacher and student are separated by space or time where the gap between the two is bridged through the use of online technologies. [1]

In essence, E - Learning is a computer based educational tool or system that enables you to learn anywhere and at any time. Today E - Learning is mostly delivered though the internet, although in the past it was delivered using a blend of computer-based methods like CD-ROM.[2]

Many organizations and institutions are using E - Learning because it can be as effective as traditional at a lower cost. Developing E - Learning is more expensive than preparing classroom materials and training the trainers, especially if multimedia or highly interactive methods are used. However, delivery costs for E - Learning (including costs of web servers and technical support) are considerably lower than those for classroom facilities, instructor time, participants travel and job time lost to attend classroom sessions.

E - Learning can offer effective methods, such as practicing associated feedback, combining collaboration activities with self-paced study, personalizing learning paths based on learners needs and using simulations and games. Further, all learners receive the same quality of instruction because there is no dependence on a specific instructor. [3]

The basic elements of an E - Learning process can be identified as: technological infrastructure, E – Learning platform, E – Learning content and participants. The two major perspectives/aspects of E – Learning are technological and pedagogical. The technology including the infrastructure and the platform should enable development, hosting and delivery of e – learning content for its users.[4]

This paper will specifically address the part of the e-platform. Explaining the way of working through the example of collaborative E - Learning and E - Working platform released under the GPL open-source license called Claroline.

A global marketplace of e-learning platforms has emerged to help education authorities provide enhanced educational services and improve outcomes for children and youth. A growing number of educational authorities are using these platforms to support the delivery of education in the classroom, and to gain a better understanding of student learning needs.

Some of these e-learning platforms and the learning analytics they facilitate have enormous capacity to foster the development of innovative and effective learning practices. At their best, they can enhance and complement the interactions of students, parents and educators in the educational environment and help them fulfil their respective potential. Nevertheless, e-learning platforms may pose threats to privacy arising from the collection, use, reuse, disclosure and storage of the personal data of these individuals. [5]

2. E – Learning Platform

An LMS (Learning Management system) or E – Learning platform is a software including a range of services that assist teachers with the management of their courses. The E – Learning platform is a computing device that groups several tools and ensures the educational lines. Across dedicated platforms to the ODL (open and distance learning), all conduits are preserved and expanded for the learner, tutor, coordinator and administrator, etc. within the E – Learning platform.[6]

Most LMS systems are using web-base platform to facilitate “anytime, anywhere” access to learning content and administration. Most of the LMS application allows for student registration, the delivery and tracking of E – Learning courses and content, and testing, and may also allow for the management of instructor – led training classes. The LMS also allow for learner self-service, facilitating self-enrolment, and access to courses. [7]

Generally LMS can be categorized into two categories which are Open Source LMS and proprietary LMS.

The most popular Open Source LMS is Claroline that is free. The advantages of OSS are that it is free and can be adapted and extended to meet one’s own needs. More important, the advantage to educational institutes is that what they can obtain by applying OSS is to profile E-Learning according to a clear vision of the educational methods one plans to apply.

It should be mentioned, that a free E-Learning platform is a software which the use, the study, the modification and the duplication with a view to release or diffuse it are permitted, technically and legally.[8] This is to ensure certain freedoms that are induced, which include the program’s control by the user and the possibility of sharing between individuals.[9] These rights may simply be available or established by a license, called “free” based on copyright.

The general principle of the operation of an E – Learning platform LMS and the key features are associated with the main actors: learner, teacher, tutor, coordinator and administrator.

The learner can consult and/or download the resources placed at his disposal by the teacher, make its learning activities while following his progress in training. The teacher, who is responsible for one or more modules, creates and manages the educational content he wishes to broadcast via the platform. It can also build tools for monitoring learner’s activities. The tutor accompanies and monitors each learner in having at his disposal the tools that needs to communicate, collaborate and animate discussions. On its side, the coordinator ensures the management of the overall system. Finally, the administrator is responsible for the customization of the platform benefiting the rights of the administration thereunder (system installation, maintenance, access management...) [10]

2.1. Key benefits of learning platforms

The cost of providing a learning platform is relatively low, especially cloud – based systems that require little or no support and maintenance. For this minimal investment, schools can reap a wide range of benefits such as:

Improved organization and communication

Efficient and effective communication is essential for the success of a school. Learning platforms help schools improve communication by promoting the use of a wide variety of modern communication tools such as cloud email, internal messaging, project spaces and blogs.

More opportunities for independent and personal learning

Learning platforms give every teacher the opportunity to place a wide variety of learning resources at their students’ disposal. The courses in its learning for example, enable the distribution of

learning materials tailored to meet the specific needs of each student, and enable these materials to be assigned, collected and (in some cases) automatically marked.[11]

Enhancing quality and range of learning resources

By giving teachers simple and quick access to a range of digital tools, learning platforms enable them to expand their repertoire of learning resources and exercises – making teaching more engaging, fun and motivating for learners. It's also possible to link these activities to the curriculum, using tools that match activities to specific learning objectives and curriculum goals.

Increased opportunities for collaboration and interaction

Learning platforms offer teachers and students a simple way to collaborate on projects and coursework. Teachers can use a learning platform to share resources, lesson plans and tests with other teachers, not only in the same school, but also in the same local authority or further afield. For example, the library function in its learning allows teachers to make, save, search for and share resources with any other teacher using its learning, regardless of location. For students, a learning platform offers a variety of collaborative opportunities through project pages, video conferencing, messaging and blogs. And, because most learning platforms are available 24/7 from any internet-enabled device, users can work together whenever and wherever they like.

Enhancing digital literacy

Computers are no longer reserved for IT programmers, and many of today's jobs require employees to have reasonably advanced computer skills. For teachers, learning platforms enable them to include these skills in their courses, regardless of the subject. Discussion forums, for example, offer a safe space where students can discuss topics online, from English set texts and math problems to the merits of closed-circuit TV cameras. Many schools also run professional development programmes through their learning platform, giving teachers access to numerous courses in their school and at partner institutions.

Improved management of student behavior and attendance

The reporting tools in learning platforms enable schools to better record and track data on student attendance and behavior – and they also help the school share this information between teachers, school managers, parents and learners. The reporting tools in its learning, for example, enable teachers to easily track attendance and behavior, and pass the reports to department heads or head teachers. Once approved, these reports can automatically be made available to parents or students through their individual dashboards, ensuring that everyone has access to the latest information.

Building the school identity and community

By empowering students to create and share their own resources, and giving them a space to voice their opinions, learning platforms help increase both a sense of community and democracy. For example, survey or poll tools can be used by a head teacher or class teacher to quickly gauge student opinion on a topic. Discussion forums are also valuable for encouraging deeper opinionated discourse in a safe, school-monitored environment. This information can then be used to make changes to the school or class.

Learning platforms are likely to play an increasingly important role as more and more teachers and schools look to further develop their use of ICT in all subject areas.

By offering communication channels, pedagogical tools and course and school management systems, the best learning platforms give teachers and students a single gateway to using technology both in and outside of the classroom.[11]

3. Claroline

Claroline is an open source platform that gives users the freedom to create their own online classroom. With Claroline teachers can produce assessment activities, post and collect assignments, build a wiki, monitor student activities, and create chat rooms or discussion forums. Claroline is

available as a free download for Mac, Windows, and Linux systems. Claroline is not a hosted service so you do need to have someone host your installation of Claroline.[12]

Lectures using Claroline allow building effective online e-learning and collaborative activities on the web. Claroline is used in more than 80 countries and translated into 35 languages.

The Claroline is based on free technologies like PHP and MySQL and uses the current standards like SCORM for the exchange of contents. Claroline provides a list of tools enabling the lecturer/teacher to write a course description, publish documents in any format (text, PDF, HTML and video), administer public and private forums, create groups of students, prepare online exercises, publish announcements, see the statistics of the users activity and use the wiki to write collaborative documents.[7]

The Claroline platform is organized around the concept of spaces related to a course or a pedagogical activity. Each space provides a list of tools that enable course manager to create learning contents, manage training activities and interact with the students. Some of the tools provided by Claroline which help lecturers to manage the class are:

- ***Manage Document and Links***
The Administrator can publish their documents; create directories and sub-directories to gather files and create hyperlinks and build their own HTML pages.
- ***Create Online Exercises***
Claroline LMS allow administrator to create exercises with a list of questions, elaborating different types of questions and tracking the results of the users. The administrator can also set exam with maximum time and attempts allowed for their students.[7]
- ***Organize: Agenda And Announcements***
Claroline LMS allows administrator to add events in the course calendar, showing the complete calendar and displaying the events from all courses, attach to an event a link to other tools of the course or to an existing resource, write an announcement which will be displayed on the course homepage and send an announcement by e-mail to a user or a group of users.[7]
- ***Supervise: Users And Statistics***
The Claroline LMS allows the administrator to follow the access to the platform and supervising the progression of the users.
- ***Coordinate Group Work***
The Administrator is allowed to create several groups of users enrolled in this course, define the registration settings, provide own tools for each group and facilitate the collaboration between users during group work.[7]

4. Future works and trends

E-Learning is present in the society and business for several decades and is here to stay. It might seem as simple process of delivering learning materials and examining the proficiency and/or knowledge by electronic means but the development and flexibility of the Information Technology enables many different approaches and implementation of new methods regarding the process of learning helped by the technology and we can consider that it is still evolving. As the technology develops and some best practices are confirmed certain aspects and tools are adopted and widely used by many institutions and business. Some of the established and emerging trends include but are not limited to:[4]

- ***Further integration and cross - system collaboration:*** allowing learning materials to be shared between schools without proprietary formats restricting use.
- ***Further development of education specific social media tools:*** helping to create a safe, school- controlled online community.
- ***Closer ties between data management information systems and learning platforms:*** enabling better reporting between teachers, administrators and parents.
- ***Increased use of advanced assessment systems:*** helping teachers and students visualize teaching and learning, and plan classes more effectively.

- **Increased use of blended learning:** providing access to education in a number of ways, including home-based learning, distance learning and classroom instruction.

5. Conclusion

Since the first pioneer systems till present days e-learning significantly evolved in parallel with the development of the Information and Communication Technologies. The real growth and development of the e-learning technologies and methodology started after the introduction of the Web and still is developing coping with the new challenges.[4]

Although it cannot replace traditional education, the internet opens new teaching-learning-assessment opportunities. The information obtained in this manner, the mobility of its use, makes e-learning come up as a completion and continuation of traditional education. Although initially created for distance education, Virtual Learning Environments are at present used as auxiliaries for the traditional didactic activities, known as Blended Learning.

Given that the e-learning has many benefits for both sides in the learning process (trainers and learners) it is widely adopted by the educational institutions (80%), the companies (77%) and the military. On the other side, the learners/students also turn to e-learning where 32% of regular students take at least one online course.

The e-learning market is widely diversified with more than 500 Learning Management Systems available where none of them holds more than 10% of the market share. Since the market is still growing this suggests that there is still space for new entrants. Regarding the e-learning tools used there is variety of them that support both synchronous and asynchronous learning like video conferencing, virtual classrooms, webinars, presentations, videos, audios, graphics, texts, wikis, blogs, chat rooms etc.[4]

This paper reveals the enormous importance of e-learning and explains the basics of e-platforms. It also points out the benefits of using them. The closing deck indicates which future trends will change the style of education forever. What was once a vision today is part of our daily lives. For more information on this type of education, it is recommended to research and read more papers of this type.

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E-learning course personalization using a Fuzzy logic, experience based algorithm (controller)

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Abstract. Distributed learning offers the benefit of adaptability to the student's requirements in terms of time, place and pace of study. Therefore, even to start with, distributed learning offers some degree of personalization that is important to be followed up on to include specific courses being able to adapt to the interests and knowledge level of the student. This paper focuses on and proposes a personalized e-learning system that utilizes a fuzzy, experience based algorithm that uses several prerequisites as: prerequisite courses taken, cumulative grade of prerequisite courses, research & independent work and classroom activity which allow a student to sign up to a specific future course. Moreover, using the same prerequisites as input parameters, the output result will define and assess the student's capability to successfully take up the course, and if so, it can be used to pace and walk him/her through the course and propose course literature and materials in a way that the students will learn more efficiently and effectively therefore completing the course will the highest grades attainable.

1. Introduction

In terms of education, many universities today extensively exploit digital technologies. The primary reason behind it is to reach larger markets and reach out to students who may study entirely remotely and entirely online. [1] However, there is a fine line that determines where conventional, campus learning ends and distributed learning starts. Distributed or distance learning differentiates from conventional learning in a way that the later is limited by the physical boundaries of the institution (university campus) where it takes place. That being said, distance learning is conceived and defined across cyber-distance and cyberspace, and with it comes its possibly largest benefit, the opportunity of distributing education across the wide reaches of digital technology which are just shy of limitless. This translates to a type of education that is entirely adaptable to the student's requirements in terms of time, place and pace of study.

The pace of study as a personalization module is of particular importance to this paper since it proposes an E-learning system that utilizes a fuzzy, experience based controller whose output defines and serves as an assessment of a student's ability to successfully take up a specific course based on his/her previous educational background. The idea behind such a personalization module may also serve the purpose of pacing the student through the course by proposing learning techniques and adequate course literature and materials.

2. Related work

Traditional teaching methods typically follow a "one size fits all" approach: the information offer is standardized and equal for everyone. [2] However it is evident that with learning, different people excel at different rates depending on the field of study, and a personalized approach can significantly improve the learning process. Customization of the learning experience has been established throughout the whole e-learning environment almost in parallel with the establishment of e-learning itself. It usually encompasses [3]: the learning environment, the learning content and the interaction between the student and the learning content.

In the paper *E-learning personalization based on dynamic learners' preference* [4] the authors stress that learning content should be modeled against a systemized adaptive learning approach which

takes account of the learner's learning content preferences. Additionally, in *Assessing e-Learners' Knowledge for Personalization in e-Learning Environment* [5] the authors point out that most researches neglect a fundamental issue – the student's prior knowledge on which the useful intelligent systems will be based. Furthermore authors *Bourkougou O and Bachari W* [6] claim that since learning style is specific for each student it is best to propose a personalized teaching strategy by selecting and sequencing learning content that fit the learners' learning style and ability which will result in a better return on the educational level.

To sum up, the emphasis is put on the interaction between the learning content and the student which should serve as a feedback loop in an information system capable of determining which content will be presented for the student next. As a result on this observation, as early as 2003, *Ruiz M et al.* [7] have gone to propose a website based system (Feijoo.net) that adapts the contents and the presentation of these contents to the learning style of each student. The main goal is to get an adaptation model of the learning of each student following cognitive psychology and pedagogy based directives. More recently, taking advantage of the advances made in fuzzy logic and uncertainty theory in the paper *Fuzzy-logic based learning style prediction in e-learning using web interface information* [8] the authors proposed a similar adaptive, fuzzy personalization module that uses the student's learning patterns, environment, time and their mood to recommend suitable e-contents.

The aforementioned papers provide only partial insight into the potential e-learning personalization modules but they all agree that the effectiveness of e-learning greatly depends on personalization. This paper takes note of their research and builds on it with the fuzzy, experience based controller, whose input parameters allow for an output level of learning ability and proficiency in a particular course of interest to the student. The controller itself is simpler and provides a numerical value as representation of the output level of ability to take up and successfully pass a course. Moreover, according to the output level the user can get a predefined selection of literature and materials in support of the online classes.

Apart from the introduction, and the related work section, we are yet to define the fuzzy controller, its input parameters and their membership functions, as well as the fuzzy rule base that will allow the controller to decide on the output level. Also, after defining the experiment to test the controller's capability and analyze the results that are brought back, the paper will conclude on the usefulness and effectiveness of the system and propose future upgrades to the system.

3. Fuzzy logic, experience based controller

Adaptive e-learning systems are typically complex because they involve many dynamically interacting components, each with its own need for knowledge and information resources, and coordination between them. A solution to the traditional systems which come off as too precise in dealing with complex problems is achieving a compromise between the available knowledge and the level of uncertainty that is acceptable for the purpose of the system. [9][10] This translates into building a special fuzzy expert system that can provide the student with a customized learning experience.

The proposed fuzzy logic controller has four input parameters: prerequisite courses taken, cumulative grade of prerequisite courses, research & independent work, classroom activity, and is built using the Fuzzy Toolbox of the MATLAB Program Package.

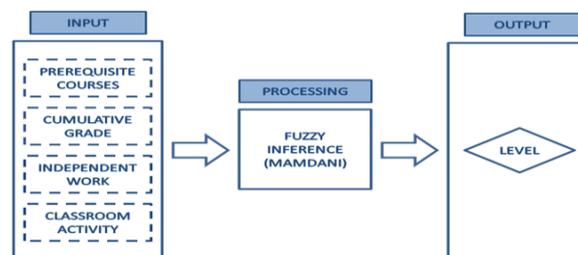


Figure 1. Structural layout of the fuzzy logic controller.

Each of the input parameters and their respective membership functions were agreed on using the European Credit Transfer System grading criteria. The total number of Prerequisite Courses is taken as 4, however this number can vary depending on the complexity of the course taken and the prerequisite knowledge required to take up the course of interest. Its membership function is defined with three levels (Low, Medium and VeryHigh).

The levels for the Cumulative Grade membership function are set as Low, Medium, High and VeryHigh, with a cumulative grade mark of 20 being the lowest grade (4 courses x 5 grade mark = 20 cumulative grade, meaning all courses are failed) and 40 being the highest cumulative grade (4 courses x 10 grade mark = 40 cumulative grade, meaning all courses are passed with the highest grade attainable). Research&Independent Work and Classroom Activity are assigned the same 4 levels as previously, with the exception that the lower limit here is defined with the numerical value 0 because a student can get anywhere from 0 to 10 points per course.

Table 1. Input Parameter Membership Function Levels.

Values	0	1	2	3
Prerequisite Courses	Low 0-2	Medium 1-3		VeryHigh 2-4
Cumulative Grade	Low 20-26	Medium 24-31	High 29-36	VeryHigh 34-40
Research&Independent Work	Low 0-12	Medium 8-22	High 18-32	VeryHigh 28-40
Classroom Activity	Low 0-12	Medium 8-22	High 18-32	VeryHigh 28-40

The output's membership function has 13 levels. In order for the linguistic descriptors to adhere to the grade levels found within the European Credit Transfer System, every value that falls beneath the half point mark (at least 51% and over to pass) will be considered a FAIL, and therefore the first seven levels are named this way, since this is the amount of knowledge that the student is bringing to the new course. This means that if the student takes up the new course, he/she is going to face great difficulty in successfully understanding the course material and it is likely to fail the course. As the level's numerical range rises, starting from the eighth level, the student has a greater chance of successfully understanding and passing the new course, and the knowledge levels accordingly go from POOR (6) , FAIR (7), then GOOD (8), VERY GOOD (9), and finally EXCELLENT (10), with the grade according to the European Credit Transfer System being found in the bracket next to the linguistic descriptor of the level.

Table 2. Output Membership Function Levels.

OUTPUT Membership Function	
RANGE	NAME
$0 < RL < 1$	FAIL1
$0 < RL < 2$	FAIL2
$1 < RL < 3$	FAIL3
$2 < RL < 4$	FAIL4
$3 < RL < 5$	FAIL5
$4 < RL < 6$	FAIL6
$5 < RL < 7$	FAIL7

$6 < RL < 8$	POOR
$7 < RL < 9$	FAIR
$8 < RL < 10$	GOOD
$9 < RL < 11$	VERY GOOD
$10 < RL < 12$	EXCELLENT1
$11 < RL < 12$	EXCELLENT2

Finally, the rule base was created using all of the combinations of the linguistic descriptors of the levels of the input parameters, to include a total of 192 rules ($3 \times 4 \times 4 \times 4 = 192$) thereby providing the link between the input parameters and the output function in a consequential relationship.

4. Experiment and results

4.1 Experimental environment

The fuzzy, experience based controller was tested against the grade results of a class of cadets enrolled in the second year mandatory course Internal Combustion Engines and Engine Driven Vehicles (EEDV), at the Military Academy General Mihailo Apostolski – Skopje. The cadets' entire previous academic background was taken in consideration in order to provide the input parameters for the controller.

All of the Prerequisite Courses to take up Internal Combustion Engines and Engine Driven Vehicles are also mandatory courses and include: Mathematics 1, Physics 1, Chemistry of the Environment and Electronics Basics, which means that the level attained by every cadet in this input parameter will be VeryHigh. The levels for each of the three remaining parameters (Cumulative Grade, Research & Independent work and Classroom Activity) were calculated separately based on the success with which each cadet passed or failed any of the prerequisite courses.

4.2 Results

The results that follow showcase 20 different grading scenarios that describe the academic success of 20 cadets that took the EEDV course. The 'Grade in EEDV' column contains the cadets' grades and shows us if the cadet passed or failed the course.

The last column contains the results as calculated by the controller on the expected academic proficiency by each cadet prior to taking the course. Aside from the Numerical Output Level of the Controller, each of the Linguistic Levels is assigned a numerical value in accordance with the European Credit Transfer System, this being done in order to compare both the Grade in EEDV with the Numerical Output Level and the Grade in EEDV with the Linguistic Output Level.

Table 3. Experiment Data.

Nm	Cadet (Initials)	Prereq. Courses	Cum. Grade	Ind. & Res. Work	Class. Activity	Grade in EEDV	Output Level (Numerical)	Output Level (Linguistic)
1	KZ	4	38	36	35	9	11.5	EXC2
2	IN	4	30	34	32	8	10.5	VG
3	AP	4	28	30	30	8	9	GOOD
4	SI	4	33	35	30	8	10.5	VG
5	MV	4	24	26	26	6	7.02	POOR
6	MM	4	21	12	15	5	4.98	FAIL5
7	AA	4	30	28	25	7	8.52	FAIR
8	DA	4	34	35	29	8	10.5	VG
9	VA	4	28	27	27	7	7.98	POOR

10	ISh	4	21	20	18	5	5.52	FAIL6
11	MK	4	23	24	20	6	6.48	FAIL7
12	SS	4	29	28	24	7	7.98	POOR
13	JN	4	32	30	30	8	9.96	GOOD
14	EM	4	38	39	40	10	11.5	EXC2
15	NM	4	35	35	37	9	11	EXC1
16	AB	4	40	40	40	10	11.5	EXC2
17	AC	4	33	30	30	8	9.96	GOOD
18	AM	4	31	29	32	9	10.5	VG
19	RD	4	39	40	39	10	11.5	EXC2
20	SB	4	30	29	32	8	9.96	GOOD

The Pearson Coefficient of Correlation was used to analyze the dependence between the Grade in EEDV with the Numerical Output Level and the Grade in EEDV with the Linguistic Output Level. Comparing the Grade in EEDV with the Numerical Output Level of the controller, a resulting value of 0,96 is representative of a strong Positive Correlation between the two sets of values, which means that the Numerical Output Level is very closely related to the Grade in EEDV set of values.

On the other hand, a resulting value of 0,94 defines the correlation between the Grade in EEDV with the Linguistic Output Level of the controller. This value also signifies a strong Positive Correlation between the two sets, or rather it tells the controller's user that the academic success and proficiency of the students could have been to a great degree predicted by the use of the controller. In fact, as witnessed from Figure 2, 12 out of the 20 grades were predicted correctly, while the rest 8 grades differentiate by a margin of 1.

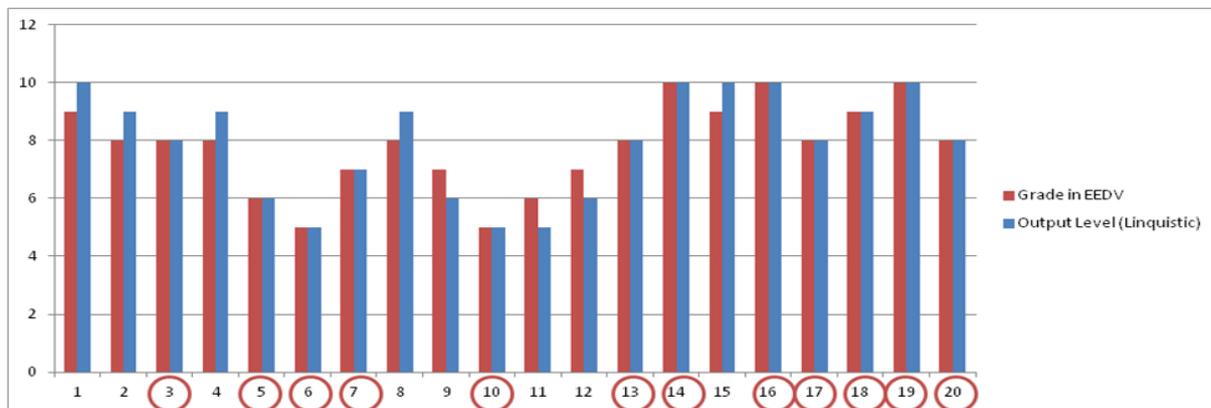


Figure 2. Pictorial representation of the dependence of the Grade in EEDV with the Linguistic Output Level using a 2D Column Chart in Excel.

5. Conclusion

This paper presented a model of a simple and reliable fuzzy controller that is able to calculate the level of a student's ability to take up a specific course while being indicative of the likely success that the student will achieve while studying the course. In its essence this is the basis of the proposed personalization system that will not only allow its user to take up a course, but at the same time present the user with a prediction oh his/her likely success with the course, the available literature and the order in which it needs to be studied as well as the pace with which the student can expect to master particular problems and topics. All of these properties can be very easily embedded in a graphic user interface that will support the system as envisioned here.

While this system primarily serves the students, its secondary benefit comes from the selection of candidates prior to attending a complicated course. This means that only students that possess the bare minimum of related course knowledge will be allowed access to the course. Third, the professors get a rough estimate of the class' comprehension ability in the topics that account for the course's content and therefore they can model their own teaching methods and techniques accordingly. Future updates on this system alongside creating a friendly graphic user interface include linking the entire system to a new or even better existing e-library (possibly a university one) that closely follows the syllabus for each available course at this university and proposes books and other additional literature based on the output level of prerequisite knowledge of the student as calculated by the fuzzy controller. The fuzzy controller itself can be further updated by adding more input parameters which will significantly widen its rule base and lead to greater reliability in the system's decisions. In conclusion, the proposed system as presented in this paper is in its infancy phase with only its core (the fuzzy controller) being built and elaborated on in greater detail. As soon as the controller was put to the test, the results analysis was conclusive and demonstrated the system's overall capability of determining a student's knowledge by taking in consideration the student's previous academic merit and exploits. Additionally, this system leaves a lot of room for improvement in terms of creating a unique user friendly GUI and integrating the system with other distributed learning technologies.

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Development and implementation of special research procedures for risk prevention on sport events - with a special accent on the role of the police

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Abstract. The big sport events nowadays are important events where lots of people gather, people who want to spend their free time and enjoy the game. Unfortunately, among them, there is a group who use the occasion to manifest deviant behaviour and put in danger the security of all people who are there in that particular moment. For that reason, security during sport events is a serious social problem that requires professional approach and knowledge that should be applied by all institutions and individuals responsible for stopping any unwanted interruptions of the game. In order to notice and eliminate all potential threats and risks, it is necessary to constantly develop institutional capacities for standardisation of the operative procedures and prevention strategies. The police as a state body, which takes part in maintaining the public order and peace during sport events, implements numerous prevention measures and activities with the use of a complex operative system for following and monitoring, based on constant exchange of information and professional experience. In order to improve the security on sport events, the focus in this paper is put on finding and implementing a methodology for proper assessment and administration of risk as a standard in the process of planning the police duty activities.

1. Introduction

Nowadays, the sport is an important social activity which integrates the security, economic, health related and cultural dimensions, and largely affects the everyday life of the individual as well as the whole society. This area constantly develops and stimulates the values such as: respect, tolerance, honesty and collective spirit. The rapid development and the domination of sport imposes the need of researching the sport as a social and security related phenomenon, because nowadays there are many deviant social manifestations which have a negative impact on the sport and sport events, some of which include dopping, violence, hooliganism, racism, sports betting and match fixing, terrorism, etc. [5], [6].

The sport events that we watch nowadays are not even close enough to those sport events which took place in the past or in the early stages of its development. This is a result of the rapid industrial development and different social and political influences that contribute to essential changes within the modern dimensions of sport. While in the past the sport has only been related to religious rituals and military preparations, the sport nowadays is mainly considered as a part of the mass culture, a manifestation that reduces psychological tension caused by the modern world, which is characterized by dynamic, mechanic and urban society [8].

This socio-psychological dimension of the sport, in other words, its contribution to the reduction of psychological tension of people nowadays is relevant security related dimension, because the sport (participation in sport activities) stimulates the sense of human safety. On the other hand, participation in activities that increase psychological tension are also security related, in other words, such activities produce and stimulate negative effects on people, property and the environment. More precisely, as a result of several factors, security is always closely related to sport, and this can include security threat of the participants in sport, security of the audience or the facility in which the sport event takes place. It is obvious that the relationship between sport and security is comprehensible, as well as the inevitability and the relationship between the cause and event, and for these reasons, a special

institutional apparatus within the sport is developed, mostly related to legal regulations, ethical norms, financial rules, security standards, etc. Regardless of the fact that these sport systems are individual units, they are strongly related, because no sport event could take place if the basic demands and tasks imposed by the authorities are not taken into consideration [10]. In this context, it is worth mentioning the role of the police as a state authority which primarily is responsible for maintaining public order and peace and to contribute to the uninterrupted maintenance of sport events. In order to perform its safety related function, it is necessary that the police uses proactive approach by taking into consideration numerous methods and activities before the event, as well as after the event [9].

2. Security risk assessment at sport events

Risk assessment is the most important step in the process of developing successful strategy for improving security and protecting the direct participants of the sport event, the audience and the security staff [4]. During the sport events, several types of risk may appear: risk for the police, social risk, legal, ethical or moral, and economic risk [12].

Risk for the police includes:

- Endangering the life and health (physical and psychological risk) of police officers who perform their duties and activities;
- Compromising planned measures and activities;
- Providing adequate evidence for further examination;
- Legal consequences for the Ministry, in other words, for the police officers;
- Damaging the reputation of the Ministry, in other words, the reputation of the police officers and
- Reducing the trust in the police.

Social risk refers to risk for the community or the citizens, which means endangering the life or health (physical and psychological risk), endangering the property or personal safety of the citizens, as well as violation of human rights and freedoms which are guaranteed by the constitution, laws and ratified international documents.

Legal, ethical or moral risk refers to violation of legal, moral or ethical norms, in other words, establishing whether the planned measures and activities for achieving the defined goals are in accordance with the legal and delegated acts.

Economic risk includes establishing whether the planned measures and activities, in other words, the considered human, technical and material resources are economically proportional with the defined goals that are about to be achieved, or if there is any danger for larger financial loss for the police as well as for the society as a whole.

Taking into consideration that different types of risks may appear during sport events, the most important is to determine the factors that contribute to security threat and interfere the professional duty performance of the security officers, in this case the police.

Understanding the factors that contribute to the appearance of security risks is a basic precondition for efficient acting by the police, and in this context, as a framework for analyzing the problem we used the 'triangle of violence in sport events', which contains the main elements of a sport event [13]. The three sides of the triangle refer to the risk factor related to the specific characteristics of the facility in which the sport event occurs, in other words the sports venue, the event and the personal traits of the people attending the event.

The first group of factors that contribute to security risks are: distance of the fans/audience from the field, levels of noise produced, seats distribution in the fans area, temperature and weather conditions.

The second group of risk factors is related to what happens during the event, composition and structure of audience, the importance of the event, quality of the game, importance of the match, alcohol availability, crowds, behavior of the audience and length of the game.

The third group of risk factors includes the personal traits of the employees working on the sport event, their training levels, skills, experience, communication, motivation, etc.

If we analyze carefully the three groups of risk factors we can reveal another unique factor related to safety endangerment on a specific sport event, and for this reason, the police officers, while

monitoring sport events, is obligated to constantly control the already identified and described risks, in other words, to be sure whether all possible risks are identified and described, as well as the levels of exposure assessment and the proposed techniques for risk management—‘figure 1’[1], [2]. It is very important that the established risk factors that would negatively impact the safety be adequately assessed, which means a precise formulation of identified risks, reasons of their occurrence, as well as the possible consequences that may arise after the police duty performance.

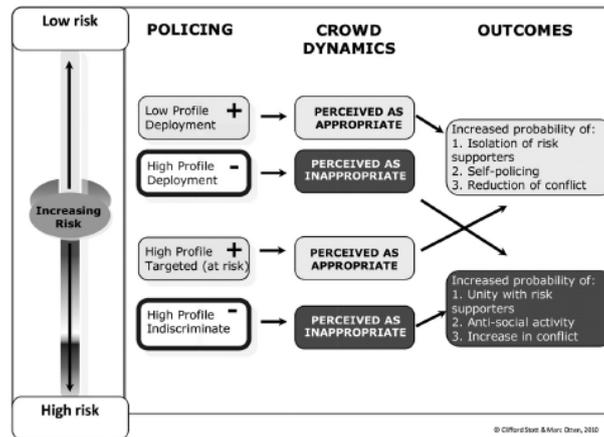


Figure 1. Managing security risk on sport events

There is a possibility that security risks will appear or happen, and with a help of suitable methodological procedure we can determine their extent (risk level, risk index), in order to determine the most suitable methods for handling them, and then, to make decisions that would fully meet the criteria and needs of certain sport event. The basic formula for calculation of risk possibility is the following: $R=P \times D$, where R- extent (level, index) of risk, P- risk possibility and D- possible consequences (damage) if the risk becomes reality. From the two formula components, in the further procedure a variable matrix for risk assessment is being made, where the one variable determines the probability or possibility of the risk becoming reality, and the second variable determines the damage or consequences level if the risk comes true.

Table 1. Matrix for assessment of security risk during sport events

Possibility	Strong/High	3	6	9
	Medium	2	4	6
	Weak/Low	1	2	3
Risk factors		Weak/Low	Medium	Strong/High
Damage				

The identified risks of the both variables are on a scale from 1 to 3, where 1 means weak/low risk possibility, in other words no significant damage or consequences; 2 means medium risk possibility, or medium level of damage; 3 means strong/high risk possibility, in other words, high levels of damage or serious consequences. The total risk exposure in the matrix is calculated by multiplying the numeric values of both variables and it is evaluated as: low exposure (mark 1 or 2); middle exposure (mark 3 or 4) and high exposure (mark 6 or 9). For example, if the risk possibility is evaluated as medium, or numerically with 2, and the damage consequences are evaluated low, or numerically with 1, then these two numbers are multiplied $2 \times 1 = 2$ and the total value is medium risk exposure.

In cases when the risk exposure is low (mark 1 or 2), suitable risk management measures are proposed that would maintain it on the same, or acceptable level. In cases when the risk exposure is medium (mark 3 or 4), risk management measures are proposed that would reduce risk on lower or

more acceptable level of risk exposure. In cases when there is high level of risk exposure (mark 6 or 9), then immediate action should be taken, in other words, to suggest measures that would reduce risk exposure at a lower level. High risk exposure is also referred to as critical risk. High risk exposure is considered critical in the following cases—‘figure 2’ [3]:

- If the safety and health of police officers and citizens are put into danger;
- If it is a direct threat and obstructs the planned goals, such as: unsuccessful division of the opposing groups of fans in the fans area;
- If there is significant material damage or financial loss caused to the police, citizens or community;
- If the risk consequence is violation of a certain law or legal regulation and
- If in certain case, the reputation and trust in the police are being seriously damaged.

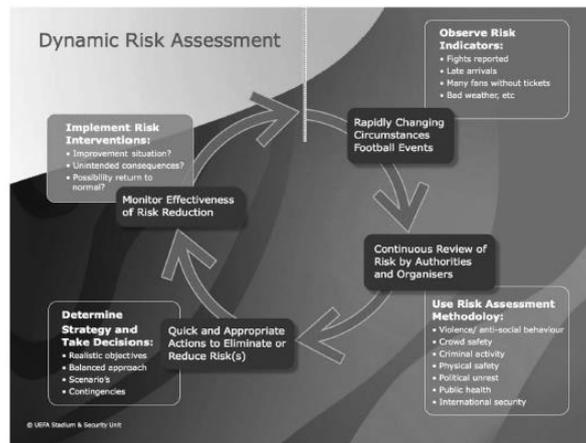


Figure 2. Dynamic risk assessment on sport events

3. Prevention measures and activities of the police during the control of sport events

When we talk about controlling sport events, the police is obligated to make precise and determine its planned activities and to provide conditions for their uninterrupted performance in accordance with the suitable and correct security assessment. This means that the police, according to the type, size and characteristics of the security risk establishes the most important activities with the help of thoroughly elaborated operative plan [14].

During the elaboration of the detailed security plan the police takes into consideration the following elements: type of sport event; place and time of sport event; characteristics of the facility in which the event is held (capacity of the facility, enter/exit distribution, emergency exits, access to the facility, vicinity to other important facilities, etc.); length of the event/match; estimated number of visitors/fans; security assessment in case of violence escalation; security or operative staff; number of authorized officers who will monitor/control the match, their duties and tactical procedure; mobilizing police unit specialized in handling disturbance of public order and peace; mobilizing reserve police unit in cases of violence escalation; number and distribution of operative civil officers and their duties and responsibilities; necessary technical equipment, vehicles and another equipment; mobilizing crime scene technicians with video cameras in order to record and document the audience; mobilizing police dogs; application of chemical elements to temporarily disable the violent groups; providing fire engines; providing vehicles for emergency cases; preparing a plan for traffic adjustment during the event in cases when normal traffic movement is not possible; depending on the situation and in accordance with the security unit manager, undertaking other further activities that would enable safe and uninterrupted development of the sport event.

Based upon the already elaborated security plan, the police starts to apply different security prevention measures and activities in order to provide uninterrupted development of the sport event and to avoid the application of repressive measures with which have to put the situation under control and would

not allow further escalation of violence. In order to achieve the wanted effect during the application of preventive measures and activities, the police would have to constantly collect information on field and elaborate them adequately, because the dynamics of events during the sport match can cause different types of deviant (criminal) behavior such as [7]: physical assault of the participants/players; physical confrontation between the players, in other words attack on the players, physical confrontation between the fans, throwing objects on the field or on the audience; damaging the equipment, devices or installation in the facility where the match takes place; unauthorized entrance on the field or in employee restricted areas in the facility or the part of the fans area assigned for the fans of the opposing team; attempt to bring, in other words bringing alcohol or other narcotics in the fans area; attempt to bring or bringing pyrotechnic devices or other objects that could endanger the safety of the participants in the game; wearing sports scarves, hats or other objects that would cover the face and personal identity; damaging or destroying vehicles when arriving at the match, during and after the sport event; discouraging attempts of stealing or stealing vehicles near the sport venue, etc. Analyzing all circumstances that could negatively affect the security and safety, in addition, there is a general review of prevention measures and activities applied by the police during sport events [3], [11].

- **Preventive measures and activities before the sport event:**
 - attending work meetings with services or individuals that are part of the sport event organization;
 - starting campaigns which aim to educate viewers of the possible sanctions which would result from inadequate or violent behavior during sport events;
 - controlling illegal sale or ticket falsification and forgery;
 - antiterrorist check and control of the sport facility, internal and external;
 - legitimization of individuals or groups who manifest suspicious behavior and warning that they may disturb public order and peace;
 - following and directing fans during their movement towards the sport facility.
- **Preventive measures and activities during the sport event:**
 - monitoring and observing all enters and exits of the sport facility;
 - safeguarding official areas within the facility;
 - dividing the opposing fans in different areas in the viewers area;
 - continuously monitoring the fans and discouraging attempts to enter the field;
 - identifying and recording individuals and groups who manifest suspicious and inadequate behavior in the audience.
- **Preventive measures and activities after the sport event:**
 - directing the groups of fans in different movement routes while they are leaving the sports facility;
 - following the groups of fans and discouraging an attempt of damaging objects or vehicles;
 - organizing special traffic regime for the participants in the game.

4. Conclusion

During the organisation process of certain sport event, every single detail related to security must be taken into consideration. Previous experiences on safeguarding sport events show that the authorised institutions and individuals should have maximally professional approach to this problem in order to detect and prevent all potential threats, risks and dangers. This paper aims to emphasise the importance of preventive planning and proactive approach by the police during safeguarding sport events and mostly the part referring to elaboration of quality security risk assessment. In order to emphasise the role of the police, special attention is put on establishing suitable methodology for appropriate assessment of security risk and finding solutions about the manner of tactical proceeding during policing. Everything that is previously mentioned should help in improving the security level on sport events and to gain the trust of the citizens who should not be afraid for their security, but also to affirm the sport.

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Bio-inspired and origami engineering approaches for project based learning mechatronics

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Abstract. With the advances in technology and more applications becoming real-time and embedded, teaching the mechatronics course only theoretically becomes insufficient. Consequently, project-based learning becomes one of the most effective approaches in teaching mechatronics subjects. The main objective of this paper is to present an innovative approach in project-based learning within a mechatronics course for teaching undergraduate students. The project based learning is presented through student projects inspired by the bio-inspired and origami engineering as new trending fields in mechatronics. The bio-inspired origami concepts in addition of locomotion, actuation, sensing and control have brought up new revolutionary solutions for the mechatronics designs. In this paper, a novel methodology for implementing the project based learning process was described. The course structure, organization and evaluation are explained. An anthropomorphic arm to simulate hand gestures, a scorpion-inspired robot folding as an origami tower and a parallel robot designed with shape memory alloy springs (SMA springs) are presented as three most successful projects. The students' feedback, results and the benefits from the course are also discussed. Conclusions about the project based learning and its effects in teaching mechatronics among undergraduate students are pointed out.

1. Introduction

Mechatronics as one of the most innovative engineering field has not only introduced a synergic integration of disciplines such as mechanics, electronics and computer science, but has also turned the engineering education into a design philosophy [1]. Mechatronic systems comprise a basic system (mechanical, electro-mechanical, hydraulic or pneumatic), sensors, actuators and information processing. In general, a mechatronic system consists of three types of flow: material flow, energy flow and information flow. An overall scheme of a mechatronic system is given in Fig 1.

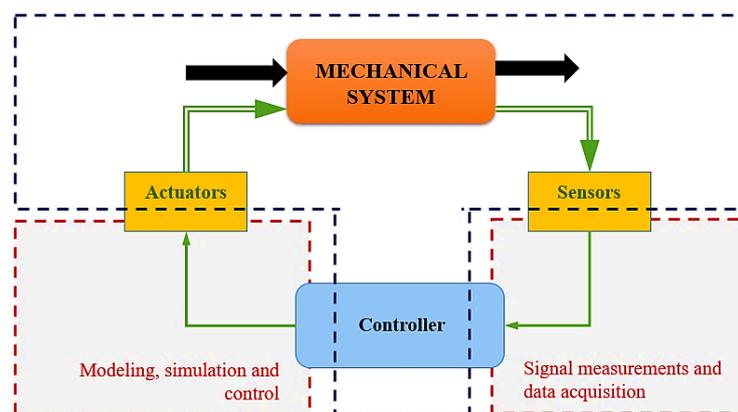


Figure 1. Overall mechatronic system scheme

Mechatronic curricula is a challenging process because it requires creative and critical thinking and also team-oriented skills. There are various methodologies and definitions that have been created to define the mechatronic system design, such as the industrial guideline VDI 2206. This

standard gives a definition about the process of developing a mechatronic system: “The development of mechatronic systems presupposes the fully inclusive consideration of the systems, an interdisciplinary way of thinking, a common accompanying language among the developers and usually the use of computer-aided tools.” Because of the complexity and heterogeneity affecting most mechatronic systems, a systematic procedure is essential. Also, VDI 2206 presents the “V-model” as macro-cycle which is a graphical construct used to connect the model-based learning design and the development methodology (Fig. 2.) [2].

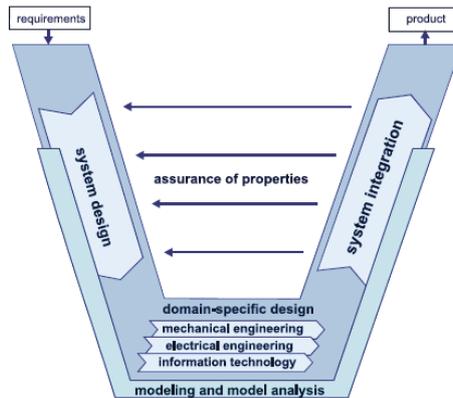


Figure 2. "V-cycle" according to VDI 2206

Based on the inspiration of this system design, the effectiveness of the teaching methods can be enhanced by implementing the project based approach to learning. Project based learning (PBL) presents a methodology for applied engineering education which is created to allow students to develop projects which are applicable to the industry [3]. Apart from the classical teaching methods, project based learning provides the students a chance for a hands-on, real industry problems solving which will make them more competent and skillful for a further job in the dynamic and rigorous engineering labor market [4]. The project based learning opens up new wider ways of creative thinking, develops their skills in decision making, time management and ultimately most important team working [5]. Project oriented education strengthens the development of the soft skills of the students in terms of making their own decisions and taking responsibility in the process of creating an original idea. At the end of the process, their motivation and self-esteem get drastically higher because they feel successful in designing real projects [6]. The final result of practical project implementation is the integration of applying basic knowledge, specific knowledge and acquirement of new theoretical knowledge, but most important in improving students' practical competences [7,8].

Within the study program in Mechatronics in the Faculty of Mechanical Engineering in Skopje, students have been involving in project-based learning process in the past 10 years. The project based learning is implemented through organized projects where students work on predefined tasks that would lead to complete products. In 2010, a project consisting of Universities and EU industry partners has been developed in order to establish connection to the local industry needs [9]. One of the objectives of the project for the Faculty of Mechanical engineering was a development of an autonomous vehicles as a student project industry examples of project based learning which are presented in [10].

The focus of this paper is to present a successful methodology for teaching mechatronic systems by developing goal-oriented student projects within the “Fundamentals of mechatronics systems” elective course in the Faculty of Mechanical Engineering in Skopje. The structure of the paper is given as follows: In Section 2 the teaching methodology and the inspiration for the course implementation is presented. In section 3, the description of the course and the results are described in terms of presenting three case studies as successful projects created by teams of students. In section 4 the conclusions are sublimated.

2. Teaching methodology

In the Faculty of Mechanical Engineering in Skopje, an elective course named “Fundamentals of mechatronics systems” is offered to the students from other mechanical engineering disciplines besides Mechatronics. Teaching mechatronics as a discipline combined of mechanics, electronics and computer programming is very challenging process to fulfill in one semester. The students need to be introduced to voluminous theoretical knowledge about systems, sensors, signal processing and software which is very hard to underline in one book or to be taught in 15 weeks. Based on the previous positive experience, the assistant professor and the teaching assistants who were in charge for the elective course decided to implement an innovative approach in project based learning to students who elected the course.

The idea was to introduce project based teaching mechatronics to mechanical engineering students from different disciplines in engineering such as Thermal Engineering, Hydraulic Power Engineering, Industrial Engineering and Management, Materials, Processes and Innovation, Motor Vehicles, Energy and Environment, Automation and System Control and Industrial Design. The teams consisted of 4 to 5 people and each team had to deliver a project task until the end of the semester. At the primary phase, the students were assigned to do a research within two given topics and choose an interesting segment for further analysis. The goal was that each team to produce a prototype and writes a review paper about the subject they have chosen.

They were given a chance to choose between two topics: bio-inspired engineering and origami engineering. The difference in the approach that was implemented in this case is that the inspiration for the projects came from the research trends in engineering, not from industry problems. Origami and bio-inspired engineering are trendy fields of research which have brought huge interest to the engineering approach concepts. Origami as an art of paper – folding has inspired engineers to design foldable and stretchable active materials and smart structures by using the development of technology to create new products and systems [11]. On the other hand, bio-inspired engineering studies the movement of living creatures and their adaptation to the environment [12]. Origami and bio-inspired concepts of thinking are very interesting especially for young engineers because of their simplicity and appearance in the everyday common life which can be used to make variety of complex forms. The idea of adding sensors and actuators to these forms could lead to creating and building innovative and creative systems, even robots. This made the projects themes more global, challenging and more motivating.

The fact that the teams were consisted of students from different engineering portfolios has widen their vision and creative possibilities in terms of multidisciplinary approach to the given problem. The idea was to introduce mechatronics to students that do not have previous knowledge in the field. Through developing simple, but still attractive and very useful projects they have learned the work and implementation of the sensors, actuators and computer programming as a consisting parts of mechatronic systems.

The course “Fundamentals of mechatronics systems” was organized by dividing the 68 students in teams consisting of 4 to 5 people. Every team was allowed to have only one member from each study program in order to keep its multidisciplinary content. The teams were given to choose between two trending research topics: bio-inspired engineering and origami engineering. They were given a period of one week to explore and read about the topics and to choose an interesting specific problem under these topics, observed in 5 relevant (not older than 5 years) scientific papers. The two teaching assistants and three students’ assistants presented the students how to proceed the process of searching and exploring successfully in order to find relevant information.

They introduced them to “Google scholar” as a vital searching machine to get to important research and review papers. After the first week, the teams presented their ideas in front of the professor and two teaching assistants and explained their vision and plans on how the project will be realized. These ideas were discussed and approved or in some cases modified by the professor. Their resources were framed only in terms of limited time and money. They were allowed to use components only from the Mechatronics laboratory under the Faculty or to spend additional 10 Euros per team and were given a period of 10 weeks to complete the projects. During the working process they were monitored by the teaching assistants who asked for a weekly report about the progress of the

work, but were also helping them with certain problems they were facing. They were also analyzing the students team work and the atmosphere among the team partners. In the meantime, the students' assistants were teaching the students software programming in LabVIEW which is a part of the subject content. At the end, the total grade of the project teams in general, and of every student separately was evaluated by the following criteria:

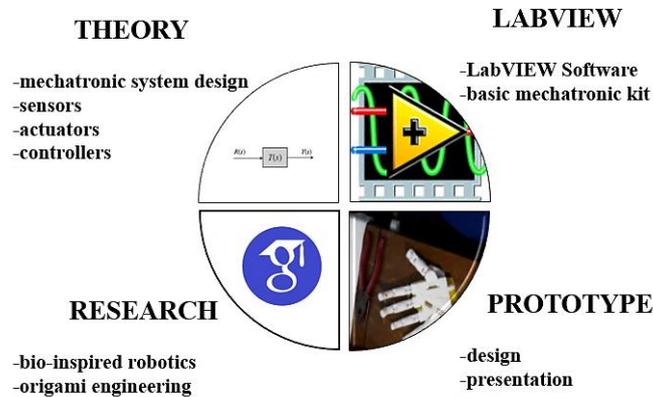


Figure 1. Course structure

In the 6th week of the semester, the students were tested over the theoretical concept. In the 12th week they had another test in a form of LabView exercises which contributed with another 25%. The rest 50% were given to the students according to the quality of the review paper they have written and the prototype that they were expected to make at the end of the semester. Every part of the subject was quantified equally with 25%. After the 15th week, the professor and the teaching assistants organized a class where all of the teams had to present their prototypes in front of all the rest. Each team was given 15 minutes to present a PowerPoint presentation about their work and to show their prototypes. After that, they were evaluated by the professor, the teaching assistants and the students themselves. Each student was graded according to the percentages from the self-grading and percentages from the test.

Each of the segments of the course structure contributed to upgrading students' skills equally effective, but in different aspects. The theory that they have been taught and afterwards examined helped them in concepts understanding and improving their technical literacy in mechatronic field. They have learned the principles of work of components that one mechatronic system is built of and the physical and engineering processes happening meanwhile.

The LabView software provided the students with a hands-on experience in software analysis and interfacing and DAQ analysis which created a virtual image about a mechatronics system function. This helped them understand the signal processing and measurements as a necessary part of a properly working intelligent systems. In order to write the review paper, they needed to learn how to search on the Internet for relevant information such as books, articles and papers.

They were introduced to Google scholar as a way of searching which has never been mentioned or used during their studies. They learned the meaning of citation and how to use them. Also, in order to write their own research paper, they were introduced to the key-points of a paper structure and the methodology of writing a paper. When their papers were finished, they were taught how to check them for plagiarism online.

On the other hand, apart from the technical knowledge they got through studying the theory and software, they also progressed in developing their soft-skills through their work on the prototype. Since they were working in multidisciplinary teams, they had a chance to work on the design and building while compromising and choosing the most attractive ideas, collaborating as a team. It was very challenging to decide which member of the team will do a certain part of the work, how to function together and to cope with the problems that are inevitable.

3. Case studies

The process of working on the projects resulted in upgrading not only the theoretical, but also practical education, but also their team spirit and soft skills were developed. Through working on a specific project in a multidisciplinary environment, their motivation and inspiration for self-proving increased. At the end of the course, they were feeling proud and appreciated because their projects were successful and their prototypes were properly working. The course resulted in different, very prosperous projects. In this paper are presented the inspiration, the idea and the final results from the best 3 of them.

3.1. *Glove controlled robotic hand*

This project was inspired by the field of bio-inspired mechatronics which has experienced a steady rise in the last decade. The bio-inspired mechatronics is inspired from the living biological organisms and their amazing adaptive behavior provided by their structural modularity. The purpose behind the idea of bio-inspired robotics is the mimicking of the movement of the biological systems which provides processes of self-repair and self-reconfiguration.

This project presents an anthropomorphic hand inspired by the human hand. The goal of the project was to create and be able to control the gestures of an anthropomorphic hand using a sensor infused wearable glove that can translate the gestures of the wearer onto the anthropomorphic hand, using potentiometers as sensors. The prototype of the hand is shown in Fig.4. The glove is comprised of actuators, sensors and an Arduino board, combined with mechanical components to simulate hand gestures.

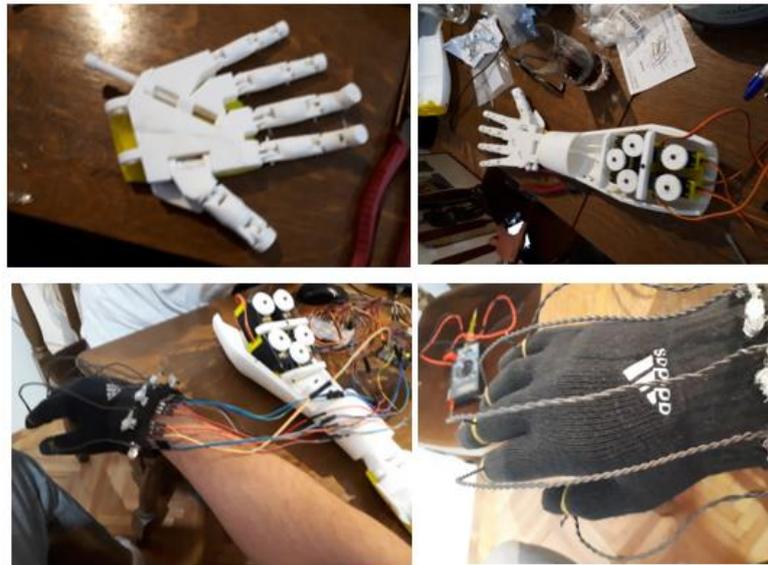


Figure 4. Prototype of the robotic hand

The glove controller is made up of a glove and five sensors, connected to points on the glove by metal wire and elastic bands. The sensors are located on the lower part of the glove, opposite of the fingers and is reinforced (in order to be able to carry the sensors) by a wristband made from metal that loops around the wearers wrist. The sensors are pushed through the metal wristband and are connected to the metal wire by silicone.

By developing this project, different aspects of mechatronics were touched. The students learned the process of designing the hand and the process of making a physical model by 3D printing it. Also, they have explored the variety of sensors and their properties in order to select the most adequate ones for sensing the human gestures motion. They had to investigate the process of actuation through different types of motors and decide which ones to implement, also depending on their programming

requires. For the programming, an Arduino microcontroller was chosen as the most common microcontroller to use in educational environments.

3.2 Origami robot

The main inspiration behind this project is the origami technique which relays on the ability to transform a flat sheet of paper into a finished design by folding it. In mechanical engineering, the origami approach provides a new aspect for compliant mechanism devices which enables relative movement between the components with a reduction of the number of parts, rigid joints in a structure and manufacturing costs.

The students' vision for the project was to implement the origami technique in a bio-inspired robotic system. They came up with the idea to create a scorpion-tail-like robot using the origami technique of constructing its body. The design presented here relays on inter-connected origami towers, but could also be easily disassembled to develop a modular concept. The developed a conceptual model, supported by CAD models and mathematical models for variables parameterizing.

As a proof of concept, a simplified prototype has been developed to show the potential performance of the robot (Fig. 5). The main building unit of the robot is the origami tower which provides translational and rotational motion. The basic structure is built from thick paper with plastic coatings. The thick paper itself is lightweight, but at the same time flexible. The paper origami towers in the first platform are placed on specialized 3D printed holders that will allow the rotational motion from the step-motors to be transmitted. Actuating and maneuvering the robot in the main concept is done by separated electro motors, built in the platform. The controlling and actuating of the step-motors is done by using Arduino Nano and L298N motor driver. Having a higher number of separated movements combined leads to a smooth bionic movement.



Figure 5. Prototype of the modular origami robot

Additional control for more precise height and bending angles positions can be achieved by adding shape-memory alloys (SMAs) springs. The springs can help the step-motors in holding a constant predefined point.

Throughout the process of developing this model, the students had to get to know to the basic principles of designing both kinematic and dynamic virtual model and real prototype. A great challenging aspect was to control the movement, which means to select the right type of actuation and control. Another aspect is the investigating of the properties of shape memory materials (Ni-Ti springs) which were used as additional control and motion improvement of the robot.

4. Soft skills development

The project based learning conducted within the “Introduction to mechatronics” class is a process of inductive teaching and learning which focused on developing innovative thinking in students. For the students, it is not sufficient to only obtain technical skills and knowledge, but also to develop communication and team-based skills. This approach utilizes real problems, not hypothetical ones and learns the students how to function in a systematic and progressive way. Besides the classic way of grading and questioning, the course included self-directed learning and learning from the peers.

The students were divided in teams and were given limited time and money to construct their project prototype. This resulted in increased sense of responsibility and resource management. Given the task to create a project prototype on a subject they have never read about was very challenging for them and developed their research, problem-solving and critical thinking skills. The team-work upgraded their awareness of discipline and strive to achieve success in order to stand out and not disappoint their team members. They were motivated to deliver the given task in terms of creating the best technical solution, but they also had to pay attention of their relationship and communication with the rest of the students. As a new aspect, they were introduced to academic writing for the first time. Throughout the semester, they were constantly learning and comparing each other's work, which created a positive and healthy competition. The grading was separated in four equally valued parts (theory, software, review paper and prototyping) which tested their capabilities of strategic thinking in terms of organizing the work more effectively, efficiently and systematically. At the end of the course the students' feedback was most important. Often, traditional learning never goes beyond the realm of the purely academic.

Project-based learning connects students to the real world. PBL prepares students to accept and meet challenges in the real world, mirroring what professionals do every day. After the course, an evaluation of the process was conducted in order to hear the students' comments. They felt very satisfied with the work done and have stated that the team work has made them more brave and encouraged about bringing their own ideas and be confident about them. Also, they said they were happy that they could talk to their professors about the problems and they could freely share what they think without being judged. They said that they were feeling self-confident and stated that they feel like they have improved their knowledge, attitude, values and engineering skills. They feel like they have recognized some skills they were not aware they possess which felt very motivating for them. They realized that engineering, especially mechatronics, is more than just facts and equations.

5. Conclusions

In this paper an innovative methodology to mechatronics course was presented. The main aim of these projects was to implement the project based learning in the “Fundamentals to mechatronic systems” class held in the Faculty of mechanical engineering in Skopje. The project based realization of the subject resulted in being very successful.

The first project presented the development of a human like robotic arm and a sensor infused glove controller that is able to control the movement of the fingers of the robotic arm. In the second project, a design of bio-inspired origami robot design was presented. The robot has a scorpion tail-like design providing modularity by independently actuated modules. The third project introduces modeling and a simulation of a segmented bio-inspired robot in multi locomotion mode. Parametric variation of outside load and different boundary conditions result in different locomotion loads: crawling, rolling and grasping.

Based on implementing the project based learning experiences, it can be concluded that the main benefits of project oriented education are acquiring basic and specific knowledge and application of the acquired knowledge unlike the traditional education approach. As an overall conclusion from this process is that both teachers and students have to show bigger commitment and responsibility in the process of teaching and learning. The project based learning have shown to be the most adequate methodology for teaching mechatronics in specific, but engineering in general, because it represents a link between the education and the industry. This way of learning provides the students competences that drastically increases their chances of success in the modern world.

The work of the team led by the assistant professor, as well as videos from the projects that were constructed at the end of the semester within this class can be followed on <http://ms3lab.com/>.

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Moodle as an advanced distributed learning platform

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Abstract. The paper reviews Moodle as a free, globally supported ADL platform. Moodle's customizable core comes with many features, which meets all the needs, whether for civilian or military purposes. Moodle's general features offer an easy to use interface designed to be responsive and accessible. Furthermore, Moodle offers a personalized dashboard, collaborative tools, and convenient file management. Aside from its general features, it also offers a wide range of administrator features which include, customizable site design and layout, secure authentication, simple plugin management, detailed reporting and logs. Overall, Moodle's platform consists of courses containing the learning materials with three different elements, Activities, Resources and Blocks, which together assist in the learning process. There are a number of other tools that make it easier to build communities of learners, as well as useful tools like grading, reports, and integration with other systems. Moodle is used by a variety of institutions and individuals, for various purposes. Based on features evaluated in this paper, Moodle offers a proven ADL platform, which is designed to support both teaching and learning, and is easy to set up and use due to its high flexibility and customization. It can be used anytime, anywhere, and on any device.

1. Introduction

Web-based learning has been introduced as a tool in the learning process in the majority of the international universities worldwide. As a matter of fact, its use increases in a direct proportion with the increase of the number of students. E-learning has grown in significance as an educational tool just like technology has developed and progressed over the years. [1] This has made educators divert a lot of effort in helping the learners to get content that is necessary for their learning process. However, not all students can develop an effective way to learning on their own. The increasing popularity and number of online programs require educators to utilize and adopt to the most valuable one, in order to enhance their learners' experiences in online learning environments.[2]

The goal of this paper is to review the most valuable option for online learning, the Moodle's online learning platform, highlight its features and show how they influence in learners learning performance and make online learning environment a valuable asset in distributing knowledge. How Moodle's e-learning platform through its features gives students' greater access to education in comparison to traditional methods of teaching, as students can undertake their study from anywhere and at any time as well as being given the option to study part-time or full-time. This allows the students who have been enrolled on e-learning courses to outperform those being taught on traditional courses. Due to the mentioned reasons, choosing a proper online learning platform is one of the keys to successful education, therefore, it is very important for educators to familiarize themselves with the features and options those platforms can offer.

2. What is Moodle?

Moodle represents a learning platform designed to provide educators, administrators and learners with a secure and integrated software to create personalized learning environments. Powering a dozen of learning environments globally, Moodle is trusted by institutions and organizations large and small. Moodle numbers more than 90 million users across both academic and enterprise level

usage making it the world's most widely used learning platform. Moodle's multilingual capabilities ensure there are no linguistic limitations to learning online, and it is available in more than 120 languages. Moodle is web-based and can be accessed from anywhere in the world. With a mobile-compatible interface and cross-browser compatibility, Moodle platform is easily accessible across different web browsers and devices. From a few students to millions of users, Moodle can be scaled to support the needs of both small classes and large organizations, due to its flexibility and scalability, Moodle has been adapted for use across education, business, non-profit, government, and community contexts.

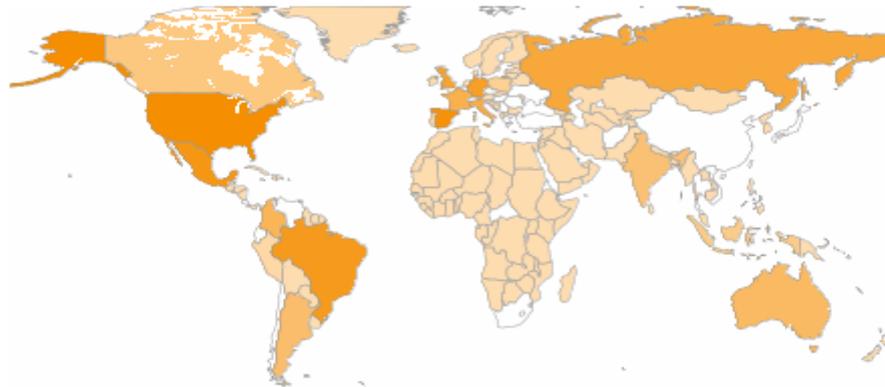


Figure 1. The figure shows usage of Moodle's platform all over the world.[3]

Moodle is provided freely as Open Source software, which allows anyone to adapt, extend or modify Moodle for both commercial and non-commercial projects without any licensing fees. The Moodle's open-source approach means that Moodle is continually being reviewed and improved on. Furthermore, it delivers a powerful set of tools and collaborative learning environments that are designed to support both teaching and learning. Its simple interface, features, and well-documented resources make Moodle easy to learn and use. Moodle also safeguards data security and user privacy, security controls are constantly being updated and implemented in Moodle development processes and software to protect against unauthorized access, data loss and misuse. Moodle can be set up on a private secure cloud or server for complete control.[4]

Registered sites	104,570
Countries	224
Courses	19,298,032
Users	163,491,890
Enrolments	769,808,689

Figure 2. The figure shows Moodle usage statistics.[5]

2.1. Moodle's standards

Moodle is a global learning management platform that supports open standards and is interoperable by design to enable integration of external applications and information onto a single Moodle platform. Moodle's commitment to open standards means institutions and organizations are able to customize and extend its features for any teaching and learning requirements, and benefit from increased cost efficiencies, flexibility, easier manageability along with performance and scalability. Moodle has achieved and is compliant with the following international standards:

- Open Source Initiative
- IMS LTI™ Certified (Learning Tool Interoperability)
- SCORM-ADL compliant (Sharable Content Object Reference Model)
- Open Badges

Moodle supports integration and use of content from different sources. Moodle platform is designed to exchange data using open industry standards for Web deployments, and supports:

Authentication

- Enrolment
- RSS newsfeeds
- Content using the import of Reusable Learning Objects
- Quiz questions via import and export using a variety of formats.[6]

3. General features

Moodle offers a modern, easy to use interface which is designed to be responsive and accessible on both desktop and mobile devices. Alongside with that it also provides a personalized dashboard that can be fully customized, which displays current, past and future courses, along with tasks due and allows users to easily track required activities and filter courses. Furthermore, it comes with a set of collaborative tools and activities that allow users to work and learn together. They include, assignments which enable teachers to grade and give comments on uploaded files and assignments. A chat that allows participants to have real-time discussions, a database that enables users to create, maintain and search a bank of record entries, feedback which allows creating and conducting surveys for gathering data from users that help teachers learn about their class and reflect on their work. The lesson activity offers delivering content in flexible ways, quiz activity also allows the teacher to design and set quiz tests, which can be automatically marked. Above all, the workshop activity enables peer assessment and moodlewiki provides a collection of web pages that anyone can add to or edit.



Figure 3. The figure shows Moodle's interface across various platforms. [7]

One of the most important features is the ability to progress. Educators and learners can track progress and completion with a set of options for tracking individual activities or resources. There are several ways to track user progress in Moodle. Every course has its own Gradebook, activities such as Assignment and Quiz send grades back to this gradebook and it is also possible for educators to enter grades directly into it. Competencies describe the level of understanding or proficiency of a user in certain subject-related skills, this refers to systems of assessment and grading where students demonstrate these competencies. Another feature are the badges that can be awarded either manually or using activity completion settings in a course and are a way to motivate users. Users may be awarded badges at different stages of the course for different levels of progress. The Analytics feature Moodle, provides detailed descriptive and prescriptive reports to support learners. On top of all, a number of Course reports are available to the educators in their course to help them track the progress of all users. In addition to the activity and course completion reports, there are also activity reports, participation reports and general course logs.

Another general feature are the Notifications which allow users to receive automatic alerts on new assignments and deadlines, forum posts and also send private messages to one another. Furthermore, it offers convenient file management which offers an easy way for educators to present materials to their learners. Materials may take the form of files such as word-processed documents or slideshow presentations. The materials can be displayed on the course either as individual items or bundled together inside folders.

4. Administrative features

Aside from its general features, the Moodle platform comes with a set of very important administrative features. Customizable platform design and layout allows the educators to easily customize a Moodle theme with their logo, color schemes and much more. Secure authentication and mass enrolment features offer over 50 authentication and enrolment options to add and enroll users to the Moodle platform. Platforms multilingual capability features allows users to view content and learn in their own language, and educators to set it up for multilingual users and organizations. Administrative features also allow the educators to manage user roles and permissions, which address security concerns by defining roles to specify and manage user access. Furthermore, they offer high interoperability, which allow the platform to freely integrate external applications and content. They also offer regular security updates with the latest security patches to help ensure that the Moodle platform remains secure. On top of all they also offer detailed reporting and logs with the ability to view and generate reports on activity and participation at platform level.



Figure 4. The figure shows website layout and theme customization. [8]

4.1. Course Development and Management Features

A course in Moodle is an area where educators can add resources and activities for learners to complete. It can be a simple page with downloadable content, or it can be a complex set of tasks where learning progresses through interaction. Course development and management features offer direct learning paths which allow educators to design and manage courses to meet various requirements.

Classes can be instructor-led, self-paced, blended or entirely online. Such system encourages collaboration alongside with built-in collaborative publishing features foster engagement and encourage content-driven collaboration. Moodle also allows the use of external resources which give the opportunity to educators to teach materials and include assignments from other sites and connect to the gradebook in Moodle. Moodle also offers a complete multimedia Integration, with built-in media support enables users to easily search for and insert video and audio files in courses. In-line marking options provide in-line feedback and easy reviewing by annotating files directly within browser.

Group management features provide educators with the option to group learners in order to share courses, differentiate activities and facilitate team work. Built-in activities such as workshops and surveys motivate users to view, grade and assess their own and other users work as a group.

Competency based marking includes personal learning plans across courses and activities. Most importantly, security and privacy options allow educators to teach and share in a private space only they and their class can access. Furthermore, outcomes and rubrics features give them the option to select from advanced grading methods to tailor the gradebook to their course and examination criteria.[9]

5. Moodle's philosophy

The design and development of Moodle is guided by the main concepts of constructivism, constructionism, social constructivism, and connected and separate. From a constructivist point of view, people actively construct new knowledge as they interact with various different environments. Knowledge is strengthened if it can be used successfully in a wider environment. Knowledge cannot be obtained by passively absorbing information, nor can knowledge be transmitted to a person just by reading something or listening to another person.

This is not to say that people can't learn anything from reading a web page or watching a lecture, obviously they can, but Moodle's developers understand that the key to obtaining knowledge is not transfer of information from one brain to another, and that there is much more interpretation going on in the process of learning and obtaining new knowledges. Furthermore, constructionism asserts that learning is particularly effective when constructing something for others to experience. On the other hand, social constructivism extends constructivism into social settings, wherein groups construct knowledge for one another, collaboratively creating a small culture of shared artifacts with shared meanings. The connected and separate behavior looks deeper into the motivations of individuals within a discussion. In general, a healthy amount of connected behavior within a learning community is a very powerful stimulant for learning.

Consideration of these concepts can help to focus on the experiences that would be best for learning from the learner's point of view. These concepts can also help realize how each participant in a course can be a teacher as well as a learner. The job of a teacher can change from being the source of knowledge to being a role model of class culture, connecting with students in a personal way that addresses their own learning needs, and moderating discussions and activities in a way that collectively leads students towards the learning goals of the class. Moodle inspires this style of behavior, and this is what the designers believe that it is best at supporting. In future, as the technical infrastructure of Moodle stabilizes, further improvements in pedagogical support will be a major direction for Moodle development. This makes Moodle's platform stand out from the others.[10]

6. Conclusion

In short, the key of Moodle's online learning platform are the courses that contain activities and resources. There are different types of activities available and each can be customized to suit everyone's needs. The main power of this activity-based model comes in combining the activities into sequences and groups, which can help guide participants through the learning process. There are a

number of other tools that allow Moodle to distribute knowledge online, including blogs, messaging, participant lists, as well as useful tools like grading, reports, integration with other systems and so on. Overall, a learning environment needs to be flexible and adaptable, so that it can quickly respond to the needs of the participants within it, and Moodle excels in that. Furthermore, learning in a modern world the most effective way of learning, is learning by doing. Traditional learning methods give students little opportunity to practice the activities they are learning about, contrary to this, Moodle's platform allows for a more modern approach, as it allows expressing and presenting posts, projects, assignments, and constructions for others to see. Combining all the above, Moodle's platform gives users tailored opportunities to share ideas, ask questions and express their knowledge, creating an environment which is flexible, both in time and space.

As Moodle has spread and the community has grown, more input is being drawn from a wider variety of people in different teaching situations. Moodle development is increasingly influenced by its community of developers and users. Moodle is an active work in progress and constantly evolving to a better state, and due to its open source nature it allows its huge community to contribute and change the platform towards a better state. All in all, combining all of the above, similar features are hard to find for no charge and that is what makes Moodle the perfect advanced distributed learning platform intended for every use.

That way it empowers educators to improve our world and gives their students most effective platform for learning. In the end, education is the foundation of making the world a better place, and Moodle is always looking for ways to improve how we learn, treating all of its users with respect and sensitivity, recognizing the importance of their contributions: team members, customers, partners, suppliers and competitors, while employing the highest ethical standards, demonstrating honesty and fairness in every action, and encouraging a culture of experimentation and research, where prudent risk-taking is encouraged, rewarded and incorporated.

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Learning strategies and metacognitive awareness

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Abstract. Metacognition is an essential skill or ability in critical thinking and self-regulated, lifelong learning process. Now metacognitive awareness involves self-reflecting on these learning processes in order to understand and improve them. It is important for learners and students to have skills and abilities in metacognition, because they are used to monitor and to regulate reasoning, comprehension and problem solving in every field of education, which are fundamental components of the educational system. Most of the students who succeed academically often rely on being able to think effectively, and independently in order to take charge of their language. This kind of students have mastered fundamental, but crucial skills such as keeping their workspace every time organized, completing tasks schedule, making a plan for learning and recognizing when it might be useful to change course. Learning cognitive and metacognitive strategies often offers students the tools to “drive the brains“. Being metacognitive in the community means to be more reflective, conscious and aware of one's progress along the learning path. Teachers can help learners and students develop metacognitive skills and abilities within the classroom by carefully designing learning activities within courses and the curriculum.

1. Introduction

Most of the models of metacognition assume that students are active learners. They construct their own strategies, plans and goals and actively regulate various elements of cognition, motivation and behaviour toward their learning goals. The own self-regulation and self-discipline of students is a metacognitive or cognitive skill or ability which mediates between the individual students performance, different contextual factors and personal characteristics of the student which makes them successful in every field or degree of education. Today the focus on metacognitive it's in contrast to an emphasis on metacognitive and cognitive content knowledge which until recently has dominated educational theory, policies and practice, which makes the work easier to students and even more to the teachers [1]. Many research papers and studies demonstrate that both metacognitive and cognitive abilities and skills are crucial to student learning and achievement [2]. Today, having a successful work career is an essential part of everyone's life, since it offers necessary financial and economic means, which are important to the physical and emotional comfort. Work and career achievements express a significant source of fulfilment that can be a very important factor of influence for a successful student. Most of us try to find a workplace or build a career that fits best to our present conditions.

The considerations may include personal, social or environmental characteristics, short and long-term needs, simultaneously attempting to reduce the eventual discrepancies within these necessary domains. All of these different processes presume the existence of specific strategies which we can acquire, update, enhance the knowledge base necessary for the successful fulfilment of different work and private-life-related tasks. Learning processes depend on personal (skills/aptitudes, attitudes, interests, age, gender, stamina, health, concentration of the student or learner) and

environmental (emotional and instrumental support, cultural and sub-cultural values and norms regarding learning) factors as well as on their constant interplay [3]. For instance, a student or learner endowed with average levels of intellectual competences may still attain high levels of academic performances if he/she can complete these abilities or skills with specific learning strategies, by which he/she may optimize the learning process itself.

2. Related work

Metacognition is defined as the „thinking about thinking“, because it refers to a person's knowledge, metacognition and cognition about cognitive and metacognitive phenomena“[1]. This type of metacognition and cognition regulates the students and learners thinking and learning and consists of three different self-assessment skills and abilities: planning, monitoring and evaluating, which are important components to define the success and achievement of the student.

Researchers have investigated three aspects of metacognition: metacognitive knowledge, metacognitive monitoring and metacognitive control [4]. Metacognitive knowledge is the information you consult when thinking about an idea, where it includes the basic facts and concepts. Metacognition monitoring is the ability to assess cognitive and metacognitive activity whereas metacognitive and cognitive control is the ability to regulate cognitive activity. Metacognitive control express processes that readers use to regulate their reading to the demands of the task and engage with the comprehension process [4]. These three aspects of metacognition are very important for the students and learners, in order to have better results and achievements in their job or future career in different fields.

Now metacognition is important in every profession. There are many reasons why metacognition is important in education, science and other scientific fields, from being a better student to becoming a better learner or teacher of the next generation. During the learning process, metacognition guides our learning strategies. Today, every successful student or learner uses different methods and many different strategies to be more successful than their generation. The strategies or the methods that they use depend on their plans and vision for the future. If the students or learners know what they know and do not know, they can focus every time on acquiring the knowledge they are lacking.

Metacognitive skills and abilities also have a role in critical thinking and problem solving, which are important elements of helping students and learners in achieving their dreams, as well as to be more successful in education. If you know what you know and do not know, your metacognitive skills and abilities will help you to drive yourself to obtain the missing information, which we refer to as self-directed and self-regulated learning [5].

3. Proposed framework

Education failures are one of the biggest problems of our generation. Every day the level of undergraduate students is increasing and that can lead to many problems around the world. Our generation must study more and start to think in which way to solve the problems of the next generation and how to improve the educational system [6]. The educational system must be better with the development of technology and industry, only in that way we can improve our life and increase the education to the younger students of this generation. Solving the educational errors, we have the chance to lead to success and achievement of the new generation and we can have better life in every field. On the path to success and development in education, we can implement many methods and strategies within the educational system. In that way we can develop successful students and learners, which can be the leaders of this generation.

3.1. *Metacognition and study skills*

Metacognition is crucial in controlling and guiding thinking, which helps students and learners to become more self-regulated in their educational process [1]. Our proposed framework of metacognition affects study time for the students. This model includes study preparation (self-efficacy evaluation, task appraisal and initial strategy selection) followed by monitoring and assessing if the

to-be-learned items had been learned and fed back into the cycle to re-study unlearned material [7]. This proposed framework will help the students and the learners to use the best strategies and methods to become more successful. Several investigators and researchers found that students and learners are unaware of the effective study and learning strategies, which impacts performance [8-10]. Many learners and students have displayed overconfidence in self chosen study strategies and methods for academic performance and have demonstrated lower correlations between self-predicted and actual performance in learning and studying assessments [2], [11]. This pattern of overconfidence may be more apparent in low-performing learners and students [9]. The issue of selecting study and learning strategies is complicated because it requires selecting learning and studying strategy, by applying metacognitive and cognitive knowledge about which learning strategies are beneficial for long-term memory and knowledge. Several studies report learners and students using low-impact study and learning strategies such as re-reading and highlighting notes. Many undergraduate students reported that the study skills and abilities they use were learned on their own and not taught to them in formal manner by teachers [12]. These are the reasons why students and learners do not have good results in the educational system and do not have many achievements.

The selection of poor study strategies and methods raises the questions of whether those improvised strategies, methods, presumably based on intuition or metacognitive feedback, are consistent with the evidence. This hypothesis raises a second question, whether instruction on learning and memory topics could improve metacognitive awareness of successful learning strategies and methods. Recently it was reported that students who have engaged in their study and learning skills development use better strategies, but the low impact of the applied strategies and methods still predominates [10]. The university members and staff have to formally teach study skills to their students [13].

3.2. Metacognition and self-directed learning

Most educational systems encourage lifelong learning and studying because of the ever-changing educational landscape. Lifelong learning and studying requires self-direction and self-regulation that improves the results and achievements to students and learners, which are the future of this digital and virtual mixed generation [14]. By improving the components of education, we have the chance to improve the lifelong memory and knowledge of the students or learners. Self-directed learning and studying is the result of allowing learners and students to make decisions about the information they want to experience or learn [15]. We know that today, many students have to learn a lot of information that they will not need in their near future, and that will be then the reason why they do not have good results. In a realistic learning and studying situation, self-directed learning is difficult and in formal education setting, information is limited and governed by the teacher. While this is limiting, teachers need to set learning and studying objectives for new learners, because these learners are not in a position to be self-directed.

They do not have the skills, abilities and knowledge that are needed for becoming a teacher, where also limiting resources for finding different information may be appropriate early on to help build efficiency into the learning process. Providing guidance can lead to a passive learning environment, which is not a good choice. However, within a passive learning environment, learners and students selectively attend to different environmental incentives [16]. As an example, in a passive learning environment learners may actively evaluate what has been said or engage in self-explanation to decide what other information is required.

Self-directed learning differs from self-regulation. Self-regulation is how individuals guide their own goal-directed activities over time. The self-directed learning and studying is designed for maximizing the long-term interests, memory and knowledge of an individual, resulting in students or learners controlling their impulses and looking out for their well-being [16]. Self-regulated learning and studying modulates various processes like for example: cognitive, metacognitive and behavioral, to help reach the desired goal of the student or learner. These regulatory mechanisms and methods are the essentials of self-regulated learning, because they are under the control of the learners and students, and would be the basis for the future professional development like for example: continual

professional development and long-term development. The self-regulated behaviors include planning, monitoring, effort and attention. Planning and monitoring are components of metacognition. When learners and students engage in planning activities, they think through what they need to learn and set task-specific goals that help them to improve the success in education [16]. Once they learn to plan, then they need to monitor. Monitoring refers to paying attention to one's performance, skills and abilities and understanding of the course material. Monitoring is a critical component of self-regulation, because it provides awareness of one's knowledge, skill and ability level, which then leads to changes in one's affect, cognition, metacognition and behavior [15]. Accurate monitoring enhances the regulation of learning because it provides feedback to what trainees already know and where they need to focus their resources [14-15].

3.3. Metacognition and critical thinking

Critical thinking involves cognitive, metacognitive and dispositional components, which are so important in education. The cognitive component represents the abilities to comprehend a problem and apply cognitive skills and abilities to make sound judgements. Metacognitive strategies and methods enable learners and students to supervise and control their thinking process. The dispositional component influences the patterns of intellectual activity, where these can include the enjoyment of thinking, learning, an open attitude, a careful approach and a mindset for truth seeking [16]. A critical thinker is one in charge of their thinking processes, while on the other side metacognitive strategies and methods enable such control to take place. The metacognitive aspects interact with a variety of internal and external factors that are important to learners and students such as type of instruction, family background, socio-economic status and environment.

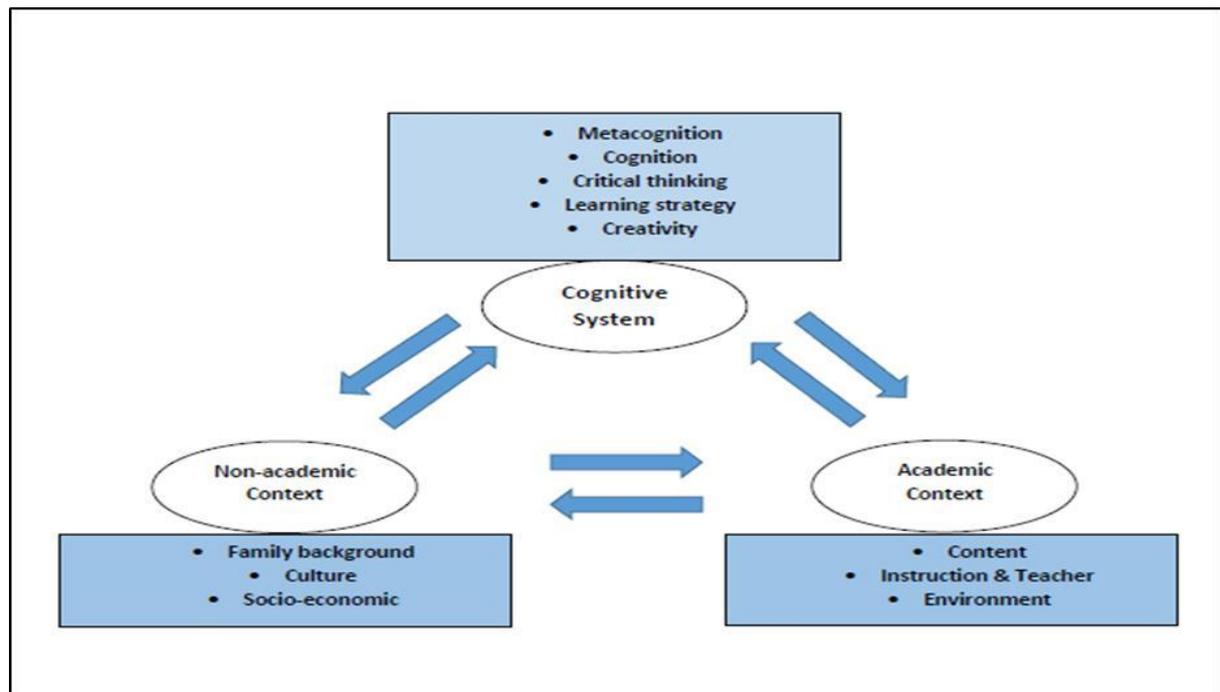


Figure 1. Proposed framework for metacognition awareness.

Metacognition is the ability to monitor thinking and learning for using different skills and abilities appropriately, in order to achieve a desirable outcome. Many researchers defined a critical thinker as one who applies appropriate skills, methods and strategies to achieve a desirable outcome [11]. As such, critical thinkers strategically use cognitive and metacognitive skills and methods that are best suited to a particular situation, which makes them more successful in achieving their goals. They are aware of their thinking and thus control their thinking processes. Metacognitive strategies

are an important variable during thinking processes [2]. They need to be made more explicit and public, for the purpose of developing critical thinking skills, abilities, methods and strategies [12].

3.4. Overview of instructional approaches to teach metacognition

Metacognitive processes are tough to the learners and students in conjunction and alignment with cognitive and metacognitive processes and separating the two processes is challenging [14]. One key instructional strategy is developing metacognition and cognition apprenticeship. Cognitive apprenticeship is „learning through guided experience“. In this proposed framework, metacognitive and cognitive processes and skills used when performing a task are explicit and public and are the focus of teaching and learning activities [17-19]. There are three dimensions of metacognition in this proposed framework, which are reflecting the three dimensions of metacognition [11], [20-21].

The first dimension includes content knowledge, for example: concepts, procedures, processes and facts, and strategic knowledge. These contents are important to the students and learners in the educational system, because by using this kind of contents we can add many more information. In that way we can easily learn and study new things and with that we can improve our long-term knowledge and memory. It may be helpful to have a heuristic (short-cut) or algorithm (formula) to follow in developing the skill and ability, and the instructions should have a content component or direct instructions on how to work through process [20].

The second dimension of cognitive apprenticeship is an extension of scaffolding. This concept refers to the importance of sequencing task complexity, the diversity of problems and to migrating from global to local skills and abilities. Task complexity for the defined problems starts with building complexity from experience. The diversity of problems helps the learners and students to build more generalizable skills and abilities. When we use a diversity of problems, we are approaching similar problems from different contexts to help build context-independent knowledge, skills and abilities. When students and learners learn, they form a memory trace for the information they want to learn. This memory is dependent on the cues available during the learning context. We can recall this information only if we receive the correct cues. If we see the content, skill or ability with a wide array of problems, we can retrieve the information from a variety of cues and contexts and start to make generalities. After the faculty scaffolds and sequences appropriately, they move the learners and students from global skills and abilities to local skills and abilities. At this point, learners and students should have a clear conceptual model of the tasks or processes before executing its parts. Developing global skills and abilities reflects the idea that seeing the overall structure of the problem or content helps in understanding the individual parts, because we can draw on relationships to help reinforce the learning [11].

The third dimension of cognitive apprenticeship is the sociology of learning or studying and includes situated learning and studying, a community of practice, intrinsic motivation and exploiting cooperation. This idea is consistent with factors of motivation, especially relatedness - we are motivated to learn, study or perform when we can relate to the situation of the student and learner. The authenticity of the learning and studying environment (experimental versus classroom) or the problem (student or learner versus science) helps frame the real-world contexts, which increases motivation to the students or learners. The last components are social in nature, but also consistent with effective learning and studying strategies and methods. For example: a community of practice (engaging in a community to achieve goals) and cooperation (cooperation between learners or students in problem solving). These important components help students and learners solve all kinds of problems and achieve their different goals, in that way helping the next generation to have better educational system and leaders. The real-world since education is a team process. Research consistently shows that learners and students teaching other learners or students is an effective strategy and method that is now used by many successful students and learners to improve their result in education. Cooperative learning also allows for a variety of positive attributes including feedback and communications, which helps them in the metacognitive and cognitive process [11].

3.5. Strategies to enhance metacognition in the classroom and enhance in the experiential setting

Many teachers are using different strategies and methods to enhance and improve the metacognition in their classroom, for the reason they want their students to be more successful. There are several methods and strategies that are used during all parts of the instructional approach, such as: lectures, active learning exercises or preplanning activities outside of the classroom. Teachers may also modify the existing methods, based on the knowledge of the students in the classroom, in combination with scaffolding. Other strategies can be used in order to improve and enhance the success of the students and learners, such as: general planning, mastery goal setting, and questioning and feedback [3]. All these different methods and strategies are aimed towards improving the success of the students in the education planning, learning, setting goals and in the end, they describe how the students can achieve the goals.

3.5.1. General planning

Learners and students plan and study better when their attention focuses on learning objectives established by the teacher. The explicit discussion of the learning objectives starts by prioritizing the importance of thinking about the learning process over the content. To activate prior knowledge and memory, prompt learners and students start to think about what they already know that is relating to the content of that day and relevant knowledge and memory they lack [17]. Students are led to analyzing the distinctions between contrasting information and focus more on the differences rather than the similarity between concepts [22]. Have learners and students assess the time taken to complete this activity and the ways for finding resources for successful completion of the task, helps them think about the process of studying and learning. This strategy is helping more students and learners to finish in time all their tasks, using all the resources they can find. Students and learners benefit from monitoring their understanding during teaching activities [21]. By checking learning behavior throughout different lecture or teaching activity, learners and students are realizing the importance of the learning or studying process. Learners and students can accomplish this by noting important concepts and writing down questions during the lecture or activity [13], [19], [23]. This helps them significantly during the lecture or activity in remembering the information they want to learn.

The teacher can help the students to learn the strategies and methods for retaining information such as chunking, connecting and elaborating, and assist them in organizing the material in ways to recognize patterns and associations. They may regulate the difficulty of the material by breaking down the problem into simpler steps, so students can clearly see the thinking process of problem solving [8]. Another way or method to assist the learners and students in monitoring their thought processes is to provide half-down examples or exercises and have learners or students solve them, and then discuss possible conclusions.

By monitoring smaller pieces of an assignment, both the teacher and the student are better able to identify and correct errors in thinking or planning activities. This method or strategy is important because it helps students and learners to learn and study in the simplest way and to achieve best results.

3.5.2. Mastery goal setting

Learner's and student's metacognitive skills and abilities (planning, goal setting, monitoring comprehension and evaluating learning) correlated positively with mastery of goal structures, which are environments that emphasize competence, mastering new skills and abilities to understand [4]. This method is useful for the learners and students, because it helps them in the correct way to plan their learning process, to set goals they want to achieve and then to achieve those goals, thus increasing their success and competence. Mastery goal structures contrast with performance-approach goal structures that focus on demonstrating proficiency and peer comparison and performance – avoidance goal structures that encourage avoiding looking incompetent.

Both performance-approach and avoidance structures are associated with procrastination, avoidance of help-seeking and poor grades, which are goal orientations that become predominant in

the experiential setting [6], [10], [24]. All students and learners who use this methods or strategies have better results and grades in the educational system, and can be more successful than the students who do not use them properly or do not know about them. Learners and students in the experiential setting may resort to these goal orientations, because a bulk of learner's and student's grades are being derived directly from observation instead of testing, so they may adapt behaviours to avoid looking incompetent. Teachers have to find different ways of how they ask the students and learners, because using test or other method can make them become more incompetent in the educational system.

Based on the proposed framework, preceptors should consider encouraging learners and students to adapt mastery-oriented goals and seek help when needed. Teachers also have to find the way to help students to learn how to use different methods and strategies to effectively learn something and with that, to make them more competent. Helping students and learners to use these methods and strategies could increase their knowledge and memory, and can increase the motivation to reach other goals in the future. The point of using different methods and strategies is that by increasing the motivation of the students and learners, they can have better grades and could really learn the information they want to learn.

One way preceptors support mastery goal structures is to offer formative assessments paired with feedback that emphasize progress and mastery of knowledge, memory, skills, abilities and attitudes [25]. These formative assessments can take a variety of forms, from case discussions or presentations to practice and exercises that normally occur during experiential rotations. These should regularly occur to help the learner and student develop and achieve the goals.

3.5.3. Questioning and feedback

Another way preceptors can help their learners and students on rotations is to emphasize metacognitive skills and abilities from the beginning of training coupled with immediate feedback regarding technique [5]. This new method or strategy that is used by many successful students is increasing their success and motivation and is making them more competent in the educational system. It shows now that this method is helping students and learners in the science field education, as well as in other educational fields.

4. Conclusion

Metacognition refers to person's ability and skill to regulate their thinking, planning and learning, and it is consisted of self-assessment skills and abilities such as: planning and monitoring. These important skills and abilities reduce self-assessments errors, such knowledge and memory ability or skill. The new educational system emphasizes metacognitive skills or abilities and the related skills or abilities in critical thinking and self-directed learning or teaching. Using these methods and strategies, the level of success of the students and learners will increase and they will have motivation and ability to achieve their goals. Suggestions for teaching metacognitive skills and abilities in the didactic setting include cognitive or metacognitive apprenticeships, exam reviews, modelling of cognitive and metacognitive skills and abilities, general planning, mastery goal setting, and questioning and feedback. In the experiential setting, faculty members can emphasize the mastery goal setting using questioning techniques that promote cognitive and metacognitive awareness, coupled with feedback about students' efforts in this area.

Using these teaching and learning strategies and methods, regardless of the setting, can raise the self-awareness of the learners and students, and help the cognitive and metacognitive thinking, planning and achieving the goals. Metacognition's role in the education system is important, because it shows the students the methods and strategies for learning, when to learn and how to learn, which are important for the students and learners to use in order to become successful in every field of education.

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E-learning System based on Recommendations, implemented in Matlab

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Abstract. In this paper - we present our research in the field of E-learning systems and the toolbox we have implemented in Matlab for an offline mode recommendations. The system gives a general recommendation about the way the student should continue to use the learning system. In order to determine the profile of individual students and their needs - we used Moodle student records that contain info about the style of learning, access to learning materials, and their achievements / success. For that purpose we have used Petri nets and the TimeStat tool that was installed as a plug-in in Moodle and which provides real-time statistics of student's time spent in each online lecture (in every particular segment of the lecture). We considered the students separated by field of study (such as Economics students, Information technology students, etc.).

1. Introduction

When analyzing the e-learning systems - different authors classify them into several different categories, which can often be confusing. Thus, according to Wang[7], systems can belong to one of the following classes:

1. Content / Course Management Systems.
2. Learning Management Systems.
3. Learning Content Management Systems.

Learning management systems are software products that are responsible for planning, delivering, and managing learning events. Among other things, they control the access of students and teachers to the system and its actions, support administrative tasks such as student membership, and assist in the preparation of a report on student activities. They help and monitor the interaction between students and content, students among themselves, and students and teachers. CMS supports online course activities and LMS supports online activities for students and teachers. Another factor that differentiates them is that the smallest part of the instruction in the LMS is the course itself. The third class of systems arise as a result of the integration of these two categories using the formula: "LCMS = LMS + CMS", Wang[7]. So, these systems give equal importance to the content and other tools to deliver complete e-learning.

To improve the learning systems - a model for analyzing student behavior can be created using different criteria. This approach will utilize the concepts of multi-criteria decision-making models that should be built for all target students. In reality, each student may have different criteria for accessing the materials, as students may have different personal traits and ways of learning. This is the main reason for creation and rise of the Adaptive Learning Systems. Once the model for each student is generated, his / her requirements will be easy to determine.

In this paper we present an adaptive model of the e-learning system, based on stochastic modeling of students' behavior using Petri networks. Our system can be of particular importance for the needs of students, enabling them to receive the content according to their characteristics: their style of learning, their level of knowledge and their test scores. An important contribution is the Petri networks generation methodology (based on Chang, [15]) that represents the student transition in the e-learning system. The real-time transitional model implemented by Petri networks provides the ability to model the tutorial processes smoothly. The controlled features of the Petri networks (PI Transition Index and IT Identity Index) can simulate 2 types of students- full-time and part-time students, providing different e-learning features and forms, that are suitable for both groups of students.

We have also upgraded the e-learning systems by introducing a recommendation system [4]. Recommendations can be generated in real time (while the student is viewing and using the content), or in offline mode - as a general recommendation on how the student should continue to use the learning system. This type of recommendation combined (with real-time measurement of system presence) is what we have implemented in this paper.

2. Adaptive E-learning systems

In the learning systems, students are faced with a significant amount of information in a variety of formats. If all information is presented to the students, this will lead to two problems: first, students will be confused by the information scope, and second, the user needs will not be met. These problems result in educational failure and lack of motivation in acquiring knowledge. So - designing an adaptive e-learning systems is an important issue in the field of e-learning.

Adaptive environments further in the text e-learning courses are those courses that provide learning materials based on the individual needs of the learner. Adaptive learning can provide students with more effective and efficient learning.

Researchers have classified adaptation into two categories (Zeng et al, [11]): adaptive presentations and adaptive navigation. In other words, there are some features like presentation details, types of media, etc. that, in different situations, affect the presented content differently.

The Adaptive Presentation will display the existing content as a set of fragments. Depending on how the fragments are stitched together - adaptive presentation techniques can be: "conditional presentation", "stretched text" and "frame-based" technique (such as Hypadapter). The Adaptive Navigation supports the ability to modify visual links that enable navigation (e.g. reorganization, concealment or annotation).

And as for adaptive presentation support, Riad [7] defines different methods of adaptive navigation support, based on Chen [9]:

- Direct guidance: The user receives a sequential path through the system, using the "next best" strategy (guiding by "next" button) or "sequencing the pages or traces", where read sequences are ordered through (parts of) the system.
- Adaptive sorting: Links to a particular document are sorted by their assumed importance (based on prior knowledge, or similarity to the current document).
- Adaptive concealment: Links are hidden or disabled, if the system assumes they are irrelevant and / or distracting.
- Annotation of links: Links are annotated with text, color, icon or darkening in order to add extra information to the learner.
- Map annotation: The annotation methods discussed are used to adapt the graphical representation and / or maps.

The adaptive system may be either concept-based, or not concept-bound [8]. Concept-based systems use a content model ("master model" or "conceptual model") to structure the information. If

the content structure is relatively single-lined or if the content is small, it may not be necessary to develop a specific model [9].

The whole learning process is centered towards the learner, and personalized to meet the student's learning needs, in which the dominant position is the learner. In these systems – the students actively interact with the adaptive learning systems, constantly receiving and analyzing feedback in order to improve the level of knowledge. The adaptability of the learning systems is done by recording of the learning process, so the learners can timely control and adjust their learning processes to achieve optimal goals appropriate to them.

Adaptive learning systems are intelligent. Intelligence is the basic guarantee for the system to accomplish self-adjustment. The intelligence enables the system comprehensiveness and scientific diagnostics of the current student level, so the psychological conditions will correspond to the learning content and learning support in accordance with the monitoring process.

3. Recommender system based on petri nets

The Petri net model can be applied for sequential control in the Web-based e-courses. Let's consider a course that is made up of three main parts, three exercises and nine questions. The course structure is divided into three clusters. The cluster is made up of three different types of learning activities: one main page, one exercise, and possibly a set of three questions or other types of learning objects. The next cluster depends on the student's score on the previous one, and so on. The result is delivered to the control points that determine the upcoming sequencing behaviors. Inside the cluster, one main exercise is linked to each page of the course and a sequence of three questions is linked to each exercise. After the initial connection, the student receives the contents of the first main page (Page 1). Upon receiving this page, the student goes to the first exercise (Exer. 1), which corresponds to a "next" type event. The student's response is represented by an event of the type "validate". The answer is analyzed and results in a constant set of {True, False}. If the answer is correct, the next (cluster) page of the course is sent to the student (Page 2).

If the answer is incorrect, the question is sent to the student (Q. 1-1). If the student's answer to the question is correct, the second main course page is sent to the student, if the student has not already received a second question of the same type as the previous one (Q. 2-1). If the answer to this second question is correct, the next page of the course is sent to the student, otherwise the student receives a third question of the same type as the previous two (Q. 3-1). The same process applies to all courses (clusters) and their respective learning sequences (learning objects). This pedagogical strategy contributes to assessing students' level of knowledge.

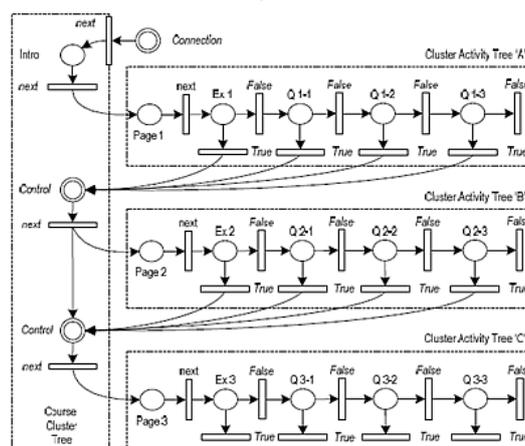


Figure. 1. Student behavior in the e-learning system using learning clusters

The e-learning recommendation system consists of on-line and off-line components. The on-line section receives requests, executes the appropriate algorithm and generates the recommended results,

while the off-line module collects student's data, processes and based on the model - generates recommendations.

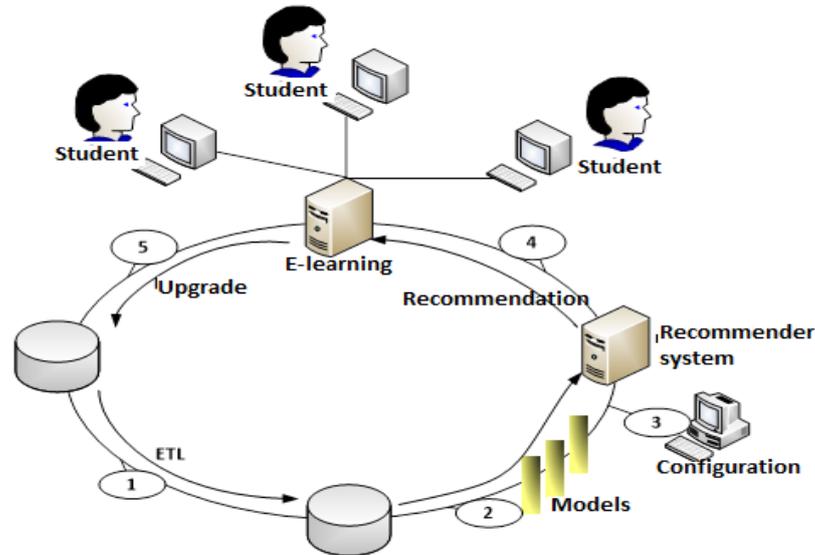


Figure. 2. Recommender system applied in E-learning environment

4. Software implementation of the recommender system

Our proposed model takes into account the socio-constructivist approach to learning. It aims to cover the technical, as well as the pedagogical aspects of e-learning; a testing is performed using a different method for evaluation of the usefulness. The model consists of several dimensions that need to be evaluated; these are: the time spent by students in each type of study materials in the course, the points achieved from the test, the level of knowledge gained, and providing the recommendations to the student.

Our model has been practically implemented within an experimental e-learning system. The evaluation included two experts and 26 higher education students, covering the typical profiles of students who would have used the system. One course was implemented in the system that accommodated the learning objects, i.e. three learning topics (lectures) and three different types of study materials- set for each topic.

To monitor student activities in the e-learning system we installed the Timestat plug-in. The process of monitoring student activities was carried out in three phases: pre-processing, processing, and analysis. The pre-processing phase involved the selection and recording of data. This student login information was stored in a relational basis and paired with records provided by the e-learning system. The connection criteria were taken into account - login time, IP address and access to a given module, i.e. type of action performed.

During the processing phase - in addition to the times provided by the Web server - we also used the tables that Time stat module generated for each student individually. The time the student spent in each part of the topic (presentations, theory-tasks, and assigned tasks) was cumulatively collected, and rounded up to 30 minutes.

In the analysis phase - three themes were set online, and each topic consisted of 3 online content segments: 1. ppt-presentation (theory only); 2. pdf lesson (theory + tasks), and 3. solved tasks. We measured the time students spent in each of the 3 segments of the lesson. The Timestat module automatically recorded the data in a table.

From the student activity data obtained, students were classified according to the time spent in each of the offered types of course materials offered in the e-learning system. Four types of students were identified: the first type of students used all materials intensively, the second type of students

used more theoretical materials, the third type of students learned only the assignments, and the fourth type of students - opened the presentations only partially.

We have implemented a Petri net using the HiPS_1.02 (Hierarchical Petri net Simulator) simulator, which describes the student's movement through the course in the learning system. In the research, it was necessary to create 4 different stochastic Petri net models, depending on which learning resources the student used, or depending on the clustering of the students.

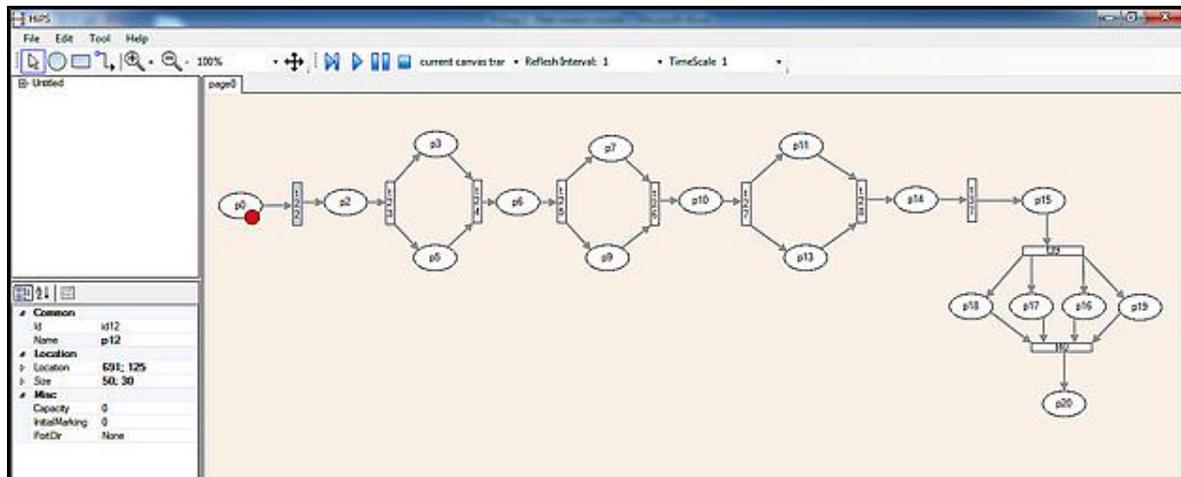


Figure. 3. Student transition in the E-learning system for students that use 2 types of materials

After the given period of on-line learning in the course, students were tested to determine their level of knowledge. The trial exam consisted of 2 theoretical questions and 2 tasks and each was scored 25 points. Depending on the points gained at the trial exam, the students were divided into three groups: students who scored less than 40 points belong to the group who achieved a low level of knowledge, students who achieved between 40 and 80 points belong to group with intermediate level of knowledge, and students who have achieved more than 80 points - have achieved a high level of knowledge. After the students testing and getting the researchresults, it was found that the students who spent more time in the e-learning system course and used different types of materials - achieved a higher level of knowledge. But there are also students who learned from the uploaded materials in only two manners, either just a theoretical part, or another type, and students who learned the most from the assigned task materials. And finally - there were students who have spent very little time in the online course and have used only the presentations (Power point and Pdf).

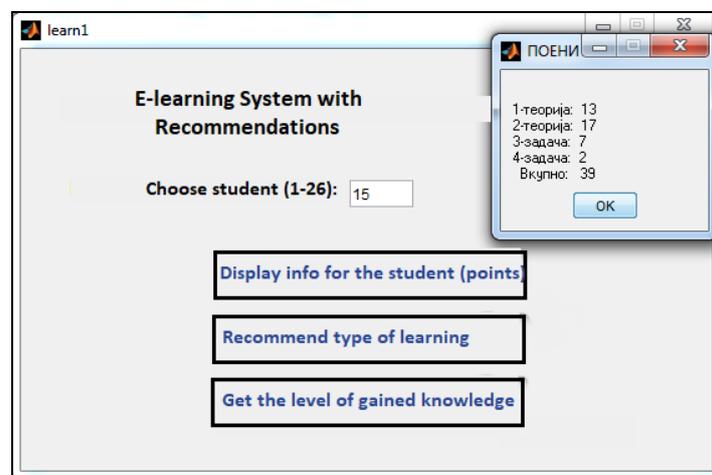


Figure. 4. Software implementation of the e-learning system with recommendations

The adaptability of the model is made by developing three applications in Matlab: *learn.m*, *learn1.m* and *novo.m*. *Learn.m* defines the times students spent in the e-learning system. The second application *learn1.m* is visual – i.e. implemented through a GUI interface. The application provides information to the student on the test results achieved, the number of points he/ she has earned for each assignment and theoretical question individually, and the gained level of knowledge and recommendation for the student. *Learn1.m* is designed to correlate the amount of time a student spends in each of the three types of materials in the course and the test results achieved. Depending on these two factors, the application recommends the student to use the materials correctly and which types of materials to pay more attention to - in order to increase his level of knowledge.

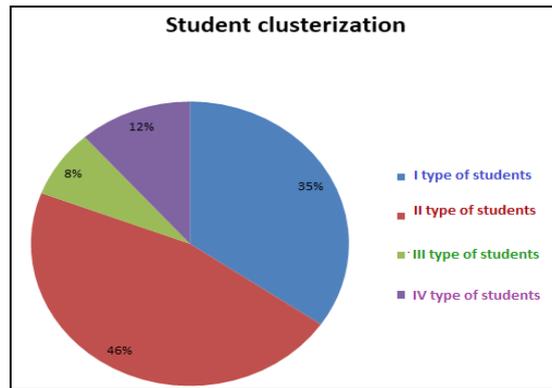


Figure. 5. Student clustering based on the learning type

After the given recommendations to the students and an additional period for study, a remedial corrective exam was conducted. The learning content and the type of materials for the corrective trial exam was the same as before. The corrective exam allowed improvement to students who did not pass the course, or were dissatisfied with the level of knowledge attained.

Table 1 – Gained knowledge for each type of student

Student type	No. of Students	%
Type A	6	23,1
Type B	14	53,8
Type C	6	23,1

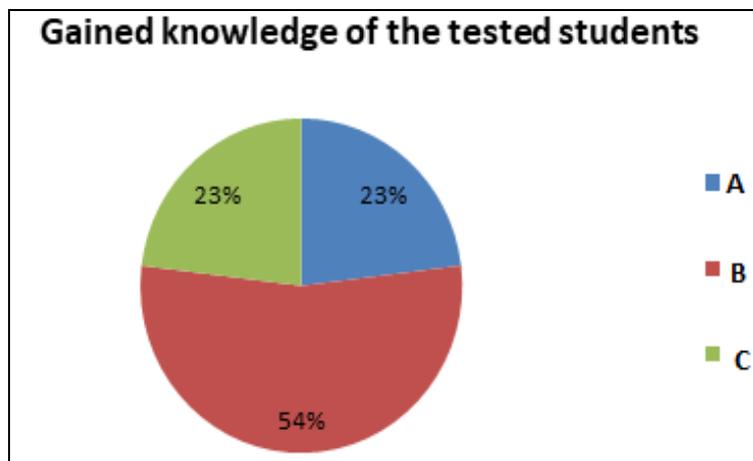


Figure.6. Gained knowledge of the tested students

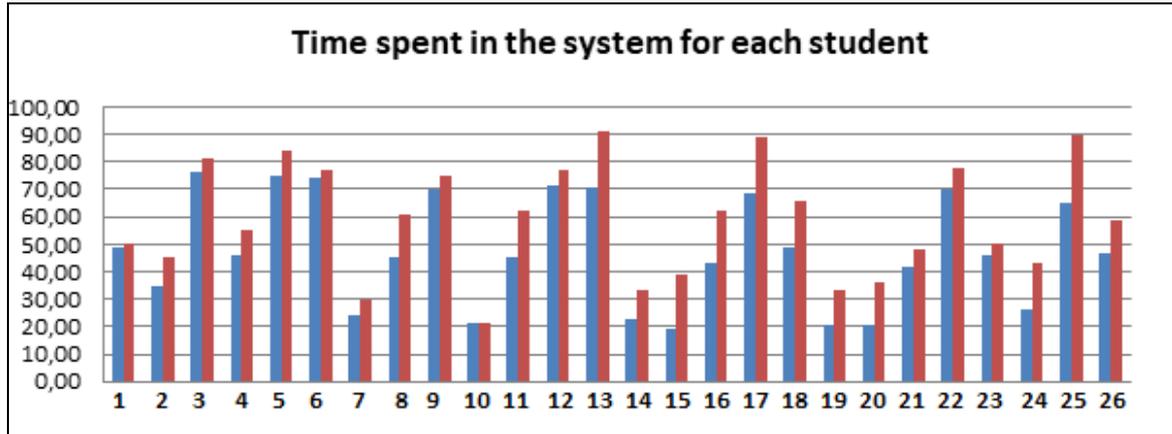


Figure. 7. Time spent in the system for each student

The adaptability of the Stochastic Petri MLM model with recommendations has been demonstrated through the results of the corrective exam. The *novo.m* application allows the student to see the points gained from the corrective exam, the level of knowledge achieved, and provides a recommendation on choosing the right type of materials- to increase the level of knowledge (if needed).

5. Conclusions

In our research work – we have focused on the two key areas that could bring improvements to the existing e-learning systems:

- Introducing adaptability to the learning system (the content and shape of information would change, depending on the needs of each individual student);
- Application of recommender systems in the e-learning system.

The adaptability is of particular importance in the e-learning systems for two main reasons. First, the learning system can be used by students who differ in their goals, learning styles, preferences, knowledge, and background. In addition, the profile of each student changes (e.g. knowledge increases as a result of learning). Second, the system will be able to help the student navigate the course by providing user-specific (not linear) paths.

The e-learning systems can also be upgraded by introducing a recommendation system. Recommendations can be generated in real time (while the student is viewing and using the content), or in offline mode - as a general recommendation on how the student should continue to use the learning system. This type of recommendation combined (with real-time measurement of system presence) is what we have implemented in this paper.

The implementation of technology with real-time recommendations depends very much on the type of information (lessons) that will be put into the system. As a first step - the recommendation system will determine if the student is registered at the database (of the learning system). This step is important for two main reasons. The first is to obtain information about the frequency with which students visit and use the learning system, i.e. creating an individual user profile for each student. The second reason is to obtain direct information on student needs, especially for newly enrolled students. In order to support students with different learning styles, the recommendation generating system should have a criterion (method) for selecting the required learning materials. Other options that such a system can offer are: distinguishing between full-time and part-time students, who would be treated differently - if different learning materials were provided for each.

The student database contains records of learning styles, access to learning materials, and achievements / successes of different categories of students (such as economics students, IT students,

etc.). These records will be used to determine the profile of individual students and their needs (materials). With this approach - students will receive more recommendations for learning materials, i.e. on a larger scale than they need. It will also be useful to identify associations between the different sources of information (lessons) and the students' needs for each of those lessons.

For further improvement - web-based mining can also be applied to reduce the need to register and record a personal profile. Real-time data from the learning system is much richer than off-line data collected. One important source of information can be the student's path through the web site itself. Clicking on the contents of the learning system would provide the information needed to analyze student behavior, such as - which materials are most frequently visited, how long the student spent in each lesson. Web mining can analyze website clicks and thus define the students' needs for each of the learning materials (lessons).

The offline recommendation mode that is practically implemented in our system, provides a general recommendation on how the student should continue to use the learning system. In doing so, we used the Timestat tool that was installed as a plugin in Moodle and provides real-time statistics of how much time the student spent in each lesson and each part of it.

We have performed validation and verification of our model- by comparisons and statistical tests on students' level of knowledge obtained before and after giving a recommendation. We've executed a test for the difference of mathematical expectations in unknown dispersions and small samples, a Wilcoxon test. character rank and - uniformity criterion. All tests have shown that providing students recommendations has an impact on increasing students' level of knowledge.

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Modern platforms on the Internet as a instrument of power in hands of violent religious extreme organization

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Abstract. A massive and wide acceptance and use of social networks by side of global religious extremist militant organizations has a major impact on the spread of international terrorism and is a growing threat to international security. When it will be in the hands of violent religious extremist militants personified in terrorist organizations, is a strong driver for indoctrination and attracting followers, profiling targeted groups, fundraising, to placing the instructions and guidelines for the development of weapons and actions in certain situations. Modern platforms on the Internet expressed through social networks represent ideal tools for processing information with the aforementioned objectives, expressed through text, photographs, audio, and video. So far, despite the fact that many measures have been taken to define the rules for the use of social networks against the promotion of terrorist and extremist groups, there are still many difficulties in the efforts to implement these measures due to the inability to track real-time information for a large number of information generated by users. Defining and specifying the concept and purpose of social networks, allows us to perceive the opportunities for their use.

1. Introduction

After the collapse of the bipolar system of international relations, modern terrorism expressed through the action of global religious extremist organizations is the greatest current threat to the modern world. Modern international terrorism, as a phenomenon, is a complex form of organized, individual and rarely institutionalized political violence. Over the last decade terrorism has evolved and has become an essential threat to international security.

This evolution reflects the ability to use modern technologies and tools that further enrich its complexity, dynamism intensity, but also its enormous danger to national security of states and to overall international security. The evolution of international terrorism is particularly due to its presence in cyberspace, which is mostly expressed by using social networks as a tool for acting in the pursuit of "higher goals".

2. Information as an instrument of power

Modern society, whose contemporaries we are, is critically dependent on information as a strategic resource and the information and communication technology that transmits, processes and exchanges them. Modern warfare is unthinkable without a lot of information about the opponent, their own forces, space and time. However, in addition to the advantages they provide, information has become an important goal for the opponent. To deprive the opponent of the advantage that it gives, while securing the necessary information for own needs, means to achieve a significant advantage in the realization of the purpose of a certain space and for a certain time with minimal engagement of forces and minimal losses.

The modern armed forces largely rely on the latest technological advancements in the field of communication and information technologies. The Information Revolution transforms the war, that is, causes changes in how societies come into conflict and how their armed forces lead the armed conflict. No more massive army forces are fighting against bloody exhausting struggles. Instead, small and

exclusively mobile forces, "armed" with real-time information, with high speed hit unexpected places. The winner is the one who can use the information faster, that is, the one that he / she can quickly analyze, assesses the situation and react. Major changes occur in how information is collected, stored, processed, taught and displayed, and how organizations themselves are organized to use the increased volume of information. Information becomes a strategic resource. Domination in the information spectrum is a necessary condition for success and victory in the conflict. The information environment in which the information acts as a power tool is divided into three components: physical part, contents of the information, and knowledge.

The physical part is even more commonly known as the "Cyber Space", which includes means and ways of connecting and the way of information delivery. This section covers information infrastructures, various communication lines (wired and wireless), computer networks, etc. Cyber space is the universe of computer networks, a world in which multinationals, societies and other subjects struggle to capture data and information. By "cyberspace" is meant "a kind of community" comprised of networks of computers where the elements of classical society are in the form of bits and bytes, that is, space created by computer networks. All of this previously mentioned interconnectedly represents a unique physical space covering all segments of the mainland, the sea, the air, and the universe. In a modern society of global connectivity, a conversation or a million-dollar transaction are made between people from one end of the world, quickly and cheaply.[1]

Computer networks allow people to create a whole range of new social relationships in which they can meet and influence each other. Thousands of groups can be formed to discuss various topics, play games, entertain each other, and even work on complex collaborative projects. Cyberspace is a "house" for thousands of groups of people who meet to share information, discuss common issues, practice work. The content of the information covers everything that is transmitted, whether it is text, images, databases, video. Knowing as a third segment of the information encompasses the impact, ie the perception that the content of the information has on the target audience.

This segment of the information environment is produced projected behavior of a particular target group or groups of recipients of the information, or the desired effects of the information creator are achieved. And precisely this piece of information as an instrument of power is a powerful tool in the hands of religious extremist organizations to achieve their goals. The information has the power to indoctrinate and attract sympathizers to a particular cause across the globe, as will be seen from the examples given below in this paper. The information has the power to force financial resources in support of the realization of the goals of the organization. And in the end the essential power is in the message it conveys with the content itself, which for religious extremist organizations, especially the Islamic State, is the cruelty with which it opposes its opponents. It can be concluded that in the modern existence of information technology and information-dependent planet, information as an instrument of power expressed through its content in the infinity of the cyberspace is a powerful tool for shaping world trends and attitudes, as well as for attracting followers for certain massive movements and causes, which are largely in favor of the survival of international religious extremist organizations.

3. Online radicalization

Online radicalization is described as a specific social environment that shapes the culture, behavior and symbols of individuals, groups, social networks and relationships, through which these individuals and groups develop and appear. The researcher Peter Waldman assigns various and independent qualities to this online environment, portraying them as social entities with their own right, which is a collective of people who share certain views and a unitary identity: "subculture" or "community". This does not mean that the conflict is absent in any of the online radicalization and violent religious extremist groups that emerge from them. Online radicalization has its own interests that lead not only to connect but often to criticize, and sometimes even to confront their violent individuals and cells. Perhaps most importantly, Wildlodon's concept of online radicalization promotes that they are not only social relations as essential characteristics, but necessarily implicitly or explicitly is the interaction between persons who are radically online.[2] The advent of the Internet (Web 2.0) has allowed religious extremist organizations the opportunity to transform their widespread

online presence in expediently interactive extremist action and radicalization.[3] Osama bin Laden's cadres used the Internet for communication and propaganda purposes before the September 11, 2001 attacks in the United States, but their use of the Internet exponentially increased after attacks. This is due to two related reasons: 1). The loss of the al-Qaeda base in Afghanistan and the subsequent disintegration of its leaders and fighters; and 2). The rapid development of the Internet, the global spread of Internet cafes, and the proliferation of personal computers and other means that have the ability to use the Internet (mobile phones). Until the advent of Web 2.0 with its focus on content integration created by the user, social networks and digital videos, bin Laden and "central al-Qaeda" maintained a certain level of control over al-Qaeda's behavior. Abu Musab al-Zaqawi and the al-Qaeda group in Iraq were those who introduced a special online strategy in the period before the end of the Web and the rise of Web 2.0, and thus mark the beginning of the transformation of violent extremist organizations from the movement of a substantial Internet component to an authentically online extremist movement.

Like traditional extremist organizations, online radical groups are communities where perpetrators of violence are in certain subgroups. In other words, terrorist groups and violent extremists come from violent extremist environment, and hence terrorist and generally extremist groups and attacks can also emerge from their online variants. The difference between online extremists from supporters is that in the online extremist's structure, there is a form of social structure responsible for group cohesion. It is not just a set of individuals who represent similar political/cultural attitudes.[4] Violent online jihadist action, as its name suggests, emerged when the jihadi sphere covered a wide range of interconnected creators and consumers, from central al-Qaeda and media weapons to several al-Qaeda franchises, to the globally widespread network of jihad supporters, without linking to any jihadist organization, all contributing to the daily making and renewal of violent jihadist behavior.[5] The changes in the nature of the Internet have encouraged a growing number of supporters of violent extremism to post and edit articles and analyzes, exchange information, opinions, and debate ideas about blogs, websites and forums that they have raised themselves. Proliferation on pages of supporters acted as a free publicity for violent extremist cause. Today new web pages appear, but also disappear frequently, popular chat rooms have rigorous policies for joining, and most pages show technical skills by their creators, including the latest internet tools and "gadgets". Al Qaeda has neither had nor has it provided finance or has any managerial role to these pages. However, they act as an invaluable multiplier of force to foster the cyber-based strategy of the groups.

3.1. Social networks in the function of religious extremist organizations

After the events of September 11 and the campaign to fight the terrorism that followed, a large number of religious extremist groups moved into cyberspace by establishing thousands of websites that promote their messages and activities. Many radical sites were targeted by intelligence and law enforcement agencies, and activists who followed the sites attacked some of them and forced their operatives to search for new online alternatives. There was a redirect to social networks.[6] Social networks differ from traditional and conventional media in many aspects, such as interaction, availability, frequency, usefulness, immediacy and consistency. In contrast to conventional/traditional media, characterized by the one-to-many approach in which only a small number of established institutes disseminated information to an effectively limited audience, social networks allow anyone to publish or access information. New communication technologies, such as incomparably cheap and affordable mobile and web-based networks, have created highly interactive platforms through which individuals or communities share, create, discuss and modify content together. With social networks users of information also act as communicators, significantly increasing the number of information providers in the communications market.

This two-way communication promotes the creation of small, diffuse sets of communicators and groups. Virtual communities using social networks are growing popular all over the world, especially among the younger population. Religious extremist organizations have good reasons to use social networks. First, these channels are far more popular with their auditorium, which allows religious extremist organizations to be part of the trend or tendency. Secondly, social networking channels are easy to use (user-friendly), reliable and free. Finally, social networks allow terrorists to access their

target audience and virtually knock on the door - unlike older models on websites where radical extremists were to wait for visitors to access them.[7]

The most important goals of the terrorists online are propaganda, radicalization and recruitment. They can develop lists of potential recruits or sympathizers through online groups. Just like marketing companies that can see information about members to find potential customers and choose a product that promotes them, terrorist groups can see people's profiles to decide whom to target and how to access it of each individual.

Social networking sites allow terrorists to use a target strategy known as narrowcasting. The narrowcasting is aimed at messages for specific segments by the public, defined by values, preferences, demographic attributes, or subscription. Online, video, nickname, photos and information are set up to match and coincide with the profile of a particular social group. These methods allow terrorists to target especially young people. In the upward trend, terrorist groups and their supporters use predominantly Western online communities, such as Facebook, MySpace and Second Life, as well as their Arab equivalents.

3.1.1. Electronic Jihad

Online platforms used to promote electronic jihad are also used for operational purposes such as instruction, training, data collection, coordination, and psychological warfare. In 2008, in the terrorist attacks in several locations in Mumbai - India, attackers used advanced communications technology, including handheld GPS devices, to plan and launch their attack. Satellite images from Google Earth and mobile phones allow users to locate hostages, especially those from abroad. YouTube videos and posts on Facebook are used to train explosives use, to direct web site followers with instructional materials, promote hacking techniques, and share programs for encryption. These postmodern terrorists are trained in virtual online camps, using the abundant opportunities of new social networks.

3.1.2. Facebook Terrorism

Facebook is the biggest social network. In January 2014, Facebook recorded 1.31 billion users, of which 54 percent are logged on a regular basis, and almost half of the 48 percent are logged every day. Their average age is about 30 years. In the Middle East, Facebook has seen a significant increase membership reached 67 percent in 2010, and in Asia 23 percent.

Special Report of the US Department of Homeland Security, lists several ways to use Facebook by terrorists:

As a way of sharing operational and tactical information, such as bombing instructions, maintenance and use of weapons, etc.;

As a gateway to extremist sites and other online radical content by linking them to facebook pages and discussion forums on Facebook;

As a media outlet for terrorist propaganda and extremist ideological messages;

As a wealth of information for distance surveillance, in order to target.

3.1.3. Twitter Terrorism

Twitter is a free micro-blogging service that allows each account holder to distribute messages called "tweets" that are limited to a length of 140 characters. Twitter messages to users can be open to the public or restricted to other users who have chosen to follow the profile. Twitter can be accessed on its website or via mobile devices. By mid-2013, 554,750,000 Twitter users, they sent around 9,100 messages every second or 58 million messages a day, a very fast growing number. Terrorists mainly use Twitter to communicate with sympathizers. A survey of 76,000 messages on Twitter from Al Qaeda linked al-Nusra Front in Syria revealed that they contain more than 34,000 links, most of which lead to jihadist content. Twitter messages also included the latest developments from various theater operations and propaganda statements. The official Twitter account of Al Nusra @jbhatalnusra, marked a significant increase in the number of followers. Twitter has become a major environment for active dissemination of links that direct users to digital content hosted on a wide range of other platforms. Twitter can also be used for practical communication. When the US air strikes in Syria appeared unavoidable in August 2013, several jihadist and Hezbollah groups in Syria used real-time

functionality on Twitter to exchange emergency communications, preparing for attacks that they thought were targeted at them. Some experts believe that Twitter could also be used to help terrorists in coordinating current attacks.

An intelligence report issued in 2008 by the 304th US Military Intelligence Battalion, including a chapter titled "The Possibility of Terrorists for Using Twitter", which claims that Twitter can become an effective tool for coordinating terrorists who are preparing to commit militant attacks.

3.1.4. YouTube Terrorism

A gigantic video sharing service has become a significant platform for jihadist groups and supporters, appealing a successful subculture for communicating, spreading propaganda and recruiting new individuals. YouTube's massive global audience allows jihadists to focus on potential conscripts and to the goals of terrorism. As important as the videos themselves, YouTube's usefulness in facilitating social networking among jihadists is as important. The ability to share comments on videos and send private messages to other users, helps jihadists quickly identify themselves, resulting in a dynamic jihadist virtual community. Many YouTube sites have posted terrorist clips, some related to major terrorist events around the world. On April 30, 2010, the Pakistani group Tehreek-e-Taliban created its official site on YouTube. A day later, the terrorist organization posted its first video, claiming responsibility for an attempt to attack the Times Square in 2008. Chechen rebel leader Doku Umarov used a video posted directly on YouTube to take responsibility for the attack on the Moscow Metro on March 29, 2010 by two Chechen women.

The video was posted on the website of the Caucasian Center, a group related to the Chechen jihadist movement. In 2012, dozens of pages on YouTube posted cut-offs from a series of detailed video lessons produced by Al-Din Al-Qasim Brigades, a militant Hamas terrorist wing. Most of the videos were about half an hour long and focused on making bombs and using various weapons. The series was titled "Waa'iddu" (ready), a Hamas slogan extracted from the Qur'an with regard to the preparation of Muslims to fight the enemy.

A study by Maura Conway and Lisa McInerney analyzed online video supporters to promote YouTube jihad with a focus on those posting and commenting on materials promoting the sacrifice originating in Iraq. Most of the beneficiaries who were studied were younger than 35 years and lived outside the Middle East and North Africa, with a large percentage located in the United States. As the survey concludes, "...what is clearly evident is that jihadist content spreads far beyond traditional jihadist web sites or specifically dedicated forums for sharing videos and social networks - features of Web 2.0 - and in that direction they extend their reach far more than what can be interpreted as their core support base in the regions of the Middle East and North Africa to the population in diaspora, transformed and political supporters".

3.1.5. Terrorism on Instagram and Flickr

Although Instagram and Flickr have a reputation primarily for a trendy but easy way to share photos with friends and foreigners, terrorists have also adopted these photo sharing services. Online jihadists pollute Instagram with radical propaganda with the enchantment of their leaders such as Osama bin Laden and Anwar al-Awlaki, as well as other lesser known al-Qaeda leaders who sacrificed themselves while fighting the West. Other photographic sets include graphic photographs of dead jihadist fighters with the text: "Perfect smile" and "Sins forgotten after the first drop of blood". The captured versions of the erased profiles belonging to Dzhokhar Tsarnaev, one of the two brothers involved in the terrorist attack on the Boston Marathon in April 2013, showed that the young bomber "likes" the photograph of the Chechen militant person Shamil Basayev.

Basayev, who was killed in 2006, was the leader of Chechen radical rebels and is believed to have been the brain for several terrorist attacks in Russia. Flickr created a virtual monument for foreign fighters killed in Syria, followed by the name, place of origin and notes for admiration for their devotion and combat force. Without a doubt, the most important goal of this propaganda is encouraging Muslims abroad to join the fight. In the end, it is easy to get to the heinous photographs of beheading or firing hostages on these pages, such as the example of the "Almurbati1" profile on Instagram, where such content is displayed.

4. Analysis of social networks as an approach to combat terrorism

The greatest threat facing the modern world is the religious extremist groupings embodied in terrorist organizations. Terrorists attack informally using terror at any time and place. There is no more structural battlefield where classical military power is used, but the war against this kind of enemy will be obtained only with the supremacy in knowledge. For that purpose, it is necessary to apply a new type of intelligence in dealing with this type of threat, which is an analysis of social networks.

The basics of the analysis of social networks (also known as network science or network sociology), is that individual nodes (which, depending on the type of network can be people, events, etc.) are related to complex but understandable relationships that form networks.[8] These networks are prevalent in basic order and simple legality. The networks form a structural one the basis of many natural events, organizations and social processes. Terrorist organizations are good for studying using analysis of social networks because they consist of networks of individuals extending to certain countries, continents, with similar economic status and with certain specific ideology. The analysis of social networks can provide important information about the unique characteristics of terrorist organizations, from network recruitment, network evolution and dissemination of radical ideas. The analysis of social networks can be used to understand terrorist networks, inform the relevant counter-terrorism institutions and form the basis for more effective countermeasures of the network war.

The importance of analyzing social networks in the fight against terrorism was recognized even before the September 11th attacks. The book by John Arquilla and David Ronfeldt, named *Network and Netwars*, which was released before the attacks of The World Trade Center describes the growing networking principles in modern criminal organizations. [9] The premise of the book is that war is no longer a battle between two powers.

A modern war is a network war, a battle with less intensity with terrorists, criminals and extremists with a networked organization. The main limitation of the analysis of social networks, which is applicable to any new and innovative technology, is that the analysis of social networks is only one tool that can be used to understand terrorism and is only one part of the puzzle. Furthermore, the basic assumptions for the analysis of social networks in terms of terrorism may not be completely valid. Despite the non-hierarchical approach, terrorist organizations are not completely organized into a network structure. Also, analyzing social networks needs to try to give an answer to the underlying cause of terrorism.

It is useful to understand how the network evolves and how to destabilize the network, but it is even more important to understand how the network recruits new members and why people want to join extremist organizations and terrorist networks. Social networks are highly variable objects (they change over time and across space). Hence in today's advanced information technology analysis of social networks in the function of anticipating and preventing terrorist attacks, is done through specialized algorithms. They automatically and in real time process the data placed on social networks and with the help of computer technologies make a prediction about possible act of violence by certain extremist groups and organizations, but also the so-called "lonely wolves" acting alone.

5. Conclusion

For a long time, religious extremist organizations have used the Internet to recruit, propagate and encourage data collection and fundraising. They turned to new platforms not only because the anti-terrorism agencies have disrupted their online presence, but because new media offer a huge audience and are easy to use. Terrorist followers, sympathizers, converts and newcomers, through new media find an easier access to access to content produced by terrorists, than what they are facing in researching and registering for access to forums. This trend is combined with the rise in the terror of "lonely wolves": attacks by individual terrorists who are not members of any terrorist organization. Terrorism of lonely wolves is the fastest growing type of terrorism, especially in the West, where all recent attacks by lonely wolves include individuals who have been radicalized, recruited, trained even launched on social networking platforms. The migration of terrorists to emerging online resources is a challenge for anti-terrorism agencies, as well as for an academic who investigates terrorism. The

growing use of social media has allowed radical groups and terrorists to freely distribute ideas in multiple ways, including web pages, blogs, social networks, forums, and video sharing services. The fight against terrorism is behind the manipulative use of new platforms by terrorists. Despite the growing research on the Internet in recent years, effective strategies, tools or tactics to combat terrorism have not yet been provided. The security community needs to adapt strategies to combat terrorism in new arenas, using new types of online warfare, intelligence gathering, and training cyber warriors. The virtual war between terrorists and anti-terrorism agencies is indispensable, dynamic and brutal.

Researchers around the world from the disciplines such as psychology, security, communications and computer science, need to be teamed up to develop tools and techniques for responding to online religious extremist organizations. This challenge multiplies multidisciplinary research topics - intelligence and security informatics, also known as cognitive security, for the study of the development and use of advanced information technologies and systems for national, international and societal security-oriented applications. Recognizing online threats, strategies for combating radicalization recognize the important role that the Internet and social networks play in advancing the violent behavior of extremists. However, due to the importance of the digital environment, the need for developing a separate, more comprehensive strategy for fighting and protecting against online extremist violence has been imposed, and with the help of technology, the resilience of the community will be strengthened.

The new online platforms represent the "increased prolongation of the war by other means" adapted to the famous phrase of von Clausewitz. Cyber space with its numerous and growing online platforms brings new challenges and requires a dramatic turning point in strategic thinking in terms of national security and the fight against terrorism. Strategic scholars should look beyond the current challenges to the future development and increase of social media resources and problems with the anticipation and prevention of terrorists to abuse those tools.

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Video-conferencing distance learning

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Abstract. One of the most popular and reliable distance learning technologies is videoconferencing. Videoconferencing uses audio and video telecommunications to bring people at different sites together when travel is not an option. Videoconferencing is used to bridge the distance gap between various sites, in order to stimulate collaboration, support and enhance student or staff communication and to enable flexible quality learning and accessibility with minimal costs. The aim of this study is to evaluate the potentials of videoconferencing distance learning and to understand student perceptions and their satisfaction with this kind of education. Also, a comparison of students' attitude between videoconferencing distance learning and traditional classroom environment learning is made. The results showed that this form of distance education can be accepted equally good as traditional methods of teaching.

1. Introduction

Distance education has been defined as “a separation in time and/or space between the learner and the instructor. More than a geographic separation of learners and teachers, it is a distance of understanding and perceptions that must be overcome by teachers and learners” [1]. There are many types of distance-education models including online courses and virtual laboratories [2], [3], [4], interactive videoconferencing, videotaped lectures, and audio-taped lectures.

Videoconferencing is a method of communicating between two or more locations in which sound, vision and data signals are conveyed electronically to enable simultaneous interactive communication. Much more personal and effective than audio conferencing, all parties involved can see the facial expressions and body language that are so vital to the way we communicate [5], [12].

Videoconferencing is a well-known facility, used in business and now increasingly in education, for bringing together – synchronously, visually, aurally – parties otherwise separated geographically. Video conferencing has recently become increasingly popular and disperse in the wake of faster and cheaper internet connections and better technologies. Modern standalone video conferencing units provide advanced video and audio quality due to more efficient compression and can function over normal broadband internet connections. Growing processing power and cheaper accessories, such as webcams, have also made it possible to participate in a video conference using dedicated software on a normal personal computer without any expensive special hardware [6], [11], [12].

Video conferencing works by using few different technologies. Some of these technologies are hardware while others are software related. A Video conference can be between two sites, i.e. locations which are connected to each other via the video conference, or the conference can connect multiple locations. Besides the audio and visual transmission of meeting activities, allied videoconferencing technologies can be used to share documents and display information on whiteboards.

Videoconferencing became a popular method with campus-based universities who were previously unable to reach their students effectively in different areas. Where geographical isolation had been a problem, the videoconference promised to bring new opportunities and options. Recent changes in the nature and size of the university population will necessarily create a wider range of particular circumstances and therefore, greater flexibility of provision [7]. Videoconferencing, in so

far as it supports distance education, may be an important factor to consider in alternative patterns of teaching and learning [13].

The current structure of the university, challenges the “Goce Delcev” University to organize and support its education with attention for communication and collaboration between the various campuses. Today this is mainly realized through physical mobility of staff and/or students between different locations. But, the university is progressively supporting initiatives that replace or enhance physical with virtual mobility. Considering the new challenges in higher education and understanding the importance of innovation in education through new educational technologies, the University “Goce Delcev” –Stip is doing permanent efforts to integrate various forms of distance learning with the traditional education.

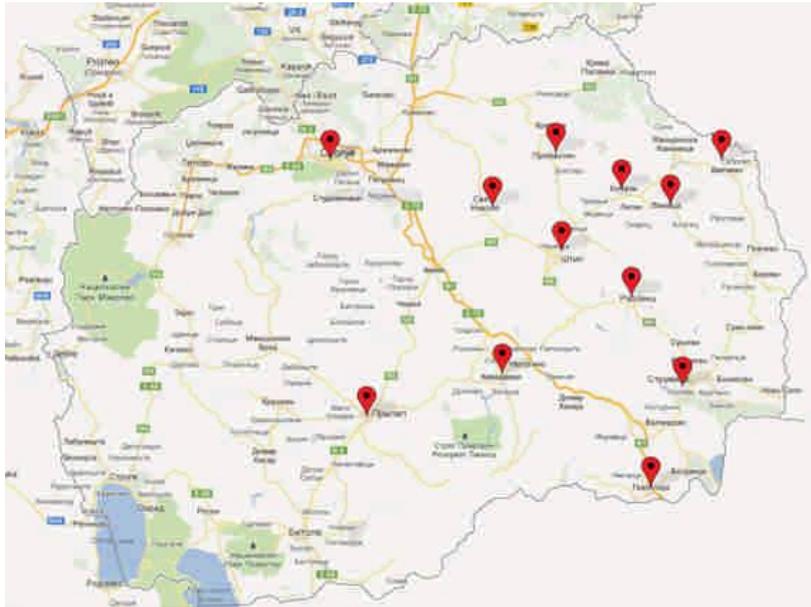


Figure 1. Locations of the “Goce Delcev” University dispersed units

The purpose of this paper is to describe the current implementation of the videoconferencing system at the university as a case-study and to remark on some non-functional requirements related to the technology and infrastructure and emerging during the process of implementation. The paper also presents students’ perspectives of videoconferencing in distance education. these findings resulted from a preliminary evaluation process of the videoconferencing system at the university [8], [9], [10].

2. Technical infrastructure for videoconferencing

The architecture of the videoconferencing system implemented at the ‘Goce Delcev’ University - Stip is presented in Figure 2. The core of the system is the videoconferencing management system, to which many end-points are connected. It consists of two segments:

- a) software for scheduling and management
- b) hardware components.

The main hardware components in the system are:

- Multipoint Control Unit (MCU), composed of a mandatory Multipoint controller (Mc) used for call signalling and conference control, and an optional Multipoint Processor (MP) used for switching/mixing media streams, and sometimes real-time transcoding of the received audio/video streams. Although the McU is a separate logical unit, it may be combined into a terminal gateway or gatekeeper. The McU is required in a centralized multipoint conference where each terminal establishes a point to point connection with the McU. The McU determines the capabilities of each terminal and sends each a mixed media stream. In the decentralized

model of multipoint conferencing, an Mc ensures communication compatibility but the media streams are multicast and the mixing are performed at each terminal.

- Gateway, provides data format translation, control signalling translation, audio and video codec translation, call setup and termination functionality on both sides of the network.
- Gatekeeper, provides address translation, admission and access control of endpoints, bandwidth management, and routing of all calls originating or terminating in its zone. Endpoints register themselves at a gatekeeper [6].

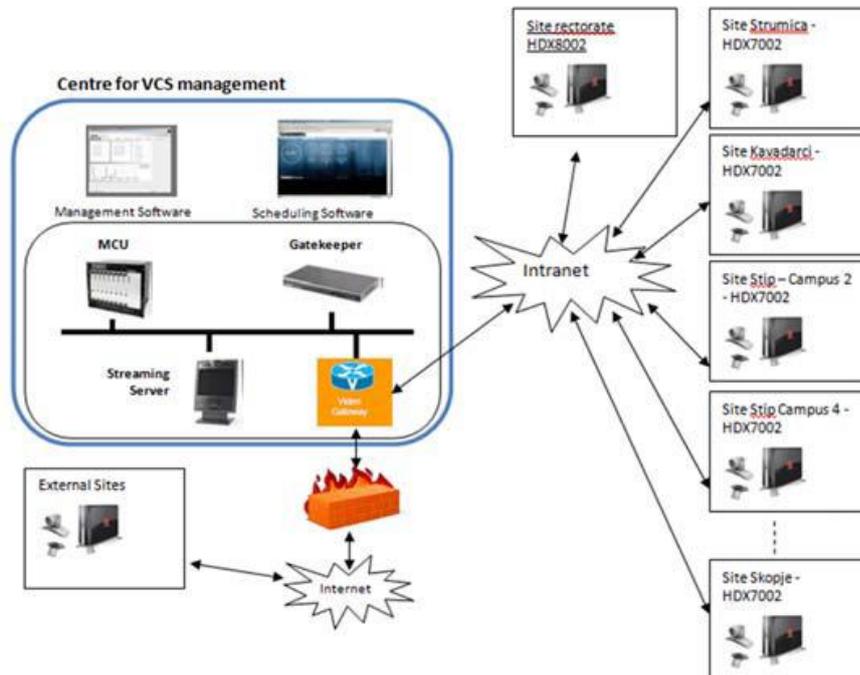


Figure 2. “Goce Delcev” University - Stip, videoconferencing system architecture

3. Research methodology

To evaluate the potentials of videoconferencing education as well as to understand students' perceptions and satisfaction with this kind of distance education compared to the traditional classroom environment, but also to understand the main challenges in this kind of setting, an experimental research was conducted.

The research was conducted for Microcomputer systems (MS) course delivered during the winter semester. This course was delivered to two separate groups of regular students at the Faculty of Computer Science, University “Goce Delcev”. The first group counted 60 students and was located in the city of Stip. The lectures for this group were taught face to face in a traditional classroom environment. The second group, counting 42 students was attending the same course in asynchronous sessions via interactive videoconferencing. Students from the second group were enrolled at one of the dispersed campuses of the Faculty of Computer Science, University “Goce Delcev” located in the city of Strumica. The instructor was physically located in the city of Stip.

The distance-education lectures were delivered from a classroom equipped with Polycom HDX 8000 end-point (Figure 3), 36 computers, document camera, interactive whiteboard, two LCD projectors and monitor.



Figure 3. Polycom HDX 8000 end-point, with table microphone, Multiview camera and remote controller

The lecturer had the ability to combine and to switch among three views delivered to the distant classroom:

- video image (e.g., the lecturer);
- computer screen (e.g., PowerPoint presentations); and
- the document camera (e.g., used to show hardcopies of figures and demonstrate working out calculations by hand).

One LCD projector projected the image being transmitted to the distant classroom, and at the monitor, the image of the students in the distant classroom was presented. The distant classroom was equipped with Polycom HDX 8000 end-point, document camera, two LCD projectors and whiteboard. They were projecting picture big enough to be perceived clearly by all students. During transmission, the distant site also had a faculty facilitator present at least for the beginning of each class, and two technicians monitored the entire transmission.

The traditional classroom lectures were delivered in a classroom equipped with a computer, a document camera, two video projectors and one interactive whiteboard. The synchronous distance education environment is summarized in Figure 4.

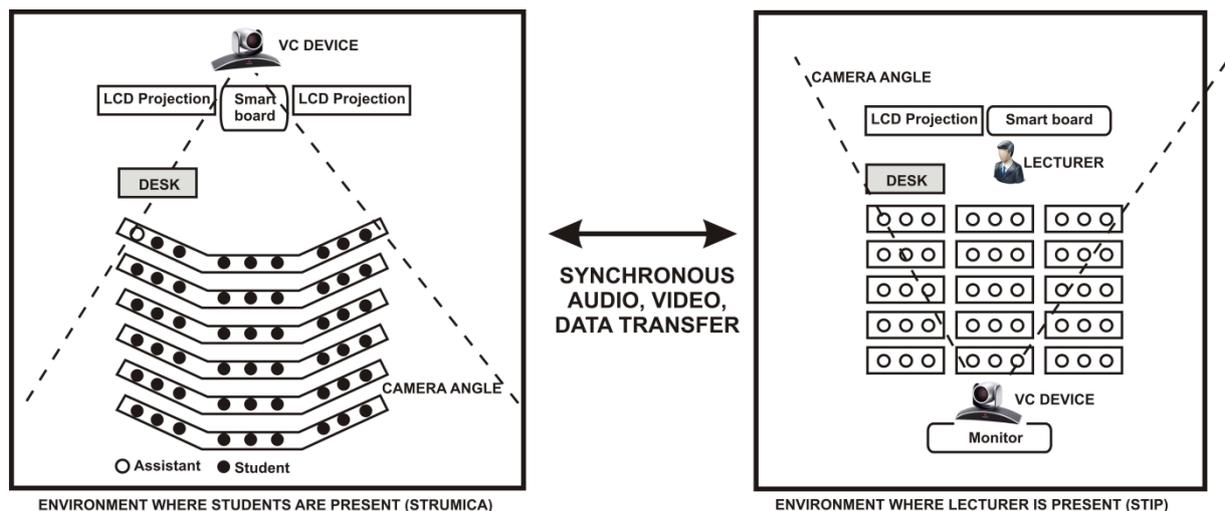


Figure 4. Synchronous distance education environment

Evaluation at a personal level throughout the course but also at a curricular level can lead to improvements to better suit the needs of the students. Course and instructor evaluations were

administered to each group at the conclusion of the courses. The questions rated students' perceptions of the course and instructor using a 5-point Likert scale anchored at 5 = strongly agree and 1 = strongly disagree. The variances of the results were first analysed using Levene's test for equality of variances. The evaluations were then analysed using independent sample t – tests based on the assumption of the equal variances or unequal variances where appropriate in SPSS v19.0. The final course grades were analysed by the same method.

4. Results

Students' demographic data are presented in Table 1. The traditional classroom students had a higher computer science grade point average (GPA) ($P = 0.012$) at the onset of the 2 courses, and the distance-education students had a higher mean grade in the prerequisite Digital logic (DL) and Computer architecture (CA) courses ($P = 0.321$ and $P = 0.222$ respectively) that preceded the MS course. No other significant differences were found.

Table 1. Student demographics

	Traditional classroom settings [mean value]	Videoconferencing distance education settings [mean value]
Age (years)	16.40	17.56
Overall CS GPA (on the scale 5-10)	8.67	7.44
Grade in DL	8.80	8.15
Grade in CA	7.90	8.83

Students who completed the course in the traditional classroom setting had an average final course grade of 8.92 compared to an average final course grade of 8.45 among students in the interactive videoconferencing group ($P = 0.031$). The response rate for the course and instructor evaluation was 95.24% (40 out of 42 students) for the distance-education students and 95.00% (57 out of 60 students) for the traditional classroom students. The mean evaluation score (Table 2) for the distance-education students was higher than for the live students (4.7 ± 0.6 and 4.4 ± 0.7 , respectively; $P < 0.001$).

Table 2. Domain analysis of student responses

	Traditional classroom settings [Mean (SD)]	Videoconferencing distance education settings [Mean (SD)]
General	4.4 (0.7)	4.7 (0.6)
Lecture content	4.4 (0.5)	4.6 (0.8)
Presentation / style	4.6 (0.5)	4.8 (0.4)
Student contact	4.3 (0.8)	4.7 (0.6)

During the videoconferencing lecture, the number of interactions between students, as well as between students and teacher were counted. The number of interactions is presented in Figure 4. As it may be observed from the figure the number of interactions is growing, which means improved synchronous communication.

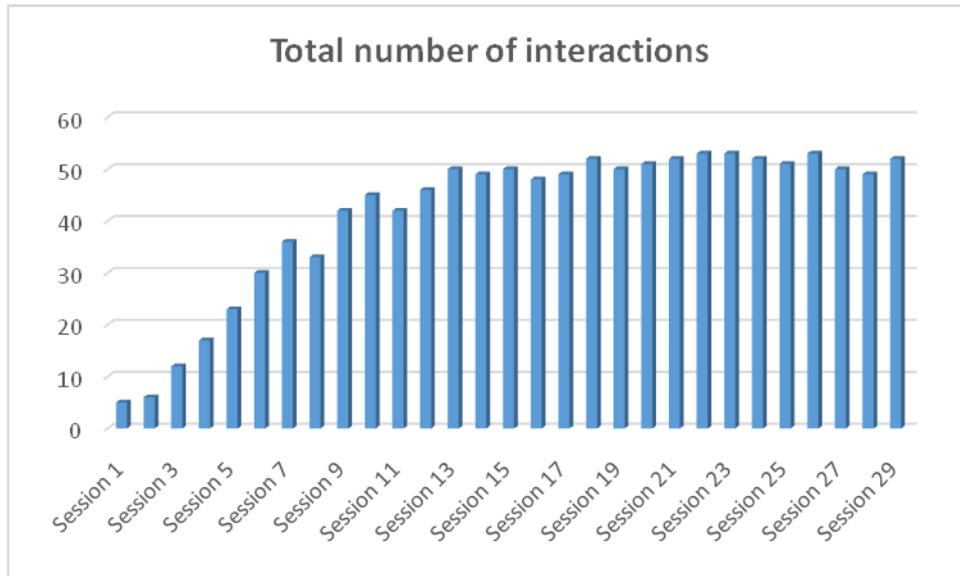


Figure 5. Total number of interactions during the synchronous

5. Conclusion

Video conferencing could lead the way for a dual approach, giving students more responsibility for their learning, working in groups, and doing educational tasks; all of which would benefit conventional teaching, but video conferencing provides an opportunity to implement them. It does not replace the use of print or other methods used in the conceptualization process. It can be used to encourage construction and its true use lies in encouraging dialogue and increasing the scope for dialogue. With the advancement and ease of availability of high speed and cheap internet connections, it is expected that video conferencing will increasingly become popular thus, leading to more interest and use of distance learning [11].

In our paper, students completing the MS course in a traditional classroom setting or by videoconferencing performed well and had a high overall perception of the instructor and courses. The distance education course was rated higher by students than the same course delivered in a standard classroom. Several techniques were used by the instructor to facilitate the instruction via videoconferencing that may have influenced the distant students' perceptions of the course. Based on the results of the interview with the distance students the use of recitations was highly valued by the distant students. Therefore, the incorporation of regularly scheduled recitation-type sessions should be considered when developing a distance-education course. Moreover, encouraging interactivity with discussions between sites and group works were also highly appreciated. Therefore, as a general finding from this research is the need for instructors to understand and acknowledge that using videoconferencing, as a delivery mode will have an impact on teaching styles and methods. Other findings also indicate that whether the course delivery mode is a traditional one or a technology-based mode, effective lecturers establish and maintain a highly interactive classroom community. Also, for efficient delivery of educational content through distance videoconferencing mainly depends on how much teachers are knowledgeable about their subject, about their learners, and about pedagogy.

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An autonomous mobile robot for obstacle avoidance

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Abstract. In this work ARDUINO UNO mobile robotis given, its specifications are given, the way it works, and the constituent elements. Before this, the terms robotics and mechatronics, the very beginings of them and their development are explained in detail. Finally, the software solution of the program that manages the robot is given, the program is presented, and the problems that we encountered in the realization of this project.

Introduction

Avoidance of obstacles is one of the most important aspects of mobile robotics. Without it, the robotic movement would be very inflexible and rigid. This paper proposes a robotic vehicle that has an intelligence built into it so that the vehicle will be all the time in function to avoid obstacles, or, to protect the robot from any physical damage. Here is a design of a robotic vehicle to avoid interference using ultrasonic motion sensors. We use the micro-controller (AT mega 328P) to achieve the desired operation. An ultrasonic sensor is used to detect any error, which sends the information directly to the controller. Depending on the received input signals, the micro-controller redirects the robot to move in an alternate direction by activating the engines that are bound to it by an arbiter for engines.

An autonomous mobile robot for avoiding obstacles is an intelligent device that can automatically bypass and overcome obstacles on its path. Avoidance of obstacles is a robot discipline in order to drive vehicles based on sensory information (information obtained from a sensor). The use of these methods in front of classic methods is a natural alternative when the script is dynamic and unpredictable behavior. In these cases, the environment does not remain unchanged, so the information from the sensor is used to detect changes that are subsequently adapted to the movement. Later, the robot automatically scans the rest of the environment.

1.1 Arduino / Genuino uno

Arduino / Genuino Uno is a microcontroller board based on the ATmega328P microchip. It has 14 digital input / output pins, of which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz quartz crystal, USB connection, power plug, and a reset button. It contains everything you need to support the microcontroller, it simply connects to a computer with a USB cable or connects to an AC-to-DC adapter or battery. We can manage the Arduino / Genuino Uno without worrying too much about if we are doing something wrong, the worst case scenario that can happen is replacing the chip for a relatively low price.

"Uno" means "one" in the Italian language and was chosen to mark the release of Arduino Software (IDE) and version 1.0 of Arduino Software (IDE) which were the reference versions of Arduino, now evolved to newer editions.

The UNO board is the first in the series of USB Arduino boards and a reference model for the Arduino platform.

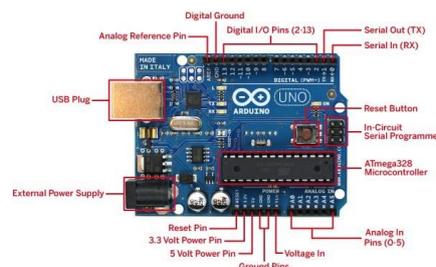


Figure 1. ARDUINO UNO table

In our project, the same ARDUINO UNO board is used as the main element.

1.2 Ultrasonic sensor

The audio waves emitted by the transducer are reflected by the object and returned to the transducer. After broadcasting the sound waves, the ultrasonic sensor will switch to the receive mode. The time spent between broadcasting and receiving is proportional to the distance of the object from the sensor.

An ultrasonic sensor is a device that uses an electrically-mechanical transformation of energy to measure the distance from the sensor to the object. Ultrasonic waves are longitudinal waves traveling as a series of compresses and extensions in the direction of the direction from which it originates from the source.

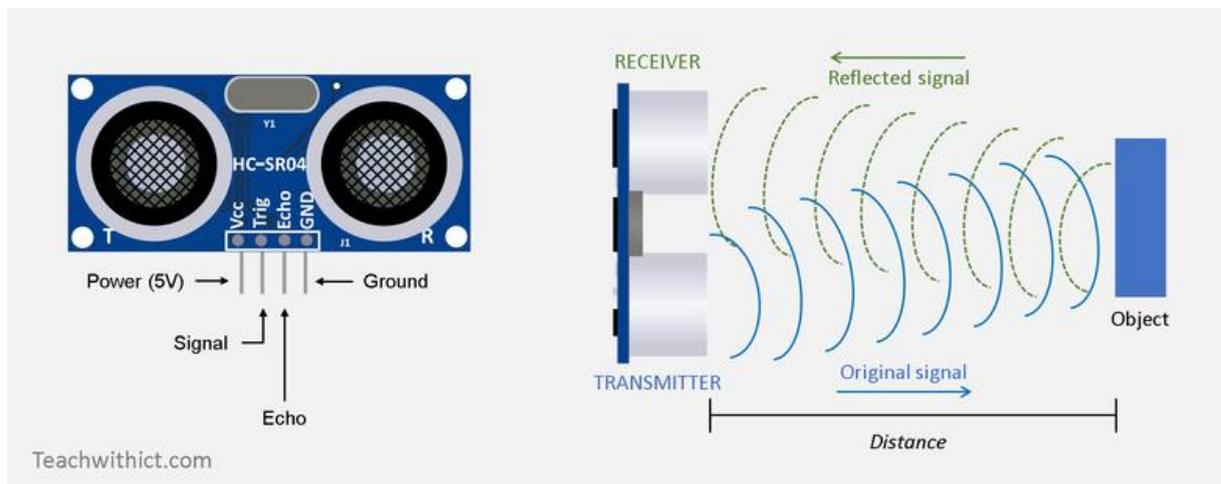


Figure 2. Principle of operation of the ultrasonic sensor

This sensor has 4 pins: VCC, Trig, Echo and GND.

Vcc represents the input voltage.

Trig refers to the wave that is released.

Echo refers to the return wave.

GND is the mass.

In our project, one such sensor for detecting obstacles is used, and it is placed on the forehead of the robot.

1.3 Driver for engines (L293D)

The L293D is a typical DC motor or IC driver, which enables the DC motor to be operated in any direction. The L293D is a 16-pin IC, which can control a set of two DC motors simultaneously in either direction. This means that we can control two DC motors with one L293D IC.

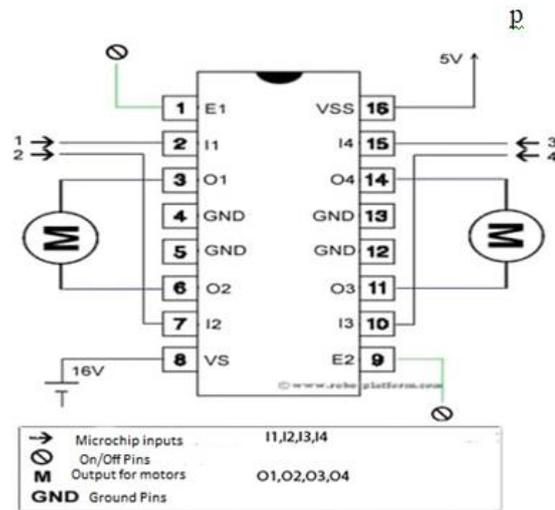


Figure 3. Engine driver schematic (L293D)

The motor driver receives a low current control signal, but provides a larger current signal, and thus acts as a current amplifier. The L293D is a motor driver that allows the movement of two one-way motors either forward or reverse.

To rotate the motor clockwise or counterclockwise, the voltage should change its direction. The H-bridge is a circuit that allows the voltage to change in positive or negative, and in turn, the motor rotates in the same direction.

In its own mode, it can simultaneously operate two DC motors forward, as well as reverse. Engine operation can be controlled with pins [2, 7] and [10, 15]. The logic signal for input 00 or 11 will stop the engine. The logic signal 01 will rotate clockwise, while the logic signal 10 rotates the motor counterclockwise.

In this project for avoidance of obstacles, two engines with a power of 12V DC and 200 revolutions per minute are used.

The used motor has a diameter of 6mm with internal holes. The internal holes are for easy fastening of the wheels using screws. It is easy to use and a relatively cheap robot application engine.

In our project, two samples of the DC engine are used as shown on the picture.

2.1 Robot programming

The control panel is used to communicate with the computer, using a serial communicator (USB connection). An adapter for data transfer is used.

Programming is not hard at all, it is based on the programming language C, which requires the installation of arduino software (IDE), later everything that remains is the construction of the program, which may be the most complex segment of the entire project.

At first, we need the key points around which the program itself will run, the robot's goal is to remain "unharmred" in the movement, which means avoiding the obstacles around it, which is provided by the key robot algorithms below, and later they are written in the programming language of the robot module.

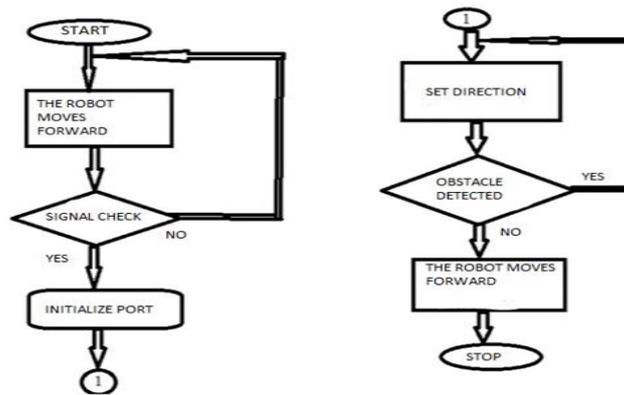


Figure 4. Algorithm

2.2. Algorithm

The following steps are written for the robot itself:

Step 1. An artificial intelligent robot collects information about the situation using sensors.

Step 2. The robot then compares this information with the initial information.

Step 3. The robot then decides on the meaning of the information, compares and determines whether a reaction is needed.

Step 4. The robot predicts what action will be most appropriate on the basis of the information collected.

Step 5. The robot then performs appropriate action and moves accordingly.

Step 6. The robot returns to step no 1.

It remains to describe the program in detail:

<code>#include <AFMotor.h> // insert motor library</code>	The first command represents the motor driver library, i.e. the <code><AFMotor.h></code> library that was previously installed.
<code>#define trigPin 12 // define pin for trigger sensor</code>	The second two commands define which pins will be active on the adruino board for the sensor.
<code>#define echoPin 13 //define echo pin</code>	
<code>AF_DCMotor motor1(1,MOTOR12_64KHZ);</code>	With these commands we adjust the pulse-width modulation, that is, with its help, the digital signal that we get at the output becomes analogous, suitable for the engine.
<code>// Set the motors</code>	
<code>AF_DCMotor motor2(2, MOTOR12_8KHZ);</code>	
<code>Serial.begin(9600); // begin communication</code>	With this command we start communication with 9600 bits per second.
<code>pinMode(trigPin, OUTPUT);</code>	This command sets the pin of the sensor as a sender, while the echo pin as an input.
<code>pinMode(echoPin, INPUT)</code>	
<code>motor1.setSpeed(105)</code>	This command sets engine speeds (rpm).
<code>motor2.setSpeed(105)</code>	

<code>long duration, distance;</code>	We begin searching the space.
<code>digitalWrite(trigPin, LOW);</code>	We send the sender pin to the low level.
<code>delayMicroseconds(2)</code>	We add a delay of 2 milliseconds which contributes to stabilization of the signal.
<code>digitalWrite(trigPin, HIGH);</code>	This time we put the pin of a high-level sender.
<code>digitalWrite(trigPin, LOW</code>	After a pause, we send it back to the low level again
<code>duration = pulseIn(echoPin, HIGH)</code>	On the variable duration we set the value of echo pin, i.e. time.
<code>distance = (duration/2) / 29.1;</code>	We convert the time received from echo pin to centimeters.
<code>if (distance < 25)</code>	If the distance is less than 20 centimeters
<code>Serial.println ("obstacle detected ");</code>	The following functions are printed
<code>Serial.println ("details for the obstacle");</code>	
<code>Serial.print (distance);</code>	
<code>Serial.print (" CM!");//</code>	
<code>Serial.println ("obstacle detected, starting to turn");</code>	
<code>Serial.println (" turn");</code>	
<code>motor1.run(FORWARD</code>	We set the functions for the engines, thus naming the direction of motion of the robot
<code>motor2.run (BACKWARD);</code>	
<code>motor1.run(FORWARD)</code>	If the condition is satisfied, the robot has not noticed any obstacles and continues forwards.
<code>motor2.run(FORWARD);</code>	

2.2 Robot simulation

In the simulation below we can physically see the robot's behavior around the environment, that is, the robot itself has no prior goal, or point to reach, but its sole task is to avoid any obstacle while remaining intact. The picture below shows that the robot initially has no obstacles and therefore continues straight, at its first obstacle, it changes its direction, and after passing the obstacle it continues its straight line.

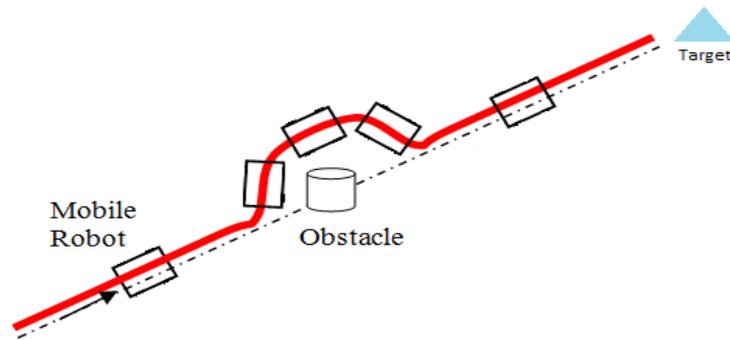


Figure 5.Simulation

The picture below shows more paths a robot can choose when avoiding an obstacle, these paths usually depend on the environment for which they are planned, and also how large is the surface it will move on.

In case there are more obstacles around the robot, this must be taken into consideration when programming, to reduce the robot's visible space, thereby helping the robot to get closer to the objects and thus create more room for maneuver. Otherwise, in a situation where the robot is in a space with fewer obstacles, it is desirable to adjust the sensors to read from a distance, which can further increase the speed of the robot and thus its efficiency.

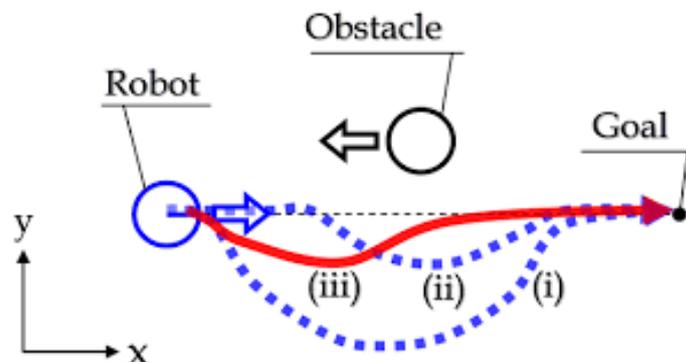


Figure 6. Different paths

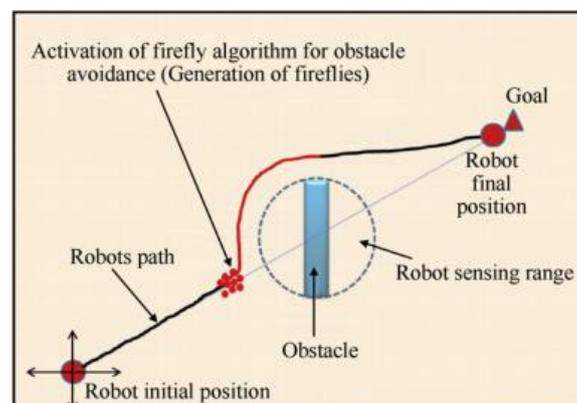


Figure 7. Simulation

Conclusion

As we can conclude, the outcome of the thesis is simple, the autonomous robot controlled by a computer moving around revealing the obstacles on its path, and avoiding them.

The robot emits ultrasonic waves through the ultrasonic emitter, and receives the ultrasonic receiver back for a certain time interval, if there are obstacles and ultrasonic waves colliding with them, then the brain of the robot (microcontroller) will calculate the distance, and analogously it will react to the situation.

This work can be further expanded and used to design alternative technical solutions based on the required specific requirements. This is a small step in forming a completely mobile and autonomous robot that would be able to perform other tasks.

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Improving the current way of learning in the Border Police of the Republic of North Macedonia in e-learning and smart learning environment

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Abstract. This paper begins with analyzing the problems of existing learning environments, along with the need for reform and innovations of educational behavior in the Border Police of the Republic of North Macedonia. It is followed by a discussion on the need for the emergence of e-learning and smart learning environment in a remote border area. The paper also looks at the interaction of teaching method, technology and their unification towards the furtherance of e-learning and smart learning environment. From the education perspective, issues like learning model, assessment model and interpersonal component are discussed. From the technological perspective, nascent technologies, innovative uses of developed technologies, and new technological models are elaborated. From the perspective of educational and technology integration, new course of study, changes in teaching behavior, re-engineering education, and alteration of the existing Border police educational methods and structure are explored. Finally, the future perspectives of smart learning environments are reviewed and shared, through examples of emerging innovations such as the open-source platform like ILIAS learning management system, Moodle open-source platform, game-based learning, virtual classroom, forums, and other services are addressed. Learning Content Management System (LCMS) supporting the desired standards should be chosen and implemented in the Border police of the Republic of North Macedonia.

1. Introduction

There are many terms for online education, but there is still no unique acceptable definition. Some of them are: virtual education, internet-based education, web-based education, and education via computer-mediated communication.[1] E-learning is usually defined as interactive education in which the learning content is accessible online. It is instruction delivered via computer that is intended to promote learning.[2] E-learning can also be termed as a network enabled transfer of skills and knowledge, and the delivery of education distributed to a large number of recipients at the same or different times. For e-learning productivity and improvement of current education we have to take in several aspects and conditions. Those conditions of improving e-learning are the tools, learning resources, content, strategies, participants and the learning outcome or the results. In the beginning, this was not accepted wholeheartedly because the system lacked the human element. Online human activity with real people is one of the desired forms but it is not obligated, so the immersion of e-learning is often more on the learning content than on human action between learners and tutors. Thus the product of the learning is 'content' and plays a nucleus in e-learning.[3] Learning content can be defined as documents and media objects presented in different formats like text, digital images, video, audio, multimedia presentations, interactive multimedia tutorials, external web documents, including

discussion board contributions, various blogs, or wiki-like contributions, discussions forums that are used in the learning process.[4] On the other hand, distance learning also needs the technology, resources and instruments, but the social status, education and acceptance depends on the vision of the educator who wants to implement cost saving and practical content with solid results. In a nutshell, the key difference between online learning and distance learning is geography. Students can be together with an instructor and use online learning, but distance learning implies that students and the instructor are separated. In Border Police both techniques can play their role. E-learning can be traduced by 'virtual learning'. It is a software system designed to support teaching and learning that allows tutors and learners to interact in an integrated, on-line environment.[5] It is used for remote education and similarly it can be used for Border Police education.

1.1. Strategies used for online education

The goal of education in this century is not simply the dominance of content knowledge or use of new technologies. It is the mastery of the learning process. The effective integration of technology requires a clear strategy and a revolution in thinking about how learning and teaching must be delivered and how the institution must overall adapt to change.[6] Education should assist turning unskilled person learners into expert learners - individuals who demand to learn, who know how to learn strategically, and who, in their highly individual and flexible ways, are well prepared for education. We enter in a smart learning environment, which is publicly known as smart class.

Much of the skill of the smart learning environments we develop, is concerned with compensating for problems that are almost entirely caused by the environment in which we teach. Border Police as any other militaristic environment, can achieve the conditions of serious advance learning techniques and tools, and also the qualified educators, but the problem is the educational level of the police officer included. If the learning environment (including the people, tools, systems, and structures within) prevents learning, it is hard to think of a better way to characterize it than as 'stupid' or not so smart environment.[7] Thus, we have to develop smart environment by promoting smart class in Border Police departments.

2. Resources for e-learning

Online education should also use digital instruction materials, 3D animated modules and videos. All notable Universities and schools are setting a criterion for using this concept. Technologies change the nature of the content which exacerbates the trend toward discrete knowledge units, as all-important artifacts such as syllabi, lectures, course readings and class notes located online.[8] This concept of progressive and interactive learning process create new opportunities for self-directed and flexible learning.[9] The idea of digitized classroom has not only made the educational activity but it gave the students knowledge to improve their smart class as a digital maiden, which is rapidly transforming the way teachers teach and the way students learn in innovative and meaningful use of technology. Globally, many countries are making the creation and diffusion of information and communications technology (ICT) an important priority.

Even in developing countries, usage is increasing dramatically. Computers and Internet connection were widely available in schools and classrooms of developed countries like USA.[10] According to the State Statistical Office of the Republic of North Macedonia data, in the first quarter of 2018, 79.3% of the households had access to the Internet at home. The participation of households with fixed broadband connection in the total number of households was 70.4% in 2018. 74.9% of the people used computers, laptops, smart-phones, tablets or other portable devices at work. According to the State Statistical Office of the Republic of North Macedonia, in 2018, 94.4% of the enterprises used computer in their work.[11] This numbers are increasing on a daily basis.

2.1. Smart learning

Smart learning is represented by interactive lessons, game-based learning software, formative assessments and collaborative workspace. The content created in smart environment is already adjusted to the creative space which usually makes easy adding PDF, word, power points and do not have to be recreated again for the student purpose. Students are also able to access (add or delete) their files that are marked as assignments, homework or projects from their smart phones or tablets.[12]

Using the class ID, student can interact with the platform in use and access the class. This pattern is simple and it has been used ever since the online learning emerged. In the coming years, technology will impact the learning experience in many ways. Internet of Things (IoT) continues to confirm its important position in the context of Information and Communication Technologies and the development of society.[13] Smart class is powered by a vast repository of digital instruction materials exactly mapped to meet the specific objectives laid out by different state learning standards.

2.2. Open-source software

With the eruption of MOOCs (Massive Open Online Courses), online learning became a blistering topic for the world's news media. Actually, the MOOCs message merely added motive to the steady growth in online learning. Today there are more students with reliable Internet access who research the possibility to project some of their courses online; less faculty members who do not wonder about the implications of technology-mediated learning for their teaching; and there is an increase of higher educational institutions that are struggling to improve institutional policies for online learning.

In our proceedings, online classes offer the Border Police officer a convenient way to complete fully certificated degree, and also to have an access to broader documentation and knowledge about police techniques and procedures. Similarly, smart e-learning could prevail in Border Police through the implementation of smart education and its continuous standardization.

3. E-learning categories

The institutions and universities in particular, can work across disciplines and lead the progress of the e-learning technologies, models and modules, ethics, and promoters of the internet enabled education in the Republic of North Macedonia. For instance, university instructor of computer science and engineering can direct e-learning labs for the development of modern technologies. IT College can teach staff how to supply e-data. Also, they can work with business colleges to set and design e-learning courses to create new platforms. Medical colleges can empower the Internet of Medical Things, and Law colleges can teach e-learning ethics, privacy, and policy. As higher education institutions commence to develop and leverage solutions such as radio frequency identification (RFID) and cloud computing through e-learning technologies, they will be able to analyse and manage Big Data.

3.1. Personalized e-learning

Border Police officers as students often forget memorized information, or they fail to apply it in situations where it would be useful if the content is not personalized. While the personal nature of some electronic devices might suggest the importance of personalized learning, in some cases the personal nature of the device can be an obstacle in implementing e-learning.[14] This is the first characteristic that identifies e-learning - it is personalized. The police officers need help in connecting new information to what they already know, and in extending and applying their knowledge to new problems. Researchers believe that students learn best when they work to combine their past experience with new information with self regulation learning (SRL) to solve problems that are personally meaningful to them.[15]

3.2. Virtual classroom

By using smart boards in a classroom, we are appealing to both the audio sense and visual senses of students. Learning in such a way is very effective as the information is strongly embedded in

student mind this way. Smart boards lead to active learning process, where both the teacher and the students are involved.

3.3. Learning in smart environment

In the past, students memorized and used formulas and models created by others to solve problems. In the early twenty-first century computer tools provide the opportunity for students to construct and test their models using tools such as spreadsheets or concept maps. When we are talking about online learning we have to mention there is a necessity of reading and writing on the presented topic. Otherwise, the students will face difficulties. Note taking and other methods are not so important as there is importance of office and mind-mapping tools. On the basis of all these, some advantages can be systematized. The advantages of online learning are: the time and place of teaching and learning does not matter, quick adaptation of students to this type of learning, consistency of data, ability to measure learning efficiency, reducing learning costs, individualization of learning, better memorization of the content and reducing the time of learning. A successful e-learning experience will use a combination of the technologies most appropriate for the practitioner, the learner group, the course content and course assessment. Central to e-learning success are communication technologies which are generally categorized as synchronous or asynchronous. Synchronous activities happen at the same time and involve the exchange of ideas and information with one or more participants.

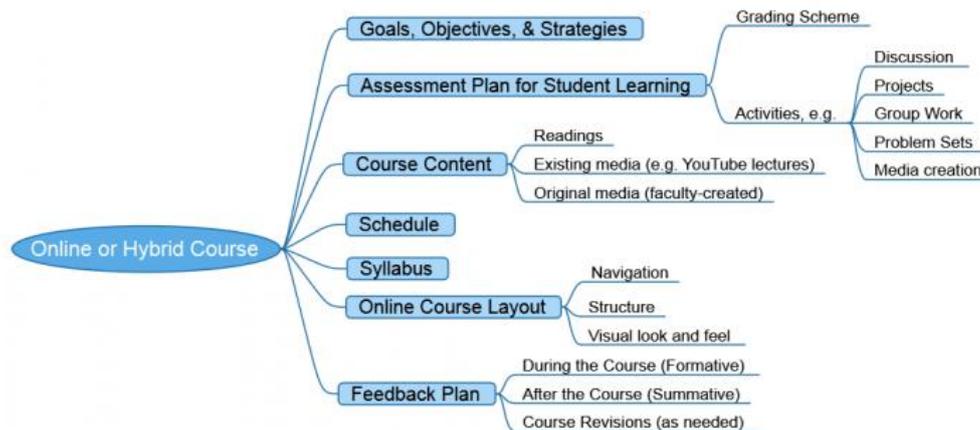


Figure 6 Online course layout

An online course should have an assessment plan (figure 1). This includes activities and assignments and overall grading scheme for the course. The content encompasses the materials provided to the students to support the course learning activities. It also includes a specific course calendar listing with all completion dates for all instructional units, assignments, group projects and tests. Qualities of a good syllabus are similar in face-to-face and they provide all of the information required for the students to navigate their way through the course. Every course needs to be delivered on an electronic platform, and one of them is Blackboard. The course menu can be modified to create new categories, and it eliminates those sections which are not in use. The menu can direct students to a complete course calendar, assignment guidelines, electronic reserves, discussions, and other common course resources. Feedback establishes ways of collecting data during and at the end of a course to measure the extent of student's achievements in the course. Online learning can allow us to change where we learn - anytime and anywhere.

3.4. Learning Management System

A Learning Management System (LMS) is software for delivering content, tracking students and managing training. Practitioners set up a course web page to hold learning content and assessments, then track and coordinate their students with tools like grade books and activity reports. The main functions of a LMS are: manage and register users, resources and formation activities, accesscheck, control and monitoring the learning process, doing evaluations, informs, managing

communicationservices like forums and teleconference amongstothers. Generally, a LMS does not include possibilities to create its content. A LCMS (Learning Content Management Systems) is used to create contents for courses, but it is in charge of administrating contents created by different sources.[16] Pages dedicated to the subject of distance learning can contain both discussion groups, as well as inquiries and send-out e-mail. Web sites dedicated to distance learning should help students to find the necessary information about the course, learn the material and get to introduce them to the topic of the course. Web pages designed in an appropriate way should help reflection, discussion and active participation of students in the distance learning process.

4. Standards and platforms

There should be realistic approach and a need for standard internet tools such as a web browser and email, and the requirement of download and installment for certain software. There is also a need for reliable and secure access to a computer and internet. E-learning program should be established to research, experiment with, and utilize technology that would support online, immersive and mobile education and training of the Border Police. NATO standardization in many different areas is influencing the military and other armed structures in the Republic of North Macedonia. The expectations are that NATO Joint Advanced Distributed Learning is going to have some introduction in the Border Police program of education at some point. This program reached full operational capability and now continues to support the development and distribution of online courses worldwide, as well as NATO and national education and training technology and capabilities.[17] The accreditation, audit and assurance process of e-learning should therefore be integrated in the national framework and not be evaluated separately. This is especially valid for Western Balkan countries where e-courses or e-programs are not differentiated from standard ones in all national and institutional documents.[18]

4.11 Moodle

Moodle (Modular Object-Oriented Dynamic Learning Environment) is a very popular LCMS tool. Moodle is a system for making courses, a software package designed to help lecturers to create quality 'online' courses and direct their results to students. Such electronic learning systems are sometimes called "Distance Learning Systems", "Virtual Learning Requirements" and "Manager content learning system". Students only need a 'search engine' (e.g., Google Chrome, Firefox, Internet Explorer, Opera) to participate in a course created by Moodle. Moodle is exploited by Universities, schools, and individual instructors.

To improve education with web technologies, Moodle is designed to be compatible, flexible and easily interchangeable. It was developed using the PHP language, which ensures independence from platforms. Moodle is built in a highly modular way and uses various types of technologies such as shared libraries, abstractions and cascading styles for shaping the interfaces that they allow expandability of the active system. Using XML technologies, independence of the interface and the Moodle coding system is ensured. Moodle can be installed on any computer that can run PHP, and can support a SQL type database (e.g. MySQL). It can run on Windows and Mac operating systems and many distributions of linux (e.g. Red Hat or Debian GNU).

4.2. Ilias

However, while Ilias scores lower on most features, it has one particular attribute that is not supported by any other open-source LMS. In Ilias, ability can be defined as 'learning objectives'. A learning objective can include pre-tests for skills gap analysis, and the administrator can set it up so that a judgment must be passed, or certain learning objects completed to fulfill the learning objective. In this way, a set of learning objectives can be set up for each activity or function in an organization.

4.3. Sakai

Sakai is a free and open-source product that is built and maintained by the Sakai community. Sakai's development model is called 'Community Source' because many of the developers creating Sakai are drawn from the 'community' of organizations that have adopted and are using Sakai. Sakai is an online collaboration and learning environment. Many users of Sakai deploy it to support teaching and learning, ad hock group collaboration, support for portfolios and research collaboration. Sakai is a set of software tools designed to help instructors, researchers and students to create websites on the web. For coursework, Sakai provides features to supplement and enhance teaching and learning.

4.4. Comparing the platforms

After searching for more than 10 open-source LMS, tree of the popular ones were chosen and compared using the criteria of Al Ajlan.[18] By comparing the tree open-source LMS (table 1), we get the best results for the Moodle open-source platform. There are many Moodle Partners to assist, even to host your Moodle site.

Table 3. Comparison of three open-source LMS. It shows that Moodle and Ilias have the best communication tools and interface.

Data	Ilias	Moodle	Sakai
Whiteboard/ Video Services	No whiteboard feature. It has a video service.	Best whiteboard feature. Skype supported	No whiteboard. No video.
Forum	Supports discussion forums.	Active discussion trough workshops.	Supports discussion group.
File exchange and mail	Supports internal e-mail system.	Provides easy access way to materials.	File exchange and e-mail unavailable.
Online Journal Mail	It publishes online content.	It has journal module available.	No information.
Real Time Chat	It has a JAVA enabled chat service.	Supports real time chat.	Supports chat.

5. Learning community in Border Police

Representing and communicating complex problem situations is an important function of technology in Border Police. Multimedia representations are easier to understand than problems presented as text. Whatever type of technology is used, an important goal is to create problem representations that are interactive and under the learner's control. According to some studies, students remember movies better than the lessons taught in classroom. [19] This kind of learning environment provides better education and access to students and Border Police staff through presentations and videos. Some of the Border Police officers may not understand the lessons lectured in regular classes, but doing the smart classes methodology can help a lot in minimizing the effect of lost attentiveness at class. The trainee can identify areas of student's strength, as well as weaknesses.

5.1. Realistic expectations

Although online learning is creating opportunities for fundamental changes in the way teachers teach and the way students learn, a recent survey indicated that only one-third of teachers feel prepared to use it effectively.[21] This includes being able to use word processing, spreadsheet, presentation, and Internet browsing software. Such tools help teachers increase their productivity by preparing reports or lesson plans, taking notes, and communicating with colleagues. For promotional

purposes on the web, online learning must create challenging activities that enable police officers link new information with the old one, adopt new meaning and use their cognitive abilities, because it is the strategy of teaching, not the technology, which affects the quality of learning. A computer itself is not the one that makes policemen learn, but real life models and situations, and police interaction with those models and simulations. A computer is more a tool that allows processing and delivery of instruction and information beneficial for border policemen.

6. Conclusion

To improve something means to enhance in value or quality. Many e-learning programs fail, that is, a large number of trainees give up and never complete the program to the end. First, it is important to meet and discuss quality assurance on state level and between different stakeholders in the educational sector. Second, there is a need for a “common” definition of e-learning, a common language of understanding. Third, e-learning must be an integral part of Border Police, while quality assurance expertise by the evaluators has to cover all aspects of e-learning. It is indicative that changes at all levels will be necessary to bring widespread and effective use of technology in institutions like the Border Police. The existing system of online learning in the Border Police of the Republic of North Macedonia is set up without standards and professional trainers who lack adequate training in smart and online learning.

Successful programs in Border Police must devote a substantial portion of their budget to extensive development and technical support; they must encourage a culture of collaboration in which educators work together to explore more effective uses of technology; and they must modify their assessment systems to measure changes, such as deeper understanding and improved problem solving, that result from effective use of technology. We introduced various online techniques and practices so in future we can tackle modern security challenges and have better Border Police learning. Self-learning in smart environment and e-learning supported by tutoring, lesson planning, setting the learning objectives and implementing the right teaching strategies can provide the Border Police precise assessment practices for measuring the outcomes of individual and group progress. We identified that the Moodle platform is the most suitable and accessible for online learning compared to Ilias and Sakai. The e-learning is not just a technology update and development within the industry, but it is expanding the modification of the whole society, including higher education institutions and organizations.

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ADL based preparation, establishment and performance assessment of a tactical exercise for a communication network realization in a training procedure

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Abstract. This article gives the overview of the proposed training procedure model for the final year Military academy cadets enrolled in Electrical Engineering Studies, Telecommunications module at University of Defence in Belgrade. The procedure itself is comprised of three segments – preparation, establishment of a tactical communication network and the performance assessment. During preparation phase, cadets are meant to frame their formal knowledge gained throughout their studies and to direct the attention towards the principles and the equipment it is going to be used in the future exercise. Establishment phase is the practical realization of the communication network along with all the customer services for the brigade level commanding post staff. The final stage is the performance assessment, which is to be divided in two parts – network performance assessment and the cadet's knowledge and skill improvement assessment. The significance of the presented research is to improve the education procedure related to the process efficiency, lowering costs, and time optimization using modern teaching methods.

1. Introduction

Military Electronic Engineering (MEE) of Graduate studies at the Military Academy, University of Defence in Belgrade is one of the studies programs, which is consists of eight-semester long educational process [1]. MEE is comprised of four different modules – Telecommunications, Information Systems, Radar Systems, and Rocket and Fire Control Systems. The first two study years are the same for all modules in meaning of the subjects (courses) that the cadets are enrolled into. The base knowledge which is obligatory to acquire during the first four semesters among other is incorporated in the targeted subjects, such are Mathematics 1 to 3, Probability and Statistics, Physics, Telecommunications 1, Basics of Electronics, Signals and Systems, etc. The third and the fourth study years are specific for each module in terms of special subjects related to specific technical knowledge required for the related systems.

Those subjects (e.g. Telecommunications module) within which scope are signal transmission techniques, commutation and multiplexing principles, telecommunication and information systems management, etc. give the foundation of specific technical knowledge. Mentioned subjects yield for various types of teaching methods in order to adequately and efficiently prepare cadets for the duties they are meant to fulfil at their starting posts. Those methods are incorporated in modern teaching tools as Advanced Distributed Learning (ADL) platforms [2], [3], simulation software [4], [5] and new analysis tools based on the Experience Application Programming Interface (xAPI) standard [6].

The last semester is quite specific in terms of specific subject teaching. The systems used in the teaching process are to some extent adopted to educational purposes and are very useful for laboratory practices. Being engaged into defined laboratory exercises, which allow signal parameter measurement, the cadets are introduced to the real system workflow. The ultimate goal of the educational process is to make cadets skillful in configuring each system part itself, getting aware of the system in all, and to be able to plan, realize and maintain the complex technical system (for

example a telecommunication center comprised of various elements of telecommunication systems for military operations).

From the presented, it can be concluded that the educational process for those kinds of modules is quite complex and it must be comprised of different educational methods in order to fulfil the required target goals. This paper is going to present the new development plan for the final stage of teaching process for Telecommunications module cadets in order to upgrade the teaching process, as well as to rise up the effectiveness of the future signal officers.

2. Subject structure, expected outcomes and difficulties

There are forty-one subjects that are included in the Telecommunications module curriculum. One of the final ones is „Professional Practice 2“, subject which is a mixture of knowledge and skills required for a high-quality signal officer (namely IT system engineer and integrated communications manager) to be equipped with. This course is divided into several topics concerning Integrated Communication Network (ICN) realization:

- Planning;
- Deployment;
- ICN and services realization;
- Maintenance;
- Performance assessment.

ICN military operations project management [7] involves two categories – Planning and organizing and Implementation (Figure 1). ICN model is made considering a scenario framework, which takes into consideration mission requirements, as well as information exchange requirements. Based on this, adequate planning of the network architecture and required information systems is made. Deployment phase consists of two main sub-phases – ICN elements configuration and system elements field disposition.

In order to properly implement the ICN, it is necessary to connect all the elements in one integrated system, and during maintenance stage to constantly monitor the information flow and security performance.

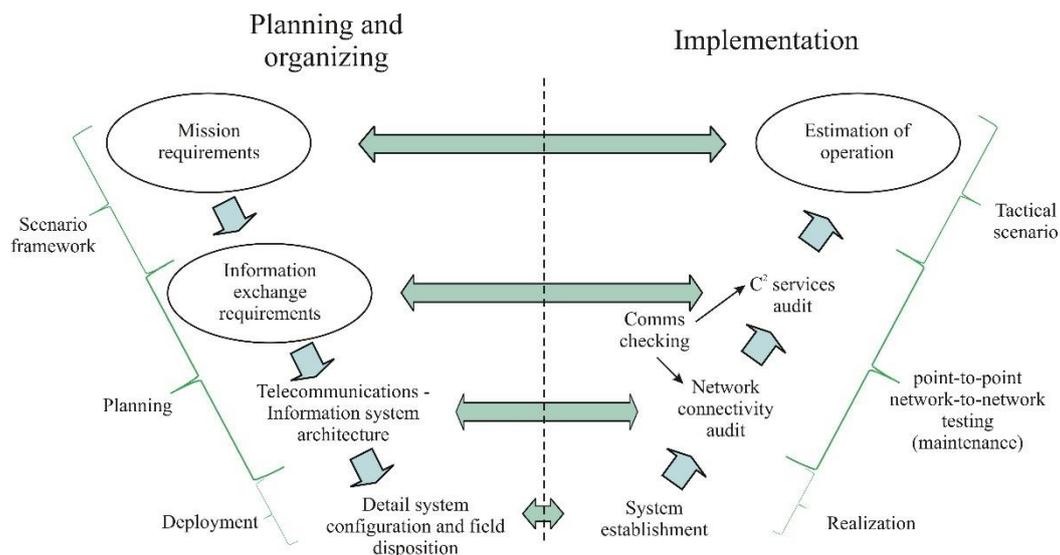


Figure 1. ICN project management

2.11 Planning

As a starting stage, it is obligatory to make the plan of the required ICN for a desired tactical situation. This stage involves the planning procedure for several integrated network segments. The most demanding planning part is the radio network segment, which consists of HF (High Frequency – 3-30 MHz), VHF (Very High Frequency – 30-300 MHz), and UHF (Ultra High Frequency – 300-3000 MHz) radio systems. All of those systems have specific radio access technologies, which are to be properly configured in order to provide high quality radio links. It is essential to provide adequate frequency utilization, network structure in coordination with the tactical scenario and reliable security mechanisms in order to protect information flow from unauthorized access (Figure 2).



Figure 2. Radio component configuration parameters

The next segment of planning is to provide configuration parameters for microwave LOS (Line of Sight) links. It is necessary to make a proper space distribution of LOS systems, to sufficiently use available frequencies, define data rates, modulation type, information baseband signal standard and to arrange links considering possible fading scenario possibilities (Figure 3).

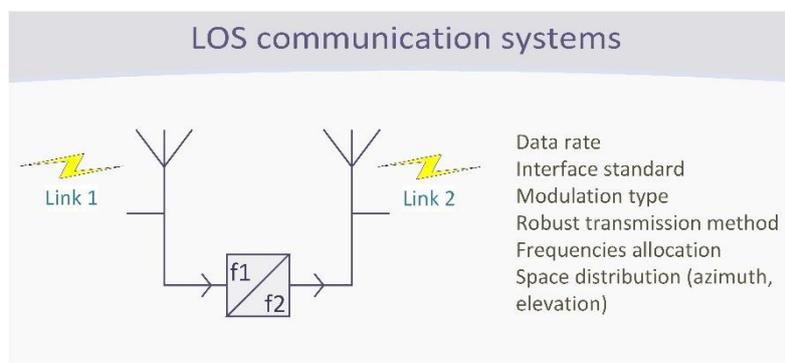


Figure 3. LOS component configuration parameters

The third major ICN part is switching and cable network component. As the core part of ICN, it is essential to properly plan those high bandwidth communication node configurations and cable links that can support high demanding services of tactical electronic warfare situations. This process requires to make transmission parameters such as types of cables and information standards, routing methods, services and subscriber parameters properly configured (Figure 4).

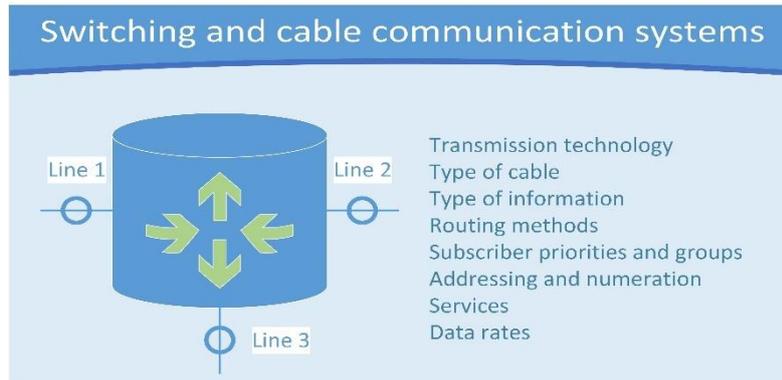


Figure 4. Switching and cable component configuration parameters

The planning process is based on the case study where cadets are pursued to actively propose the solutions for the given tactical scenario. In this way, they develop management skills and become aware of the parts of theoretical fact gaps they have.

Beside ICN communication infrastructure, there is an additional component of Tactical Command Information Systems (TCIS) that is meant to be applied. However, considering the fact that is the responsibility of the Information Systems module, it will not be taken in consideration in this analysis.

2.2. Deployment

A good planning process enables prerequisites for efficient configuration data deployment. The next stage of exercise realization is to produce required configuration parameters for considered scenario, which have to be consolidated between each other. The consolidation means low radio emission interference and effective secure communication between ICN nodes. For such critical stage, cadets use various kinds of software solutions that provide successful frequency allocation, radio propagation simulation, traffic analysis, etc. Generated data is then used for manual and automatic configuration of network devices and terminals. The procedure for every one of those deployment techniques is unique and developed by different vendors. The spotlight for this stage is to make cadets skillful for effective tool usage in order to speed up the deployment process and to properly disperse communication systems following the conducted plan.

2.3. ICN and services realization

Communication systems are mobile, vehicle based modular configurations meant to be spatially dispersed considering actual tactical criteria. When properly connected in a desired ICN configuration, the tactical network is a high performance, ruggedized and secure communication platform for reliable data exchange. This phase of training is the actual communications building where cadets use their skills in order to effectively manage and configure all the elements of the ICN. Considering the complexity of the ICN in terms of various technologies and systems used, there is a majority of difficulties the cadets are faced with during this stage. This is where all the knowledge the cadets accumulated during their education has to be used in order to properly arrange, configure and install all the elements of the whole system they are responsible for.

2.4. Maintenance

When there is a functional ICN, cadets are involved in maintaining the functionalities of the existing infrastructure and performing modifications in order to meet eventual new demands. The main method of successful malfunction detection and repair is to use adequate troubleshooting using a satisfactory systematic method. The main problem at this stage is that the troubleshooting can be quite time-consuming, especially when there is a shortage of a cadet's specific skills, which should have been acquired through the theoretical education on this subject.

2.5. Performance assessment

The operational ICN is strong as much as its weakest node or link. Therefore, the whole network is in this stage the subject of performance testing that put to the test all the applied security mechanisms in the network. After the network stress procedure using penetration testing solutions, the overall assessment of the cadet's performance can be made. The second aspect of cadet's training assessment is to evaluate how the cadets performed in managing the processes of all five stages. The overall assessment of the methods used in the teaching procedure is to be made at the end of the exercise.

3. Proposal of the enhanced teaching methods to overcome the difficulties in subject realization

It is evident that such a complex subject structure requires a very good background theoretical knowledge, as well as acquired skills in operating specific planning and simulation software and telecommunication devices. The general framework of those prerequisites is not the same for each cadet individually, so considering the fact that it is required all of them to act as a highly synchronized team, it is essential to equalize their skills. This might be the crucial contribution of an ADL platform, which would serve as a quite beneficial tool for upgrading every each one of the ICN realization stages.

3.1 Planning stage upgrade

The planning procedure is a very complex task that requires broad knowledge from several different fields such as: characteristics of various telecommunication devices and systems (radio, LOS, switching, multiplexing, multisensory), frequency allocation management, ICN management during an operational scenario, cyber security, etc.

In order to habilitate the cadets for ICN planning, beside traditional methods in mastering a subject teaching content, it is quite necessary to enable the access to the ADL platform tools, using network resources. The content which is meant to be accessible to the cadets is a mixture of SCORM based lessons covering various subject areas (spectrum management, device characteristics, configuration procedures, management procedures, cyber security procedures, etc.). It is essential that cadets in this time period use a form of a group communication in order to share ideas and possible solutions.

3.2. Deployment stage upgrade

The first part of this training phase (ICN elements configuration) is activating the cadets to set up ICN element parameters in order to implement the scenario plan tailored in the previous phase. Since there are several different software tools for frequency planning, higher level network configuration, as well as radio propagation software, the ADL MOODLE platform should give the support to cadets with video tutorials on how to properly develop a suitable frequency allocation configuration parameters and other data required for the correct device functioning. The blog application as a kind of support realized through the ADL platform at this stage could be extraordinarily beneficial. It could be the place where cadets could share the problems they encounter, misunderstandings and could debate on possible solutions.

The second part in this phase is the system elements field disposition and preparation for interconnecting all of them. Every system is a complex structure made of the vehicle, a cabin with the communication and electro-energetic devices and the station crew consisted of at least three crew members. In order to set up the system in such a way to be the most effective performing as an element in the ICN, cadets should have available procedures in the form of courses accessible „off-line“ on mobile devices for each specific system, separately. Considering the real training environment, during this stage, the cadets are personally involved in commanding the crew during system elements setup, working without the network access which is to be made in next phase.

3.3. ICN and services realization stage upgrade

This phase is dedicated to the practical communication setup between the elements of the network, connectivity realization, network and user services and security monitoring. Immediately after the ADL MOODLE server startup and its availability on the network, the cadets should be

encouraged to use the resources in the form of tutorials for various different network connectivity check procedures, network and user services enabling procedures and procedures for network traffic analysis software solution usage. This phase could be considered as a “motivation” stage aiming the “reward” in a form of available ADL MOODLE recourses in order to speed up the previous deployment stage.

3.4. Maintenance stage upgrade

During the maintenance phase, cadets are involved in implementing basic network security mechanisms, defect detection and solving the eventual network element faults making all user services available again. There are a lot of troubleshooting procedures and tools the cadets should be familiar with. Using those tools, they are responsible for making ICN secured and resilient to the cyber security threats. It is evident that the frequently updated information of new potential threats should be available on ADL MOODLE platform in order to improve cadets’ knowledge about this subject.

3.5. Performance assessment stage upgrade

The performance assessment could be analyzed considering network performance valuation and cadet’s knowledge and skills improvement valuation. The first part of this task is easily performed using exact facts conducted through the network performance testing. Facing targeted network penetration testing, cadets should demonstrate their ability to detect the attack and to use the appropriate security mechanisms to overcome the effects of the related cyber security threat. As the most demanding task, this stage should be supported with a kind of “help desk” of a dedicated cyber security engineer.

The problems in this stage are solved highly with the help of modern teaching tools involving on-line communication in real time aiming at team work and fast reaction on the conducted threat. The result of the engineered attack is the right measure indicator of the cadet’s competence as a general conclusion for the competence for the whole group of cadets involved in the exercise.

The other aspect of the assessment could be related to individual knowledge and skill improvement of each cadet. It demands testing cadets individually at the beginning, as well as at the end of the exercise. In that way, each of the cadets could be introduced to the individual ADL material in order to make a desirable progress during the exercise. Since many of the software tools for network simulations and performance testing planned to be used in the exercise could give operating valuable data, a well-tailored xAPI application could be used in order to give proper analysis of the assessment in various ways.



Figure 5. Modern teaching methods improvements

Conclusion

This paper gives the brief overview of the Telecommunications module education structure with the focus at the „Professional Practice 2“ subject teaching methods upgrading. The analysis of the mentioned course is done particularly considering the fact that this is the most comprehensive and significant course for the professional orientation of the Signal officers at the beginning of their career. It is shown how the overall procedure of the ICN establishment as the ultimate goal of the course is done, as well as how each of the establishment phases could be improved using modern teaching methods (Figure 5).

The benefits of the cadets' capability to access the required material every time it is needed improves planning, obstacle solving, deployment, maintenance and ICN practical realization for a military operation according to a tactical situation.

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History of Heutagogy as a self-determined learning

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Abstract. The essence of heutagogy is that in some learning situations, focus should be on what and how the learner wants to learn, not on what is to be taught. This approach is very different from more formal and traditional way of 'teaching' people. In heutagogy the educational process changes from being one in which the learned person (teacher, tutor, lecturer) pours information into the heads of learners to one in which the learner chooses what is to be learned and even how they might learn it. Heutagogy represents a change from teacher-centred learning to learner-centred learning.

Heutagogy is underpinned with assumptions of two key philosophies: humanism and constructivism. As mentioned above, the idea of the learner being central to the educational process is a humanistic concept. Originally, andragogy as a precursor to heutagogy, was identified with adult learning science, so many scientists firstly assumed that this would be updated case for heutagogy. However, as time goes by it becomes clear that heutagogy represents a science approach which should be available for learners of all ages.

The purpose of this paper is to review research on historical development of heutagogy as a science and self-determined learning and to make comparative analysis of heutagogy with andragogy and pedagogy. As time goes by a lot of scientists conclude that web-based learning, new information technologies and long distance learning and education methods lend themselves very well to a heutagogical approach.

1. Introduction

Heutagogy (pronounced **hyoo-tuh-goh-jee**) is a term derived from the Greek word "heuriskein". According to Graham R. Parslow, "Heuriskein is the Greek verb to discover, and underlies the etymology of the word "heuristic" that is defined as a method of teaching by allowing students to discover for themselves. Deriving from the same Greek root, the term heutagogy was coined in 2000 by Hase and Kenyon to describe self learning independent of formal teaching.

Since its beginnings in Australia in 2000, heutagogy has been presented as an extension of andragogy, but has received limited attention from higher education and from researchers.

Challenges of adopting a heutagogical approach are many, such as academic resistance to change and a "fear of relinquishing power" (from instructor to student), increased financial and learning pressure on students due to new technology requirements, and a continued student focus on assessment and grades rather than the learning process. The essence of heutagogy is that in some learning situations, focus should be on what and how the learner wants to learn, not on what is to be taught.

Hence this approach is very different from the more formal and traditional way of 'teaching' people. In heutagogy the educational process changes from being one in which the learned person (teacher, tutor, lecturer) pours information into the heads of learners, to one in which the learner

chooses what is to be learned and even how they might learn it. It represents a change from teacher-centered learning to learner-centered learning. In the heutagogical approach the 'learned' person takes on more of a role as a facilitator or guide as to how the desired learning might take place, and if formal assessment of self-determined learning. There are further elements to this approach to learning, such as the question of how the learning is going to take place, and how the learner is to be guided in their learning. Also, we need to be sure that the desired learning is within the capabilities and maturity level of the potential learner. One of the inherent benefits of the heutagogical approach that many learners have already discovered is that their learning capabilities are considerably enhanced through using this approach. Hence the challenge of learning something that, conventionally, might be perceived as being outside their capabilities, may in fact develop and extend learners' capabilities. This has particular relevance given today's emphasis on lifelong learning.

Heutagogy is underpinned with assumptions of two key philosophies: humanism and constructivism. As mentioned above, the idea of the learner being central to the educational process is a humanistic concept. Carl Rogers later adapted his client-centered approach to psychotherapy (1951) to education (1969) in what was termed student-centered learning. Similarly, constructivism places the learner at the heart of the educational experience [4]. Constructivism is based on the notion that people construct their own version of reality using past experience and knowledge, and their current experience. Thus, the learner is creative, actively involved in their learning and there is a dynamic rather than passive relationship between the teacher and the learner.

Heutagogical learning is not necessarily linear or planned, but much more informal and parallel with how people learn best outside of a school setting. The teacher serves more as a coach—a valuable resource to be tapped if necessary, but not the primary source of knowledge. Heutagogy is an interesting concept that can have a huge impact on our students.

Whereas pedagogy is teacher-led learning and andragogy is self-directed learning, heutagogy takes an approach that is different from both. In pedagogical environments, teachers determine what students will learn and how they will learn it. Students rely on their teacher and learn topics in the order in which they are presented. In contrast, students in andragogical environments use the teacher as a mentor or guide, but aim to find their own solutions to the tasks the teacher sets.

Meanwhile, the heutagogical approach encourages students to find their own problems and questions to answer. Instead of simply completing the tasks teachers assign, these students seek out areas of uncertainty and complexity in the subjects they study. Teachers help by providing context to students' learning and creating opportunities for them to explore subjects fully. As the image below illustrates, heutagogy requires the most student maturity and the least instructor control. Pedagogy, on the other hand, is on the opposite end of the spectrum.

Almost all adults are capable of taking control of their learning. Often, though, they carry expectations from previous experiences that get in the way. Self-directed learning does not always just happen. Sometimes it has to be crafted. Fortunately, participant expectations can be negotiated, goals can be clarified and a sense of community can be built within the classroom or change team. When that is done, the result is more likely to be a strongly learner-centered and learner-directed situation. Strong engagement and deep learning can then ensue. This chapter explains how it can be done, illustrating the approach with examples from university classes and action learning teams [5].

Open Context Model of Learning posits three phases of learning across the PAH (pedagogic-andragogic-heutagogic) Continuum: Pedagogic: when we learn using the focus of a subject discipline to structure that learning. Andragogic: when we learn how to negotiate what we want to learn both within and beyond a subject discipline, and how to collaborate with others in the social processes of learning. Heutagogic: when we begin to understand what the structure and form of our subject is and how we can start to play with form and transform it.

So the Open Context Model pre-supposes that we not only need to understand the structures of the subject under study, but also that we need to both identify processes of collaboration, as well as strategies for creative renewal.

Fortunately for this analysis George Martin, who signed The Beatles to his record label Parlophone in 1962, explicitly uses educational analogies in discussing their working together in 'All You Need is Ears' (2001). He observes that he was 'like a schoolteacher' in the early days (1962–4)

(pedagogy), and that after recording 'Yesterday' (June 1965) they became collaborators (andragogy), reflecting the first two stages of the PAH Continuum.

2. Heutagogy and E-learning

Heutagogy or self-determined learning, encourages students to become active participants in what they are learning. Rather than using a single-loop model of learning in which the learner identifies a problem, takes action, produces an outcome and then begins again with a new problem, doubleloop learning encourages students to reflect on their learning and to assess how it has changed their beliefs and actions and how they can apply what they have learned to other areas. Teachers become facilitators, not as leaders who sit back and let the students 'discover' their learning but as leaders who provide appropriate guidance, resources and models.

While heutagogy may be considered an outgrowth from andragogy, a term coined by Malcolm Knowles (1984) that suggests self-directed learning in adult education. In other words, teachers do not play a less significant role; they play a different role and it is one that is at the heart of good teaching. As more has been learned about education and learning, teachers, for the most part, have adapted their skills to suit the needs of students to help them learn in the best ways possible. Heutagogy enables growth for instructor and student alike. Originally, andragogy, the precursor to heutagogy, was identified with adult learning, and many assumed that to be the case for heutagogy. However, if one studies the skills and outcomes of heutagogy, it becomes apparent that heutagogy is an approach that should be available to learners of all ages [6].

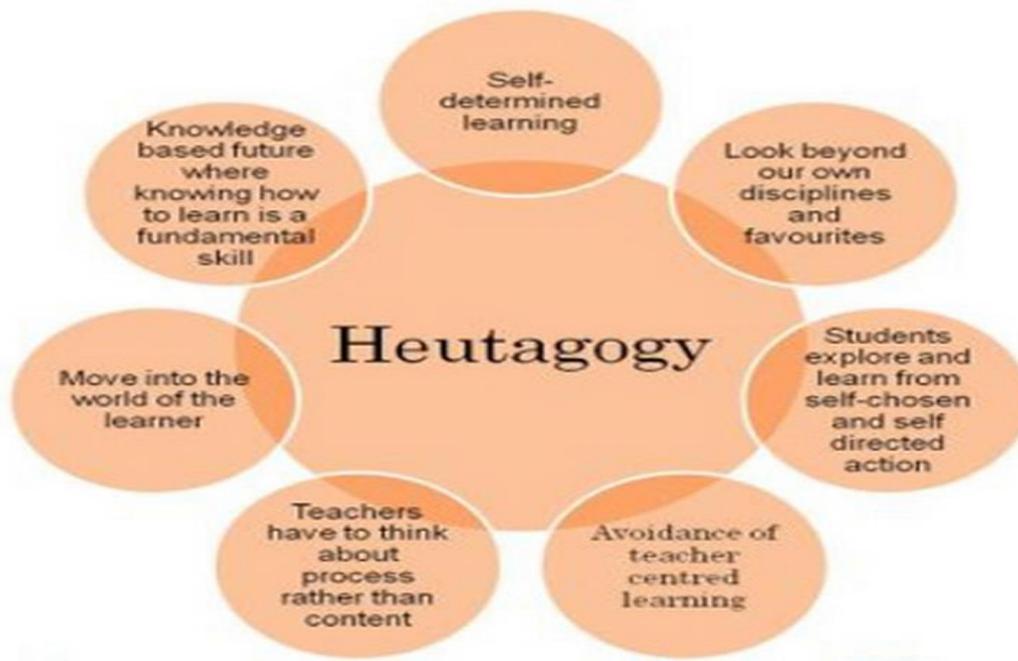


Figure 1: *Meaning of Heutagogy*

Hase and Kenyon (2000) claim that heutagogy, may be viewed as a natural progression from earlier educational methodologies – in particular from capability development – and may well provide the optimal approach to learning in the twenty-first century. Stephenson and Weil (1992) describe capable people as those who know how to learn; are creative; have a high degree of self-efficacy; can apply competencies in novel as well as familiar situations; and can work well with others. In a global world in which citizens must come together to solve global problems, surely we need to start at an early age to groom them to become effectively capable [7]. At the time that Stewart Hase and Chris Kenyon (2000) first introduced the concept of heutagogy, technology and education were not sufficiently well aligned to fully support a self-determined approach to learning. Just over a decade

later, it is a different story [8]. Enter the age of open education resources, social media, massive open online courses and digital badges – the start of an era where learners have substantially more control over what they learn, and how and where they learn it and a period in which the institutional grip on accreditation has begun to loosen. Today's term used by Kamenetz Self-Determined Learning (2010) to describe the new, self-directed and self-determined learners – want to learn on their own terms. A transformation of higher education is unfolding – ‘a colossal shift, toward informal and nontraditional learning pursuits chosen by the learner where much of the content is "free and open" and new technologies are paving the way [9]. Heutagogy provides a theoretical framework for considering these systems in a holistic way, and the latest technologies serve as the agents for extending and supporting the framework. This chapter discusses emerging technologies that have triggered renewed interest in heutagogy and how these technologies support heutagogical practice.

An important concept in heutagogy is that of double-loop learning. In this style of learning, students not only think deeply about a problem and the actions they have taken to solve it, but also reflect upon the problem-solving process itself. The idea is that students will begin to question their assumptions and gain insight into not only what they are learning, but also how they learn [10]. With its emphasis on providing a learner-centered environment that supports students in defining their own learning path, heutagogy also equips students with skills that will help them transition into the workforce. Employers need employees to have a wide range of cognitive and meta-cognitive skills, like innovativeness, creativity, self-directedness, and an understanding of how they learn—all foundations of the heutagogical approach.

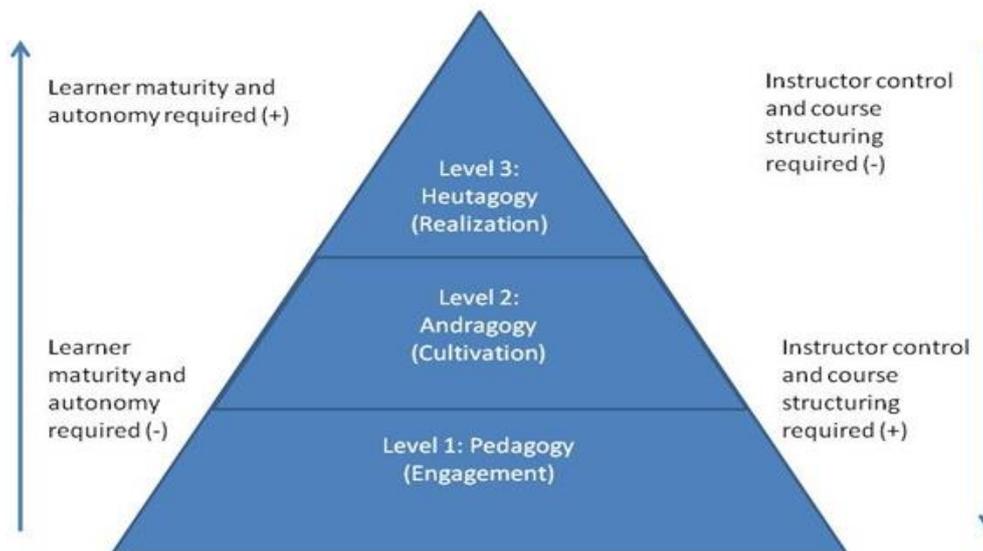


Figure 2: *Evolution from Pedagogy to Heutagogy*

Self-determined learning is at the core of heutagogy. The web is conducive to and reinforces self-determined learning, as learners access the internet to find information, and hyperspace lets learners choose the path that they will take in learning. Online education makes learning available anytime and anywhere, and open educational resources (OERs), such as the MIT Open Courseware project (<http://ocw.mit.edu/index.htm>), the Khan Academy (www.khanacademy.org) and Harvard's Open Learning Initiative (www.extension.harvard.edu/openlearning-initiative), further extend learning opportunities and make course content readily and abundantly available to learners – and to teachers. In addition, different media platforms (YouTube, video, chat rooms, online forums) provide learners with the flexibility to choose where, how and what they will learn [11].

Another important characteristic of heutagogy is double-loop learning, where learners confront their values and beliefs and adapt them accordingly, basing their decisions on the information available. In this process, learners ‘try to find the most competent people for the decision to be made, and . . . try to build viable decision-making networks in which the major function of the group would

be to maximize the contributions of each, so that when a synthesis was developed, the widest possible exploration of views would have taken place [12].

Heutagogy is also characterized by group collaboration, a common attribute of Web 2.0. While Web 1.0 promoted the passive consumption of information and the creation of knowledge, Web 2.0 is characterized by user design and the development of new information. There is an emphasis on active learning rather than passive learning, with learners creating their own content, and as a result becoming more engaged in the learning process [13]. Tools are social and community-based, supporting the construction of individual and group knowledge [14]. For example, Google Docs can be used for classroom projects, allowing learners to work together in building new content and knowledge over time. LinkedIn groups and other social networks can support group collaboration and problem solving. In environments such as these, 'anyone can now learn anything from anyone at anytime [15].

3. Conclusion

Our understanding for andragogy and heutagogy can be enhanced when they are considered in the wider context, concepts, field, habitus and capital [16]. Our contribution to knowledge is: to provide a pragmatic understanding of andragogy and heutagogy; to place the PAH Continuum in a wider context; and to associate and extend the theories of Pierre Bourdieu to the virtual world of learning. In broader terms, heutagogy can be seen as a key component in responding to Web 2.0 affordances and understanding new modes of learning in the changing public context of our transition from social hierarchies to social networks: as Ben Hammersley put it in the British Council Lecture of 2011, 'An Internet of People'. We need to design new approaches to learning and to create new contexts for learning that reflect an emerging networked digital society rather than a mechanical, industrial one. We commend heutagogic learning, and thinking, as the missing link in this process.

We can conclude that heutagogy is a specific scientific field of self-determinate learning with specific statement and advantages gained, listed as:

- Becoming more reflective and more ambitious;
- Providing different perspectives;
- Improving contributions to meetings;
- Implanting a real desire for a management post;
- Encouraging the individual to make applications for promoted posts.

With incorporating heutagogical practice, educators have the opportunity to better prepare students for the workplace and for becoming lifelong learners, as well as to foster student motivation by cultivating students who "are fully engaged in the topic they are studying because they are making choices that are most relevant or interesting for them.

Distance education has a particular affinity to the heutagogical approach, due to distance education's inherent characteristics of requiring and promoting learner autonomy, its traditional focus on adult learners, and its evolutionary and symbiotic relationship with technology – all characteristics shared with this emerging theory. Because of this affinity, distance education is in a unique position to provide a sustainable environment for studying and researching this teaching and learning method – and for assessing and evaluating the theory's appropriateness as a theory of distance education [17].

SIDE model is best practice using a heutagogical approach in online learning. SIDE is an acronym for Students, Instructors, Design, and Experiential learning and suggests a way to move from the informal to formal learning context where there is a requirement to do so.

This model could be implemented in every institution, including military educational institutions. Institutions, instructional designers, and educators can use the model to adopt a heutagogical approach to learning and perhaps increase retention rates in the online learning environment. The SIDE model describes the changing roles and dynamics of students, the reassessment of instructor control, the fundamental principles of heutagogical instructional design, and the experiential factors to consider in teaching and learning in this way.

- Things to consider as you read this chapter:
- Heutagogy occurs in both formal and informal learning contexts
- When learners achieve an autodidactic approach to their learning, heutagogy comes into use
- Learning, and the design of new technology, can both be seen as individualistic enterprises; online education needs to cater to such individualism
- The SIDE model represents a way to increase the value proposition of online education.

In near future heutagogy is more than a realistic option for every high educational, especially scientific institution, and also very realistic for military educational institutions.

For example, preparations and also the phase of operational construction of joint military exercises could be made with heutagogic approach of sharing knowledge and experience. Students create the learning approaches. Teachers are only responsible for the context and primary sources, or a couple of words for the research topic.

The education process does not have limits. So, the students' choice of education in a military educational environment must also be unlimited. Students must be aware of cyber and similar networks attacks because they sometimes use more or less important documents.

Whereas pedagogy is teacher-led learning and andragogy is self-directed learning, heutagogy takes an approach that is different from both. In pedagogical environments, teachers determine what students will learn and how they will learn it. Students rely on their teacher and learn topics in the order in which they are presented. In contrast, students in andragogical environments use the teacher as a mentor or guide, but aim to find their own solutions to the tasks the teacher sets.

Also, self-determined learning could be a subset of andragogy, because the adult learners have experience, but a few of them know how to properly use technology and to learn from it.

Heutagogy in near future can work as a synchronous distance learning environment, but depends on web tools and applications for synchronous distance learning, for example: scientific quizzes or environment or online platform which is online present for every participant for sharing knowledge and scientific results.

Evaluation and effectiveness of knowledge evaluation could be done with online exams, quizzes, study exams and so on.

In heutagogy the fascinator is a student, because teachers only give the topic; the researcher of the topic is a student independent in their research.

Students can succeed in a heutagogic approach only with evaluation by the teacher. The evaluation process could be done by: an exam, topic essay, scientific paper and so on online.

Students in heutagogy as self-determined learners are mature when they prove their knowledge in front of the teacher with online: course, exam, research paper, scientific paper and so on. The best reliable scientific resources for heutagogic approach for learning are reliable resources such as: online courses for a given topic, Google, web pages, e-library (NATO multimedia library, SCOPUS, Emerald, Thomson Reuters and so on).

At the final stage of this paper we can conclude this: Pedagogy - the art and science of teaching, especially to children; Andragogy - the art and science of teaching adult learners; Heutagogy - self-determined learning and Technoheutagogy which is another approach involving the study of technology to enhance the experience of learner-directed learners. Bill Pelz (2012) explains, very succinctly in a YouTube video clip, the differences between the terms pedagogy, andragogy, heutagogy and technoheutagogy which is technology-enhanced learner-directed learning environment.

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Time allotment and its influence in the FLP computer-based assessment of the reading skill

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Abstract. Time allotment is among the many factors that need to be taken into consideration in computer-based assessment of the reading skill, when assessing foreign language proficiency (FLP) abilities of test takers. When taking a reading test, test takers find time limitations stressful as test administrators often emphasize the importance of time management when the test is on. Time limitations could refer to the time allocated to read a particular text, to answer a particular question, time allocated for the overall test, etc. This can have a negative effect on test takers' results, especially in high-stakes proficiency tests, where the results have a significant impact on test takers' future career or professional development. Through literature review and analysis of available computer-based reading assessments, this research paper is aimed to explore the time limitations in a variety of reading proficiency computer-based assessments. We attempt to find out how these limitations affect the final results of the test takers taking into account test takers' language abilities and the complexity of the cognitive skills that are required when providing a response at a reading proficiency test. Based on data collected, we will intend to provide conclusions, and recommendations for future research.

1. Introduction

Computer-based assessment (CBA) is going through a fast developmental phase. It is becoming a common way to assess language skills through the use of computers, to electronically record and assess test takers' performance. CBA is being used in large-scales testing programmes, ranging from computer-adaptive tests (CATs) in which examinees progress to easier or harder questions based on their performance on prior questions, to others that use computers to administer and score non-branching linear tests [1]. One example is the Test of English as a Foreign Language, Internet-Based Test (TOEFL iBT). It is a linear computer-based test (CBT) that assesses ability to read, listen, write, and speak in English and is used for admission to undergraduate and graduate programmes in the US and Canada. Another example is the Test of English for International Communication (TOEIC), linear speaking and writing tests delivered by computer, in combination with some paper-and-pencil reading and listening assessments, used by businesses that need an assessment of English skills of potential employees.

When taking a high-stakes proficiency test as the two aforementioned examples, test takers are usually highly motivated as their results will have a great impact on their personal and professional development, like graduation and enrolment in higher education, migration to another country, a promotion to a higher-level job position. It is in test takers' interest to complete the test, but when they sense that the time is running out, they speed up to complete the test providing the answers though random guessing[2]. In circumstances where the stakes are high for the test takers, it is simply unallowable to let time interfere with test takers' final scores. Proficiency tests are meant to show what the test takers can do with the language, not how fast they can read and respond to a question.

Almost all kinds of language tests (proficiency, diagnostic, achievement, placement, etc.) incorporate standardized test administration procedures so that the test-takers have similar experience as much as possible, thus ensuring that the test is fair to all. Typically, test administration guidelines include information on the test administration locations, instructions to the test administrators and the

time limits of the test. Lu and Sireci [3] consider that “whenever tests involve a time limit, the rate at which students work will more or less affect their performance” (p. 29). Test takers who are running out of time often either hurry through the latter stages of the test or just randomly complete items toward the end of the test. The situation where the test takers face time constraints which do not allow them to fully consider all test items is known as speededness [3]. According to Van der Linden [2], speededness is a complicated concept in which three factors interact: the speed of the test taker, the complexity of the items, and the time limit imposed on the test. Due to this interaction, several terms have been used to refer to test items based on test takers’ responses:

- *Omitted items*- items a test taker read but decided not to answer;
- *Not reached items*- not attempted items due to the time limit;
- *Incorrectly answered items*- items answered by the test taker, but incorrectly;
- *Uncontemplated items*-items which were not seriously considered by the test takers before answering them due to lack of time and include not reached items and items answered randomly;
- *Error score*-the number of all items with incorrect answers: omitted items, not reached items, items answered incorrectly.

Speededness can be detected through CBTs by tracking test takers’ response rate, response time required for each item, and accuracy rates. Unlike paper-and-pencil tests (PPTs), which cannot give precise information on how much time test takers need to finish a certain test without it influencing their final results, CBTs do provide that information. Bridgeman [1] identifies several advantages of CBTs regarding the time factor:

- *Data Collection*. CBTs provide data on the amount of time spent on each question, that is how much time the test takers spent to read the passage and provide the answer before moving to the next passage.
- *Greater Standardization of Test Administrations*. Unlike PPT administration, CBTs do manage test timing very accurately, assuring fair timing for all. In addition, CBTs can accurately record reaction time for simple prompts or solution times for more complex problems.
- *Monitor Student Motivation*. In educational programmes, it is very important to know that students taking the test are making an honest effort to answer the questions. If time spent on each question is monitored, the computer can identify students who are responding at an unreasonably fast rate that suggests they are not fully considering the question. Also, monitoring can show differences in the time spent on questions that most students can answer quickly in comparison with questions that should take more time. If students take an equal amount of time for both types of questions, we can assume that they are not seriously considering each question. When responses from apparently unmotivated students are identified, then the best thing to do is to document them and remove them from further item analyses.

In spite of numerous advantages that CBTs have, test developers face many challenges, especially in the assessment of the reading skill. The technological development definitely influences the way we read, how fast we read, what information we seek for, what reading strategies we rely on while reading. This certainly reflects on our reading abilities, not only as first language (L1) readers, but also as foreign language (FL) readers. These developments additionally burden the reliability and the validity of a reading proficiency test. According to Bachman [4], *‘reliability is concerned with answering the question, “How much of an individual’s test performance is due to measurement error, or to factors other than the language ability we want to measure?” and with minimizing the effects of these factors on test scores. Validity, on the other hand, is concerned with the question, “How much of an individual’s test performance is due to the language abilities we want to measure?” and with*

maximizing the effects of these abilities on test scores' (pp. 160-1). Following his view, we must decrease the influence of the measurement error thus maximizing the effects of the language abilities we want to measure.

Many researchers have recognized time to be a serious threat to test's validity and reliability. To overcome these issues, we can find a variety of equations and response models that have been proposed to detect and evaluate the degree of speededness. For the purposes of this study, we attempted to find empirical evidence from previous studies regarding time allocated in a CBT of reading proficiency. Unfortunately, this field still remains under-researched. However, without any doubt, several important variables need to be taken into consideration when determining the amount of time necessary to adequately measure test takers' reading proficiency: reading rate, interface design, topic and text variation, and complexity of reading skills.

2. Reading rate

Carver (as cited in Chang and Millett [5]) recognizes five gears of L1 adult readers ordered from fastest to slowest: scanning (to identify a target word in a text), skimming (to find specific information or to comprehend the gist of a text), rauding (a combination of reading and listening aimed for general comprehension), reading to learn (to learn information from textbooks), and reading to memorize (to recall information accurately). Naturally, all gears reflect different levels of cognitive processes, thus have a different reading speed. A typical rauding rate is approximately 300 words per minute (wpm), reading to learn takes about 200 wpm, and reading to memorize occurs at approximately 138 wpm. However, it is difficult to assume that these reading rates apply for FL adult readers. Chang and Millett [6] confirmed the assumption that FL adult readers' reading rate is much slower than L1 adult readers' rate. In addition, it is questionable whether these reading rates are applicable in both non-testing and testing environments. Rupp, Ferne, and Choi [7] found that response processes that appear when test takers respond to text passages with multiple choice questions do differ from the processes readers resort to when reading in non-testing contexts. Also, they found that test takers often segmented a text into chunks according to individual items and largely focused on the microstructure representation of a text base rather than the macrostructure of a situation model.

3. Interface design

Although CBTs bring many advantages, still there are challenges that need to be taken into consideration, like the ability to manipulate and control the computer, display characteristics, and navigation.

Test takers may face with lack of familiarity with the procedures to respond to the item [8]. Test takers may find themselves in an awkward situation if a reading test requires the test taker to drag and drop a headline to match it with the appropriate text. Although using the Internet to read information and navigate from one page to another is largely done by clicking, these challenges are rather computer related than language-ability related. If unfamiliar with the procedures, the test taker will try to figure out how to respond, attempt multiple times and end up with no response because the response time has expired. Even more, the test takers may lose their confidence which may persist throughout the rest of the test.

When taking a computer-based reading test for a long period of time, test takers may experience eye fatigue. Some studies have found that test-takers complain about eye fatigue caused by continued intense exposure to monitor screens [9]. This is even more present if the test takers need to use the vertical scroll bar to read lengthy passages and find the information they need in order to answer the item. Fulcher [10] proposes minimal scrolling (maximum two screens) because test takers may lose 13 % of their time moving up and down the text. Alderson [11] agrees that screen fonts and character types can ease reading suggesting proportionally spaced screen fonts to make reading easier, double spacing for faster screen reading, and high screen resolution to lessen eye strain. He also suggests more blank spaces on screen than on the equivalent printed page, fewer words, shorter paragraphs, avoidance of certain colours and colour combinations, etc.

The ability to move forward and backward during the test also is related to time. Some software programmes provide the test takers with the ability to click the "next" button when they have already

given the answer thus allowing them to individually control the time they spend on each item. On the other hand, there are software programmes with individual time limits for each item. Here, if the “next” button is not clicked after the answer is provided before the time expires, the test automatically moves on to the next item. Also, some software programmes like multistage adaptive testing software programmes allow the test taker to return to previous items by clicking the “back” button if the test taker wants to check the provided answers, or give an answer if there are items he/she had not responded to. In these cases, this manoeuvring is largely controlled by the time limit of the test.

4. Topic and text variation

Reading proficiency tests usually contain a wide variety of topics and texts. Test takers very often have to switch from one topic to another, being forced to quickly adjust to new key words, another type of text, different authors, etc. This transition does not always go smoothly. All topics may not be familiar to the test takers, some texts may not be interesting to them, which causes even more effort to comprehend the text and decide on or write the answer. On the other hand, texts on abstract topics are more difficult to understand than concrete texts which describe objects, events, people or activities. Texts which are concrete, imaginable and interesting are certainly more readable [11].

Everyday, familiar topics are easily processed than the unfamiliar topics.

Topics are associated with certain text types. The way a text is written, its style and its features consequently impact its difficulty. For example, expository texts, whose intention is to educate readers through facts, are harder to process than narratives due to a variety of relationships which derive from the complex content. Unlike expository texts, narratives present a story meant to entertain the reader.

5. Complexity of reading skills

The development of reading proficiency tests has always been guided by a number of reading skills and sub-skills listed in the test specifications. When addressing test takers' performance, the interpretation of the scores in general can range from no functional ability to well-educated native speakers, depending on the proficiency levels of descriptors according to which the test has been designed. Typically, all proficiency scales order the skills and sub-skills according to the complexity levels ranging from simple to complex and from concrete to abstract. In this respect, the texts in reading proficiency tests range from simple to complex, from a friendly letter or a popular magazine article to formal business letters, editorials, serious newspaper articles, etc. Based on the complexity of the cognitive demands necessary to comprehend a more complex text, we can also distinguish between beginning readers and fluent readers. According to Alderson [11], the main difference between beginning and fluent readers is their differential language proficiency and the ability to use metacognitive skills effectively, such as: recognising the more important information in text, adjusting reading rate, skimming, previewing, using context to resolve a misunderstanding, and formulating questions about information.

6. Comparison and analysis of two CB language testing software programmes

Test developers often face the dilemma of what is the appropriate time limit for the test they develop, be it a PPT or CBT. Clearly, time allotment is a very important variable, but at the same time it is very hard to determine. Alshammari [12] assumes that even good readers may not do their best under time limitations if they have not been trained to work under the pressure of time constraint. This may happen very often because almost all standardized tests give a high importance to time limitations as an important independent variable in reading comprehension sections.

To better present our arguments, we provide a short analysis of two language testing software programmes for the reading skill in English: the Bulgarian STANAG 6001 test and the Benchmark Advisory Test (BAT). Both software programmes have been developed in accordance with the STANAG 6001 descriptor for language proficiency for the purposes of the defence to measure and report language proficiency of the NATO military and civilian personnel who are non-native speakers of English.

The Bulgarian STANAG 6001 test is a multistage adaptive test consisting of three levels. The test contains 4-option-multiple-choice items. The whole test lasts for 120 minutes. Two clocks are presented on the screen: one showing how much time has passed, and the other how much time remains until the end of the test. Items are grouped in testlets of 7 items. Some items have two questions per text. There is a "Next" button which the test takers click when they are ready to move on to a next item. There is no "Back" button. According to the test specifications, the whole test has about 3000 words.

BAT is also an adaptive test and covers three levels. The items are multiple-choice and have five options. The fifth option is "I don't know" and is included so that test takers are not forced to guess when the item is above their ability level. Each text has one item and for each item there is a certain amount of time for the test taker to give the answer: for items at level 1 - 60 seconds; for items at level 2 - 120 seconds; and for items at level 3 - 240 seconds. The test consists of testlets of five items. After submitting each item for scoring, the examinee cannot return and change the chosen option. If the examinee takes longer than the time allotted for a specific item, the option "I don't know" will automatically be selected and the test will proceed to the next item. Although each item is timed, the examinee may move to the next item before the time has expired.

In order to feel the effect of time pressure, we took both tests and approached them as test takers, not as test developers and researchers. Before we started the tests, we carefully read the instructions, paying particular attention to the time limits.

The Bulgarian STANAG 6001 demo test started from level 2. Every text had an orientation which gave the idea of what the text was about. Level 2 texts were approximately 70 words long, while level 3 texts had about 150 words. Each level 2 text had one multiple-choice question. After seven items, we got level 3 texts. Three texts had two questions, while one text had one question. After seven items in total, the test ended and we got the highest level of the test, level 3. We ended the test in 20 minutes.

BAT started from level 1. The number of words ranged from 20 to 40 per text, one question per text. After 10 questions, we got level 2 texts, one question per text, each text around 100 words. Longer texts needed two scrolls. After 15 texts at level 2, we were directed towards the most difficult level, level 3. Almost all texts were around 300 words and almost all of them needed 2-3 scrolls. After 15 texts, we ended the test and we also got level 3.

Comparing the experiences from the two tests, even though we got the highest proficiency level on both tests, we found that BAT was much more demanding than the Bulgarian STANAG 6001 test, not only because we got more texts to read, but also because of the time pressure we felt during BAT. We felt we had a psychological advantage when taking the Bulgarian STANAG 6001 test because we knew that we had plenty of time. That gave us a sense of relief and made us concentrate on the texts and questions without the need to glance at the clock to check the time. On the other hand, when we started BAT, even at level 1 texts, we started to unconsciously check the time. The pressure raised as we progressed towards level 2. We started to feel slightly uncomfortable, had to reread the texts although we understood them completely. This condition got even worse at level 3. The texts required to comprehend author's opinion, read between the lines, relate ideas, understand abstract concepts. Some topics were less familiar than others, thus required more time to be analysed. After time allocated for the text ran out, the option "I don't know" was automatically chosen and we were directed to the next one. We even did not have time to take an instant break, i.e. to take our eyes off of the screen. We were forced to read from the screen for 100 minutes without a break. We had difficulties in maintaining our concentration all the time even though we do know that the individual's performance levels vary from minute to minute based on the level of concentration.

7. Conclusions and recommendations

CBTs offer endless possibilities to further explore the reading skill. While this was not possible with the PPTs, now the limitations lie exclusively in the hands of the researchers and their ability to analyze and interpret the data [11]. And the data is large: recorded response latencies, time spent on text and task, reading rates, word recognition, etc. Unfortunately, there is little or no reliable evidence as many testing offices do not report analyses of test speededness based on which we can determine

the time limits flexible enough to assume that speededness does not affect students' performance negatively [3]. Most testing offices currently rely on a criterion for test speededness according to which a test is unspeeded if at least 80% of the test takers complete all items and all test takers complete at least 75% of the items. The criterion was introduced by Educational Testing Service (ETS) and was subsequently adopted by several others in the testing industry, which in a certain way contributed to standardize the discussion [2]. However, Van der Linden [2] also concludes that the criterion is ambivalent due to the fact that it contains two different norms that do not necessarily imply the same time limit. The criterion needs to be administered under operational conditions of a full test before its degree of speededness can be evaluated. The evaluation of speededness should be carried out in trialling and pretesting as part of the test validation process. This phase should also provide arguments as to which approach to use when setting the time limits to avoid appearance of randomly answered test items at the end of the test. Some researchers propose setting time limits on individual test items instead of measuring the overall time of the test. In our experience, this appeared not to be a good solution. The pretesting phase should definitely show which approach is best for the test takers.

CBT data may also be used to provide more information which will have pedagogical implications. A slow reader is not always a poor reader. Teaching reading skills, or learning to read under timed conditions to be more precise, may be systematically approached and practiced until it is fully developed. Also, CBT data may be used to develop distance learning courses for the reading skill. These courses should include reading practices under time constraints so that individuals who lack proper training and experience in reading under time constraints are prepared to perform better on timed reading exams thus be considered effective readers.

However, we must not forget the limitations. As technology progresses extremely fast, soon we will be able to integrate different media and information sources in the tests, but we should not be fooled by these opportunities as the amount of text which can be displayed on the screen is limited.

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International military cooperation with medical VR training

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Abstract. This paper represents a case study and lessons learned from the experience of creating a small-scale medical virtual training environment, which eased integration of national training and courses and boosted international military cooperation among unexpected allies. The Balkan Medical Task Force (BMTF) is a deployable modular military capability, mission-tailored for a broad spectrum of crisis response operations, and is modelled upon existing national military medical capabilities in the Western Balkan region. A high rate of staff fluctuation requires frequent and costly training to maintain the minimum level of readiness for this tent-based NATO Role 2 Medical Treatment Facility [1], which provides primary health care to a peacekeeping force of up to 1000 individuals, with the capability to treat up to 40 ambulatory patients per day [2].

The virtual reality environment simulates the functionality, layout and equipment of the BMTF, and enables learners to acquire and practice competencies in a risk-free environment. Exploration and observation in the 3D mode allows users to experience the BMTF field hospital as an immersive virtual world, integrating unified SOPs with the aim to achieve efficiency, quality, and uniformity of performance, while reducing miscommunication and failure to comply with regulations.

1. Introduction

The use of virtual and augmented reality is one of the most exciting evolutions of computer-assisted instruction (CAI) or computer-based training (CBT). A virtually simulated environment provides excellent grounds for new forms and methods of learning to utilize the natural human strength of visual representation and to gradually include other senses and feelings in the learning process.

Numerous studies have been conducted on the topic of the effectiveness of virtual reality in education and training that provide valuable insight into the use and development of such training. McLellan (1996, 2003) traces the early use of virtual reality in flight simulators with head-mounted displays developed at Wright-Patterson Air Force Base in Ohio in the 1960s and 1970s [3] Chen (2006) conducted a lengthy investigation, which resulted in the major theoretical framework and an instructional development framework for VR-based learning environments [4].

The biggest advantage of virtual reality training is the ability to simulate dangerous or risky situations within a controlled environment with accurate and realistic depictions of real-world conditions. It also offers all the other advantages of online education, such as serving a large number of students, peer review, easy data collection, ongoing assessment, interaction, and cost effectiveness. Virtual reality training provides a platform to deliver complex information in a visually attractive and engaging way.

There are many types of military virtual training programs, given the important role of recruit combat instruction in every army. Virtual training allows militaries to teach soldiers how to respond to a variety of situations, keep calm, and follow specific instructions without risking the recruits' lives. Likewise, medical training or/and surgery simulation enables trainee medics to address complex medical situations with virtual casualties. Medical trainings also are widely available, non-classified, and already established as part of West-Balkan regional military and medical cooperation. [4]

2. Objectives and beneficiaries

This project was created as sub-task under the umbrella of the Regional ADL Initiative of the West Balkans "Distance Learning: Building West Balkan cooperation in military education and transformation project" – or RADLI [5] – supported by the Norwegian MOD. Its goal was to initiate a

sustainable path and capacity building for non-combat simulations and VR training, which would benefit all RADLI nations. Direct beneficiaries of this project were ADL offices in Serbia, Bosnia and Herzegovina, Slovenia, and Macedonia. These offices are responsible for managing simulation and training needs in their respective national defense forces. Additional beneficiaries are the broader ADL community, NATO, and the Partnership for Peace.

3. Concept Description

Virtual reality is commonly used to simulate particular situations or the functionality of certain equipment and to enable learning, practice, and the acquisition of competency in a risk-free environment. Each of the interactive e-learning solutions usually has two parts:

Exploration and information

Practice and interaction

With the short timeframe for the project execution in 2018, we aimed to achieve a virtual environment of a Balkan Medical Task Force Field hospital (*Virtual BMTF*), which would serve for exploration and observation as well as a base for the future development of UN Peacekeeping missions' medical training.

4. Background of BMTF

At a meeting in Brussels in October 2010, initiated by the US, participants discussed how to enhance Balkan regional military medical activity. This meeting concluded that the US and Norway would establish an assessment group, along with Serbia and Macedonia, to develop a concept and identify medical operational regional capabilities for a Balkan Medical Task Force. [6] The Brussels meeting was followed by the South East Europe Military Medical conference in Belgrade in April 2011, co-chaired by Norway, Serbia, and the US. All West-Balkan countries at the meeting supported the idea of establishing a medical task force. As a result, Albania, Bosnia and Herzegovina, Macedonia, Montenegro, Serbia, and Slovenia have signed the mandate for the assessment group and have dedicated permanent representatives to the group.

The Balkan Medical Task Force (BMTF) is constituted as a deployable modular military capability, mission-tailored for a broad spectrum of crisis response operations, with a vision to become a future permanent tool for responding to regional and international crises (BMTF Strategy, 2015). The capabilities of the BMTF derive from the existing national medical and crisis response capabilities in the West Balkan region. Its maximum medical ambition is NATO Role 2 Enhanced (Role 2E), and its minimum level of ambition is a tent-based NATO Role 2 Medical Treatment Facility (MTF) [1] However, a high rate of staff fluctuation requires frequent and costly training to maintain the minimum level of readiness.



BALKAN MEDICAL TASK FORCE

Figure1: Logo of the BMTF

5. The virtual BMTF

The concept of the Virtual BMTF is modeled on the Veterans Health Administration's Virtual Medical Center (VA-VMC) [7], a state-of-the-art Virtual VA Hospital & Online Collaborative Learning Environment for Patients, Providers and Staff. The virtual BMTF is a smaller-scale virtual training space integrated with the joint LMS used by the RADLI nations. To simplify integration with other nations' trainings and courses, it uses existing login accounts and credentials. During 2018, the virtual BMTF was developed, and it replicates the actual MTF in detail for informational and exploration training. Additionally, xAPI capabilities were incorporated to allow future users to merge training results into broader medical and UN Peacekeeping Missions training. The subject matter

expert for creating the virtual environment was Dr. Nikola Zec, MD, who is a veteran head of fieldhospitals at numerous UN missions in Africa and the first Director of the BMTF.

The Virtual BMTF consists of the following MTF modules:

- Reception
- Triage
- Outpatient Ward (one)
- Lab
- Dentistry
- X-ray
- Surgery
- ICU
- Nursing Wards (two, with up to four beds each)
- Post-surgery (one, with up to four beds each)
- Pharmacy
- Sterilization
- Storage

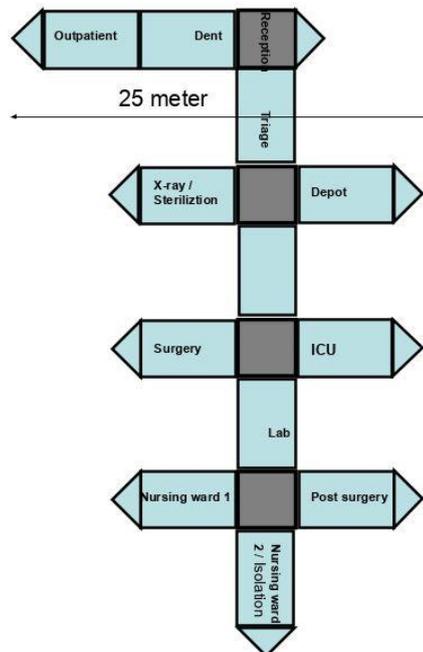


Figure 2: Layout of the virtual BMTF

Each of these modules has its own standard operating procedure (SOP) [8][9][10], but the unified SOP of the BMTF aims to achieve efficiency, quality, and uniformity of performance while reducing miscommunication and failure to comply with industry regulations. This level of the medical facility provides primary health care to a peacekeeping force of up to 1000 individuals, with the capacity of treating up to 40 ambulatory patients per day. [11] The Virtual BMTF would have a total of 35 personnel, the same staff level as a physical facility:

- 2 x Surgeons (general & orthopedic)
- 1 x Anesthetist

- 1 x Internist
- 1 x General Physician
- 1 x Dentist
- 1 x Hygiene Officer
- 1 x Pharmacist
- 1 x Head Nurse
- 2 x Intensive Care Nurses
- 1 x OT Assistant
- 10 x Nurses/Paramedics
- 1 x Radiographer
- 1 x Laboratory Technician
- 1 x Dental Assistant
- 2 x Drivers
- 8 x Support Staff

There are many types of VR trainings that can be led in such an environment for multinational teams. The following VR trainings are currently in the development stage for the BMTF:

- Preparation and planning for deployment to Peacekeeping Mission
- Pharmacy (standardization and operating procedures)
- SOP for control of hygiene and preventive medicine
- SOP for primary radiographic diagnosis
- Treatment of common diseases under specific conditions
 - Triage (under specific conditions)
 - Measures of resuscitation and intensive care (standards)
 - Urgent surgical procedures
- SOP for dental care under specific conditions
- SOP for basic lab (blood group and cross-reactions, basic biochemistry, blood count, blood smear, basic coloring, urine)
- Evacuation to Level 3 and/or 4

The Virtual BMTF also potentially could include the operation of the following equipment under specific conditions:

- Clinic and ward equipment
- Resuscitation room equipment
- Standard operating room fixtures and equipment
- Intensive care equipment
- Field laboratory and radiography facility
- Dental chair and equipment
- Hospital support equipment, e.g. autoclave, refrigerator

6. Technology

It is not easy to create a real-time VR engine, which both substitutes for in-person training and is enjoyable for users. To create the virtual environment, we have considered the leading industry gaming platforms such as Unreal Engine (www.unrealengine.com) or Unity 3D (<https://unity3d.com/>). However, the problem with these off-the-shelf products is that they require deep, skilled knowledge and dedication to use effectively. Nations would need a separate, long-term solution for military training programs.

The Canadian ADL office had realized the potential for simulated training by collaborating with a vendor to develop a solution for rapidly creating advanced VR interactive training applications without programming. Canada was also kind enough to share the solution by donating licenses to each of the Balkan nations included in the BMTF to use this tool. The tool is built on a game development platform, but it is much easier to use to create a VR environment, and no programming knowledge is necessary to create a functional VR storyboard.

It seeks independently created assets in an alternative 3D modeling software tool (such as 3d Max, Maya, or a similar tool). However, most of the medical assets are available free of charge, and a list of nations volunteered to donate the additional and specific-need assets, as required in the future. This includes the Canadian ADL, US ADL, Norwegian ADL, and other NATO partners.

Inside the tool, the camera is not fixed and is free to be utilized by the user through the interface. The user has complete liberty to control the scene, which makes it perfect for exploration and observation – the main learning objective of Virtual BMTF 2018. The objects are assigned to an action, and if an animation is needed, the user interacts with them by revealing their function and use. This capacity is crucial for future virtual BMTF development and further trainings.



Figure 3: Virtual BMTF

7. Conclusions

The Virtual BMTF resides at the RADLI (Regional ADL Initiative) server. It is currently hosted by the MOD of Serbia, the chair of the Steering Committee of the RADLI project. It is available as

- a 3D web-based application.
- A SCORM course Introduction to BMTF.
- the xAPI format.

Conducting virtual interoperability training, planning, and rehearsals with partner nations cuts the cost of the training and helps manage frequent assignment changes among the multinational members of the BMTF team.

Meanwhile, the xAPI format will allow future users to integrate training results into broader medical and UN Peacekeeping Missions trainings by comparing performance in advanced learning analytics.

The current use of the proprietary software is favorable not only because of the Canadian ADL support, but also due to sustainable maintenance for the RADLI nations and the potential for broader cooperation with other ADL offices and nations. There is no long-term, dedicated use commitment of this tool; all developed assets can be easily transferred to any other virtual environment, if any became more suitable for the RADLI nations.

The Virtual BMTF was presented at the I/ITSEC 2018 within the OCW (Operation Coalition Warrior) by the RADLI representatives (Serbia, Slovenia, Bosnia and Herzegovina, and Macedonia), and the in-person VR demonstration attracted much attention at the ADL/NATO booth. The

presentation inspired the continuation of VR development among the RADLI nations and sparked numerous examples of further cooperation and resource sharing among NATO and PfP allies.

Because of its playfulness [12], the Virtual BMTF has proven that it can bring together Balkan nations, despite the war histories and the many cultural differences, which often present an obstacle for joint military training and education. This VR environment bridged many of the divisions between these Balkan nations by introducing a new concept of a “united in virtual reality team.”

It remains to be seen whether this spirit of cooperation will create sufficient regional readiness to make a timely response to a broad spectrum of regional disaster relief situations and/or to prepare for uncertain future conflict.

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Learning and Motivation

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Abstract: Everything in our lives is underlined with some sort of motivation. This includes our students and their motivation to learn. Motivation is essential for learning and represent a driving force for students to complete their tasks and to build their knowledge. There are many factors which could potentially influence motivation, which makes research on this topic as it relates to learning diverse and abundant. However, motivational considerations can be summed up as being either task or ego-oriented. For facilitating task-oriented learning is recommend that teachers evaluate student performance based on an absolute scale rather than on a scale that compares student performance

against each other, emphasize student participation and self-improvement in learning and incorporate test questions that require explanations and justifications rather than memorized material. Students are motivated by knowing that what they are learning has a greater purpose. They want to know that what they learn in the classroom has relevance and significance to their daily lives. Students who are motivated conduct themselves in ways that maximize learning and success in academic environment. Motivated students attend classes on a regular basis without a need for external rewards, they seek additional help when is needed and they turn in quality work on time. On the other hand, unmotivated students minimize the effort they exert, which result in continued poor performance. Based on this concept, students are motivated to learn if they perceive having adequate support from their social environment and their master skills have positive social effect in real life. Students feel this sense of belonging if they believe their teachers are supportive of social aspects in the classroom, such as promoting interaction and respect among students.

The purpose of this paper is to review research conducted on student motivation on learning and in the process to identify teaching methods which are motivating students to learn.

1. Introduction

Behavioral and cognitive psychologists agree that motivation is essential for learning. Yet how to motivate learners in the classroom continues to be one of the most puzzling problems confronting the teacher. Relationship between motivation and learning is issued by Suprijono [4]. He states that motivation to learn is the process that gives the spirit of learning, direction, and persistence of behavior. That is, the motivated behavior is behavior that is full of energy, focus and enduring. Furthermore we define that motivation to learn is the overall driving force within the students who lead activities and provide direction on learning activities. Thus, motivation is born from the need to achieve the goal. Motivation to learn is very important for the realization of learning achievement. For this reason, students must have the ability to motivate themselves since it is truly required to gain achievements. For increasing our learning motivation, we must identify some indicators in certain stages [5]. Motivation indicators are: 1) the duration of the activity; 2) the frequency of the activity; 3) persistence of the objectives of the activity; 4) fortitude, tenacity and ability in the face of actions and difficulties to achieve the objectives; 5) devotion and sacrifice to achieve goals; 6) the level of

aspirations to be achieved by the activities carried out; 7) the level of qualification achievement; and 8) toward its attitude toward the target activity.

Professor Hamzah defines that the characteristics or indicators of motivation are [6]:1) desires and wishes to success; 2) encouragement and learning needs; 3) hopes and ideals of the future; 4) awards in learning; 5) interesting activities; and 6) the existence of a conducive learning environment. Meanwhile, dimensions and indicators of motivation based on theory of learning motivation are [7]: 1) intrinsic dimension actively involve the learning activities, the urge to find out things related on encouragement to learn independently; and 2) extrinsic dimension avoid in teachers "punishments" encouragement to get praise from the teacher, the urge to please parents, the urge to get good grades and encouragement from friends. We use all the indicators mentioned above in arranging a questionnaire study due to their significant differences. As the consequence, all of them would represent an assessment on learning motivation.

According to educational psychologists, three factors affect learning: Motivational factors, Physiological factors and Environmental factors. Motivational factors are psychological factors that condition learning. Sufficient motivational force, not only initiates activity which results in learning, but also sustains and directs its. Kinds of Motivation: There are two kinds of motivation in the context of learning. These are: Intrinsic motivation and Extrinsic motivation. Intrinsic motivation is the most effective type of drive which makes the matter to be learnt significant or meaningful to the learner. Extrinsic motivation which is external to the learning activity includes praise and blame, rivalry, rewards, punishments, and knowledge of progress. Other sources of motivation may include desire for social approval, domination, urge to excel and so on. Individuals differ greatly in their achievements and power motivations.

2. Learning process

Learning means – (a) activities and (b) experience. Both teaching and instruction influence learning through various activities and experiences. Learning and teaching mean the modification of pupils' behavior through activities and experiences. Various learning theories view this differently. Stimulus-Response (S-R) theories treat man as a machine. For them, the organism is governed by fixed principles and motivation of behavior originates from psychological drives. On the basis of cause-effect, the behavior of organisms can be predicted. Motivation is an urge to act. This urge results from stimuli which may be internal or external. Behavior does not consider any 'purpose.' S-R theories give importance to past experiences to explain the causes of present behavior. Motivation results from psychological situations, which are created by disequilibrium in individual's life span.

Cognitive field theories emphasis present experiences. Their approach is a situational approach to motivation and behavior. Their emphasis is on the effects of field conditions and other variables. Motivation itself could be said to be learned. Educational psychologists have always had a special interest in the relationship between learning and motivation.

On the other side learning: depends to a large extent of motivation. No matter what is learnt, the speed and efficiency would depend on motivation. Motivation is concerned with the arousal of interest in learning and is basic in learning. Motivation is effective only when it gives a mental set toward learning. Continuous motivation is needed in order to help learners concentrate on the learning material. Motivation through rewards has certain definite advantages- It is a positive approach. It also utilities the human desire for approval. Motivational factors are "activating" variables, whereas learning factors are "associative" ones. It is not easy to learn well. Describing teaching and learning as resembling a kind of "muddling through" that involves us negotiating moments of surprise as we learn our own truth about the realities of the classroom or online experience. But that doesn't mean that great teaching can't be achieved. Four core assumptions inform this book: that skillful teaching boils down to whatever helps students learn, that the best teachers adopt a critically reflective stance towards their practice are the most important knowledge we need to do good work is an awareness of how students are experiencing their own learning and our teaching, and that we should always aim to treat students as adults. To that it could be added: You can become a great teacher and that the students could easily learn from you as a teacher. Brookfield restates some of the chief insights of previous editions but interprets them for new contexts, such as online learning environments and

increasingly diverse classrooms. He uncovers what students most value in their teachers that they are authoritative allies—and explains how one can develop and demonstrate the credibility and authenticity required to fill that role. With putting the philosophy and strategies presented into action, educators can transform the unpredictable chaos of the college classroom into an environment of engaged, authentic, and successful learning [8].

2.1. Motivated learner

Unstated goal of teachers is to increase their students' independence and interest in learning [9]. Extrinsic motivators can be initially useful to engage reluctant learners; however, it is important not to forget that goal should be to move students towards independence and being intrinsically motivated. At a young age, children tend to react negatively to a task as 'work' when their behavior is controlled by socially imposed factors, such as rewards and rules and they tend to react positively to tasks as 'play' when there are no constraints imposed. An environment that supports students' independence facilitates change towards more self-determined, or intrinsic, motivation. Change in motivation is not an instant process but rather takes place through a number of successful experiences eventually becoming internalized. Students who expect to perform poorly often do.

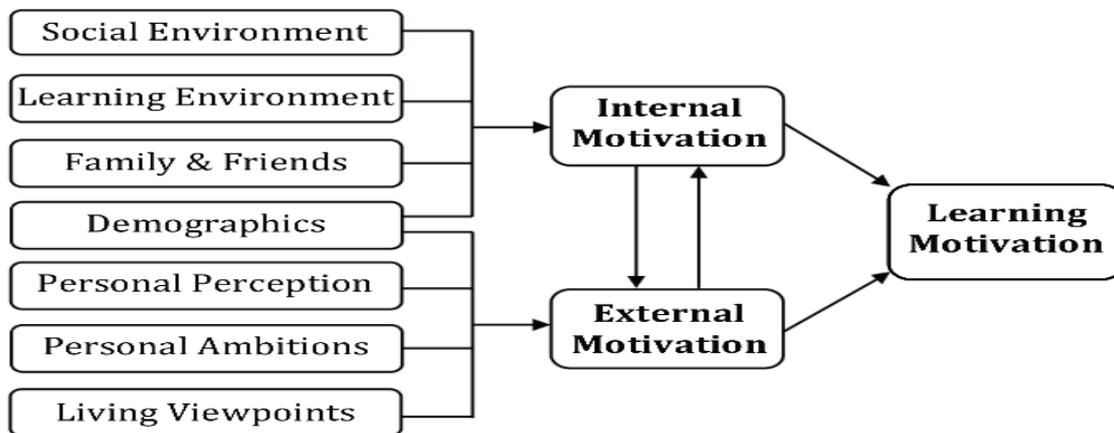


Figure 1: Learning motivation

Positive classroom climate and teacher interaction have a profound influences on student achievement and motivation . Believe your students can learn: Teachers' beliefs about teaching and learning and the expectations they hold for students are also a powerful influence. Motivation to learn can be directly stimulated by adult and peer models as well as through direct experience. Students often assimilate motivation from those around them, even when doing so is outside their awareness. Create a learning environment that is encouraging and challenging and communicate with your students for realistic expectations. Set goals: Setting intermediate goals can be self-motivating because it allows students to feel competency as they accomplish smaller goals.

Allow independence and involve students in the learning process: Students who are involved in creating the project assignment or the project checklist gain valuable experience in setting their own goals and standards. In addition, this gives students a sense of ownership and control over their own learning. Help students to focus on the intrinsically interesting, fun and playful aspects of a task, and encourage them to make even the most routine assignment exciting. Use positive words associated with intrinsic motivation as often as possible. Words associated with intrinsic motivation include: spontaneous, challenge, interested, involved, volunteering, mastering, delighted, autonomous, absorbed, competent and enjoying. Limit the use of words associated with extrinsic motivation including: competitive, obligation, expected, evaluated, constrained, demanded, avoiding, restricted, forced, pressured, controlled and proving. Positive responses to students' questions can enhance intrinsic motivation. When a student makes an error, respond positively and guide him or her back to the correct context. Show students affection and use positive responses rather than reprimands [10]. Praise helps learners develop a feeling of competence and has been found to increase intrinsic

motivation. However, do not give vague praise, as it will lose its value. Encouragement should be given when the student is attempting to reach a goal but has not yet achieved it. Teachers should convey the message that everyone can learn and that the process of learning and developing skills is more important than gets best grades with: improvement and learning for understanding.

3. Motivation as a process

Motivation is one of the individual factors which affects learning. Other very important individual factors which are directly affected to learning are: maturation, attention and interest, memory, readiness and capacities, sensation and perception, will to learn, physical handicaps, defect and diseases, fatigue, mental health, food and drugs and etc. Motivation usually is defined as a process or a series of processes, which sustains us and finally give us the right way to a goal directed with sequence of behavior. Motivation is most relevant to following: Direction of behavior: goal or goals being pursued. Intensity of behavior: the amount of effort, concentration and on invested in behavior. Persistence of behavior: extent to which a goal is pursued until it is reached.

In the Figure 2 is given descriptive statistics of participants by: gender, age range, living area and school grade level. The results are briefly given in the table below.

		Frequency	Percentage
Gender	Female	273	50.84%
	Male	264	49.16%
Age range	18-20	151	28.12%
	21-22	227	42.27%
	>22	159	29.61%
Living area	Rural	239	44.51%
	Urban	298	55.49%
School-year	Freshman	62	11.55%
	Sophomore	91	16.95%
	Junior	289	53.82%
	Others	95	17.68%

Figure 2: Descriptive statistics of participants

Motivation originate us during our lifetime, largely through experiences involving other people, because, they are developed through personal and social contracts, these motives are referred to as personal, social or acquired motives. Some of our motives are inborn, determined by our physiological inheritance.

Research on motivation has been strongly driven by theories that overlap and contain similar concepts. A comprehensive review of this literature is beyond the scope of this report, but we highlight a few key points. Behavior-based theories of learning, which conceptualized motivation in terms of habits, drives, incentives, and reinforcement schedules, were popular through the mid-20th century. In these approaches, learners were assumed to be passive in the learning process and research focused mainly on individual differences between people (e.g., cognitive abilities, drive for achievement). These differences were presumed to be fixed and to dictate learners' responses to features in the learning environment (method of instruction, incentives, and so on) and their motivation and performance. Current researchers regard many of these factors as important but have also come to focus on learners as active participants in learning and to pay greater attention to how learners make sense of and choose to engage with their learning environments. Cognitive theories, for example, have focused on how learners set goals for learning and achievement and how they maintain and monitor their progress toward those goals. They also consider how physical aspects of the learning environment, such as classroom structures and social interactions which affects learning through their impacts on students' goals, beliefs, affect, and actions [11]. Many students experience a decline in motivation from the primary grades through high school [12]. Researchers are beginning to develop interventions motivated by theories of motivation to improve student motivation and learning. Some interventions focus on the psychological mechanisms that affect students' construal of the learning environment and the goals they develop to adapt to that environment [13]. For example, a brief

intervention was designed to enhance student motivation by helping learners to overcome the negative impact of stereotype threat on social belongingness and sense of self [14].

Usually at the end of the year, students in the growth mindset condition had significantly improved their math grades compared to students who only learned about study skills. However, the effect size was small and limited to a small subset of underachieving students [15]. The subjective and personal nature of the learner's experiences and the dynamic nature of the learning environment require that motivational interventions be flexible enough to take account of changes in the individual and in the learning environment. Over the past decade, a number of studies have suggested that interventions that enhance both short- and long-term motivation and achievement using brief interventions or exercises can be effective.

In the table or figure 3 are given results of Linear regression analyses. When we analyzed the results given for standardized coefficients and significance level, we can easily conclude that: family and friends with standardized coefficient 0.721, learning environment 0.798, living area 0.712 and external 0.698 and internal motivation 0.682 are most important factors for motivation for learning.

Dependent variable	Independent variable	Std. Coefs.(*)	Sig.(**)
External motivation	Social environment	0.528	0.012
	Family and friends	0.721	0.018
	Learning environment	0.798	0.023
	Living area	0.712	0.041
Internal motivation	Personal Perception	0.624	0.032
	Personal Ambitions	0.645	0.014
	Living viewpoint	0.561	0.033
Learning motivation	Living area	0.147	0.029
	External motivation	0.698	0.000
	Internal motivation	0.682	0.000

Notes: * Standardized coefficients; ** Significance level

Figure 3: Linear regression analyses

The effectiveness of brief interventions appears to stem from their impact on the individual's construal of the situation and the motivational processes they set in motion, which in turn support longer-term achievement. Brief interventions to enhance motivation and achievement appear to share several important characteristics. First, the interventions directly target the psychological mechanisms that affect student motivation rather than academic content. Second, the interventions adopt a student-centric perspective that takes into account the student's subjective experience in and out of school. Third, the brief interventions are designed to indirectly affect how students think or feel about school or about themselves in school through experience, rather than attempting to persuade them to change their thinking, which is likely to be interpreted as controlling. Fourth, these brief interventions focus on reducing barriers to student motivation rather than directly increasing student motivation. Such interventions appear particularly promising for African American students and other cultural groups who are subjected to negative stereotypes about learning and ability. However a note of effectiveness on these interventions appears to depend on both context and implementation [16]. Studies such as these are grounded in different theories of motivation related to the learners' cognition, affect, or behavior and are intended to affect different aspects of motivation [17].

However, this meta-analysis was small: only several hundreds of published and unpublished papers met criteria for inclusion, and the included studies involved a wide range of theoretical perspectives, learner populations, types of interventions, and measured outcomes. These results are not a sufficient basis for conclusions about practice, but further research may help identify which interventions work best for whom and under which conditions, as well as factors that affect implementation (dosage, frequency and timing).

4. Conclusion

Motivation to learn is influenced by the multiple goals that individuals construct for themselves as a result of their life and school experiences and the socio-cultural context in which learning takes place. Motivation to learn is fostered for learners of all ages when they perceive the school or learning environment is a place where they “belong” and when the environment promotes their sense of agency and purpose. Theory and research support the important role of self-efficacy in learning, motivation and self-regulation. Self-regulation has several definitions, hence this article opens with a discussion of definitions. Self-regulation is a construct that represents development of children's abilities to follow the everyday norms and practices that are embraced by their parents. Self-regulation is an intrinsic part of the socialization process. Research findings have provided insights about the role of caregiver and child factors in effective self-regulation. From instructional and social and environmental sources, students gain information that affects their self-efficacy and in turn, self-efficacy influences various achievement behaviours. The operation of self-efficacy in education contexts will continue to be clarified as researchers investigate such issues as the generality of self-efficacy measures, how students' capabilities to process self-efficacy information changes with development, how self-efficacy functions in different cultures, and the role of self-efficacy in learning from technology.

Professors must support the learners' motivation by attending their engagement, persistence and performance by:

- Helping them to set desired learning goals and appropriately challenging goals for performance;
- creating learning experiences that they value;
- Supporting their sense of control and autonomy;
- Developing their sense of competency by helping them to recognize, monitor and strategize about their learning progress and
- Creating an emotionally supportive and nonthreatening learning environment where learners feel secure and valued.

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Challenges of Differentiation in Learning and the ADL Approach

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Abstract. The notion and the ideas related to differentiation in learning are present in the education literature since 1950s. Today, its significance becomes more and more important, as the number and the diversity of students in the classrooms rises. This aspect is paralleled by the constant development of the learning technologies, which have improved at an unprecedented rate. There has been a rapid transformation of the learning environment afforded by mobile devices and social media. In this context, the differentiation approach raises many challenges, in addition to its defining learning objectives. An efficient architecture of the contemporary learning system should support content communication among various learning platforms that enriches the traditional approach with mobile, virtual and other interaction enhancing technologies. As a result, when striving to meet the goals and objectives of differentiated learning, the teachers of today need a careful planning ahead of the lessons, in order to make the learning process effective, adaptive and easily accessible.

1. Introduction

Being a teacher is challenging for many reasons, including the fact that each student has a distinct learning style and learns at a different pace. While covering certain content to satisfy the standards set by the state institutions, teachers also strive to effectively tailor and pace their lessons to each student's backgrounds, readiness, interests and skills. As many teachers experience, fulfilling the needs of each student in class can be highly demanding.

Differentiated instruction (DI) is a comprehensive, learner-centered approach that is applied as a response to the variance among learners in the classroom, based on the premise that students learn best when grouped by ability, as well as by their personal interests and learning styles. It is a framework that relies on a variety of methods teachers use to accommodate a diverse range of learners. Applied as a learning strategy, DI ensures that every student masters any given concept, no matter his or her learning preferences. As such, it is a process of making the curriculum accessible for all students, regardless of whether it is a struggling or a gifted student, a student with learning disabilities, a student with behaviour or communication disorders.

Teachers have always practised some degree of differentiation, simply by noticing which students require more or less challenge and by asking them different questions. As a systematic response with defined strategies, DI emerged in recent times, being firstly introduced with a focus on gifted students, further promoted to include students with disabilities into general education classrooms, and later also international/immigrant students. The important benefits of DI for students include the ability to: learn the same material as their peers at a level of challenge appropriate to each student, incorporate the most effective learning styles, increase their engagement in materials and motivation to learn. By providing options to choose from, students take more responsibility for their learning and improve additional skills such as collaboration, cooperation and critical thinking.

The essential characteristics of DI have been synthesized by Smit and Humpert (2012) [1]: the professor takes into account the differences between students; the learning sequences are established following some formative evaluations; the professor modifies the content, the process and the products according to the needs of the learners; the professor and the students collaborate within the learning process. Whereas traditional teaching methods involve an instructor lecturing in front of the class with

minimal interaction between students, DI encourages students to work together and with their teacher to become actively involved in the learning process. In this context, it is clear that applying DI may potentially bring benefits to both the professor and the students. But when, for example, "kinesthetic" students get to make things or draw pictures, while "analytical" students get to read and write, this approach seems to complicate teachers' work, requiring them to procure and assemble multiple sets of materials. They have to carefully observe students, reflect on activities completed in class and set assignments, in order to design experiences that match the learning styles of the class and the differing levels of ability and understanding. When teachers differentiate their instruction, they are adapting instructional methods, materials, and assessments to ensure that all learners have a chance to make their best.

In general, teachers hold various misconceptions about DI, considering it as individualized instruction, chaotic instruction, homogeneous grouping, or tailored instruction. They can be sceptical of DI believing that its use will lead to insufficient preparation of students for standardized tests, unfair workloading among them, or even to a student who is not well prepared to survive in the real world. Moreover, some teachers believe that credits should not be given for learning if a student has not demonstrated the same knowledge level as the other students in the same class and that there is only one approach to differentiating instruction [2]. One important thing to keep in mind is that the process of differentiation should not change the learning objective or the content standard being met. All students are expected to meet the same standards by applying different approaches.

2.Strategies and Activities for Differentiation

There are many different strategies that can be applied to DI. An obvious way is that the teacher picks up a topic for a unit or a lesson and then chooses several different ways in which students could learn about it. DI – compatible strategies include the use of graphic organizers, learning centers, independent study projects, tiered assignments, learning contracts, and web based inquiry projects. With most such strategies comes an increasing option for student's choice, and thereby an increasing student engagement. [3]

Differentiation strategies fall into one of the two main types: *readiness-based* (level-related) and *interest-based* (profile-related) differentiation. Readiness differentiation ensures that all students are provided with appropriately challenging learning experiences, while differentiating instruction according to students' interests motivates them to connect what is being taught, with things they already value. Another aspect that DI can take into consideration is student's *learning profile*, thus providing opportunities for learning in ways that are both natural and efficient. Students may be given the opportunity to choose work conditions that are conducive to various learning preferences, such as working alone or with partners or a group, the learning environment, etc. Other key factors in the student's learning profile are the cognitive styles and the intelligence preferences [4].

Instructors can differentiate at least four classroom elements based on the student's readiness, interest, or learning profile: the learning *content*, the *process* (activities) in which the student engages in order to master the content, the *products* (projects) for rehearsing, applying and extending what the student has learned, and the organization of the *learning environment*.

Differentiation of content requires teachers to either modify or adapt the access to the material they want the students to learn, in response to students' readiness levels, interests, or learning profiles. For example, teachers may choose to differentiate content by using flexible grouping where students can work in pairs, small groups or alone, using books, audiovisual or internet resources as a means of developing understanding and knowledge of the topic or concept [5]. Some other possibilities for differentiating content are: using contents at varying difficulty and complexity levels; using assignments' lists at readiness levels of students; presenting ideas through both auditory and visual means; meeting with small groups to re-teach an idea or skill for struggling learners, or to extend the thinking or skills of advanced learners. Whatever strategy is used, all students must be aware of their responsibility for meeting specified deadlines for class projects.

Differentiation of process refers to "how the learners come to understand and assimilate facts, concepts, or skills" [5]. These activities are referred to as 'sense-making' activities that allow students to increase their understanding of the topic being taught. It is important to note that the process is

differentiated not only by how the teacher decides to teach (lecture for auditory learners; PowerPoint and video clips for visual learners, small group and whole group), but by the strategies the teachers encourage students to use to facilitate thorough exploration of the content being taught. This can be done through higher-order thinking, open-ended thinking, discovery, reasoning and research [6]. Examples of differentiating process or activities include: chunking instruction into shorter segments or expanding assignments over longer periods; re-teaching, reviewing, paraphrasing, rephrasing, retelling key concept ideas; providing additional opportunities for students who wish to explore topic subsets of particular interest to them; developing personal agendas to addresses individual needs of learners; varying the length of time a student may take to complete a task in order to provide additional support for pursuing a topic in greater depth.

Product differentiation allows students to demonstrate what they have learned in a variety of ways. In [7], it is suggested that products are culminating assessments that allow students to demonstrate how much they understand and how well they can apply their knowledge and skills after a significant segment of instruction. Product differentiation should offer students multiple pathways to show mastery of common learning goals. Effective product differentiation assignments should offer students clear and appropriate criteria for success, focus on real-world relevance and application, promote creative and critical thinking and allow for varied modes of expression. One of the most widespread strategies to differentiate by product is to offer students the opportunity to choose their work or the way they will be evaluated. Other ways to differentiate by product are: adopting alternative forms of evaluation, alternative or modified assignments and independent projects. Examples of differentiating products include: giving students options of how to express required learning; using rubrics that match and extend students' varied skills levels; allowing students to work alone or in small groups on their products; encouraging students to create their own product assignments with required elements.

Differentiation of the learning environment focuses on the overall climate and the operation of the classroom - class rules, furniture arrangement, lighting, procedures and processes. It involves: considering the look and feel of the classroom; providing a safe and positive learning environment; allowing for individual work preferences such as quiet spaces or collaborative spaces; setting classroom routines and classroom contracts; varying the places where learning occurs; setting out clear guidelines for independent work that matches individual needs, etc.

The table below summarizes the main issues of differentiation in teaching and learning.

Table 1. Overview of differentiated instruction elements

WHAT	WHY	HOW	TECH TOOLS
Content	Readiness Interests Profile	graphic organizers	Web 2.0
Process		learning centers	Web 3.0
Product		study projects	cloud computing
Environment		tiered assignments	web quest
		collaborative spaces	analysis and simulation tools
		...	student response systems
			...

2.1 Differentiating in higher education

The implementation of DI starts with an analysis of students' characteristics and needs, preferably to be done at an early stage. Based on the evaluation, the instructor needs to plan a prescriptive instructional design, including goals, resources, and strategies. Specific data may refer to students' characteristics, needs, lesson goals, strategies, and assessments, which implies a need for a well-designed data management system. Finally, an ongoing revision in terms of student interests as well as assessment of achievements should be conducted in order to provide constant feedback.

When it comes to higher education, DI diverges from the traditional practices that use whole-group lecture format, where student learning and participation are more passive and unresponsive to

individual needs [8]. Adult learners have a clearer idea of what they wish to learn, as compared with children. According to the adult learning theory devised by Malcolm Knowles in the 1960s that popularised the term ‘andragogy’ (vs. ‘pedagogy’), one characteristic of adult learners’ motivation is the willingness to learn when the subject matter is relevant to their perceived needs. In this regard, the advantage of DI is primarily in differentiating the content of learning for individual students. The strategies of DI would use assessment of each individual student for readiness, interest, and learning preferences to modify instruction in content, process or product. Students who have already exhibited sufficient mastery, for example, could be excused from studying particular content, which provides them with time for acquiring other knowledge. Another DI strategy that applies in adult learning context is the ‘learning contract’, which recognizes student’s needs and interests.

According to another assumption about adult learners in Knowles’ andragogy theory, adult learners need to be self-directed in their learning efforts. This is in contrast to the fact that in DI, the person making decisions about learning is usually the instructor, with some input from learners. Since DI was firstly developed for younger learners, the element of control by teachers might be stronger than one would expect to encounter in university settings. From this viewpoint, DI could be considered as an interim measure in higher education. There may be many university students who are already self-directed but, given the increased access to higher education compared to previous generations, it is reasonable to suppose that a more directive approach such as DI could be appropriate on occasion and for particular learners.

Student populations at universities, academies and other higher education institutions are often highly diverse. Besides readiness, interest and learning profiles [7], there are numerous other factors that distinguish students from each other: age, gender, nationality, ethnicity, religion, socioeconomic status, physical disability, specific learning disorders, mode of study (full or part-time), etc. In these circumstances, DI offers a systematic yet versatile response that is available to higher education lecturers. In another aspect, university lecturers, compared with elementary school teachers, may not always know their students that well – groups may be large, number of contact hours may be lower, students may be absent from lectures from time to time. If the lecturers are not that well informed about the learners, then any attempt at DI would be based upon assumptions.

There have been some experiments with DI at tertiary level with both positive and negative results. Ernst & Ernst [9] reported that “students generally responded favourably to the differentiated approach, reporting higher levels of intellectual growth”. According to the same paper, increased time commitment needed to implement DI and ‘instructor’s concerns related to the fairness of the approach’ have been reported. While many teachers report that they lack ‘the time, the skill and the will’ to utilise DI strategies [10], some believe that ‘educational technology shows promise as a means to make the differentiation of instruction and provision of individualised formative feedback more feasible and practical’, [11].

3. Applying new technologies and approaches in DI

Today’s learning opportunities are quite different from those of couple decades ago, having that technological advances allow teachers to tailor curricula to individual students quickly and effectively. Web Tools 2.0 and 3.0, Learning Management Systems and interactive media provide teaching and learning support that can supplement, and sometimes replace the traditional teaching aids of the past. The use of technology plays a transformative role in the static, passive classroom as teachers can use a variety of ways to engage students, encourage active and collaborative learning and get better results. Many new ways to differentiate learning in the classroom have become available, providing an interactive, changeable experience for every student. The non-traditional mediums have proven successful at all levels of education, allowing students to develop confidence in their digital skills alongside their academic ones. Information and Communication Technology (ICT) is considered a key tool for supporting teachers who adopt DI, since it gives students with different learning profiles the opportunity to work at the same level, at the same time and through peer interaction.

In general, digital learning resources fall into one of three categories: content delivery, engagement and feedback, and assessment. They can be applied for presenting information or supporting information processing through a mix of media elements (text, image, video and audio), in order to

help students in developing mental representations. Research on multimedia learning have demonstrated more positive outcomes for students who learn from resources that effectively combine words and pictures, rather than those that include words alone. The attention and engagement that these resources provide, helps students to process the information into the working memory. Furthermore, when the interaction with the multimedia information is meaningful, the information can be more easily encoded into the long-term memory. [12]

Introducing digital resources into the teaching and learning process provides means for teachers and lecturers to conduct ongoing assessment on students, without the need of formal exams or tests. This allows students to perform at their best, while giving an honest view of their progress. Furthermore, teachers can get diverse and more frequent feedback from students, spot problems and set plans for dealing with them. By setting flexible, progressive tasks that accommodate all speeds of learning, students do not feel bored, left out or pressured excessively. This approach also allows for variable outcomes and the ability to incorporate creative thinking, without the usual 'yes or no' type situations with only one right answer. Offering variable outcomes to learning for higher education can even help students realise their own special interests and further concentrate on particular areas of a subject.

But using digital technology only for its sake does not count as an effective teaching. Before exploring specific technologies that can support differentiation practice, it is important to consider how to effectively integrate technology into instruction. The first and most important principle of technology integration is that the focus should be on the outcome of the instruction, and not on the technology itself. Teachers should first make decisions about the learning goals, activities, and assessments, as well as the types of technologies they wish to integrate. This perspective is central to the conceptual framework for educational technology known as TPACK: Technological Pedagogical Content Knowledge.

Today, smart technologies have already transformed the paradigm of education toward providing intelligent and customized teaching and learning environments. The development of smart media has accelerated knowledge sharing by enabling connection and offering information anywhere and anytime around the globe. It is a technology that is sensitive to what is happening and responds quickly to provide personalized products and services through analysis and forecasts [13]. Smart devices might enable services such as cloud computing, Web 2.0, analytics (semantic Web and Web 3.0), etc.

Cloud computing refers to systems that use hardware and resources in the 'cloud' as a specialized data center hosted by thousands of servers. Individual users can use an application on a wide range of computer platforms, access services and tools without the need to invest in additional infrastructure, synchronize data between computers to provide access from anywhere and work effectively with the variety of smart devices according to the context. This makes cloud systems an attractive option for teaching and learning data management for many educators (Johnson et al. 2010).

Web 2.0 can be defined as a technological feature that facilitates interaction between web users and sites, while encouraging participation, collaboration, and information sharing. It was enhanced by social network services, which help in building networks and relations by online media for sharing interests and activities. The major features of Web 2.0 include: dynamic content that is responsive to user input, free sorting of information, collective retrieving and classifying of information, evaluation and online communication between site owner and users, developed APIs to allow self-usage, such as by a software application. Examples of Web 2.0 applications are YouTube, Wiki, Flickr, Facebook, etc.

Web 3.0 refers to the evolution of web utilization and interaction by altering the Web into a database. It is a set of technologies that provides efficient ways to make computing systems organize and draw conclusions from online data, due to the advances in data mining, interpretation, and modelling. Dynamic user-generated connections facilitate blending semantic Web tools with Web 2.0's capacity, using the knowledge that users are creating and sharing to make the computing system more intelligent. Allowing users to connect, create, share, and modify their own systems offers customized and individualized data with their own structure. The major features of Web 2.0 include: create, share and connect content through search and analysis based on the capability to comprehend the meaning

of words, rather than on keywords or numbers; distinguishing information in a human-like way in order to provide faster and more relevant results (artificial intelligence); create 3D Graphics (Museum guides, computer games, ecommerce, geospatial contexts, etc.); provide a higher level of connectivity thanks to semantic metadata; provide accessibility of content by multiple applications, at all places and through all devices. One example of Web 3.0 is Tivo, a digital video recorder whose recording program can search the web and read what it finds based on the given preferences.

Analysis and simulation tools support knowledge construction by allowing learners to collect, manipulate and visualise information in different ways. Some examples of technological tools that support these processes include [12]:

- Concept or mind-mapping tools that help learners to identify and link relevant concepts and represent them visually.
- Database software, which allows learners to record, sort and report on a variety of data in numerical, textual and media forms.
- Spreadsheet software, allowing learners to record, sort, mathematically analyse and represent numerical data in tabular and/or graphical forms.

Technology can be embedded meaningfully and engagingly into **communication learning activities** for students, including journal writing, speech writing, preparing topic talks, newsletters and debates. Communication tools include: word-processing, presentation and publishing software, webpage authoring tools, email and online discussion forums. These tools allow students to communicate their ideas using a range of media elements (text, images, sound, and video).

WebQuest is an inquiry - oriented lesson format that embeds the use of a variety of learning resources, with most being digital learning resources available on the internet. The inquiry activity may take the form of tasks such as a problem to be solved, a position to be taken, a product to be designed or a work to be created. Teachers can create their own WebQuests that address curriculum outcomes and draw upon resources they have identified and evaluated, or use an already created WebQuest.

Collaborative learning is an important learning strategy in which two or more students work together to search for understanding, create a product or solve a problem. It improves student knowledge by combining strengths, sharing responsibilities and learning from one another, which brings together many opportunities for enriching knowledge. In these learning experiences, students work together towards a common goal and, through the process, depend on each other for their experiences and knowledge. Technology in classroom enables collaborative learning through many different means or modes, such as online discussion groups, interactive platforms and online classroom environments. These environments allow students to work together on group projects, publish on wikis and blogs, solve problems, have debates and study teams, conduct an online classroom, and participate in other activities in cooperative ways.

Student response systems or ‘clickers’ is a formative assessment technique that provides feedback for both teacher and student. These devices connect to a computer and LCD projector or an interactive white board, allowing students to answer questions in class without sharing their responses with classmates. This option requires devices that must be purchased, although some interactive white boards are already packed with them. Clickers provide immediate data that is aggregated with no additional effort. The data can be either anonymous or tied to the individual learner, as many systems can associate the number of the device with a given student to keep a running record. Once collected, student data can then be used to develop either an individual or a classroom learning profile.

4. Differentiating the four classroom elements

A Virtual Learning Environment (VLE) functions as an important web-based instructional component in education. Pimentel (1999) defines a VLE as “one that allows learners to perceive the environment, assess situations and performance, perform actions and proceed through experiences and lessons that will allow them to perform better with more experience on repetition on the same task in similar circumstances”. Through the use of VLEs, there is a change from teacher-centred to learner-centred classes. An example of VLE is Moodle (Modular Object-Oriented Dynamic Learning Environment), a free open-source learning management system or e-learning platform that serves

educators and learners across the globe. This platform has different tools and applications for use, among others chats, forums, discussions, tests, assignments, lessons, wikis and quizzes. One of its main benefits is facilitating interactions amongst students, as well as between learners and their teachers, in order to reinforce the learning process.

4.1. Differentiating the content

Technology can provide an easy and practical way for organization of the learning content and materials. A vastly accessible tool is the use of hyperdocs to create virtual 'playlists' of instructional materials. A hyperdoc could begin with a formative assessment, upon which teachers can decide between two ways for DI - either create unique playlists for each student, or one playlist can offer options for students based on their performance. Depending on which problems students got right or wrong, and what kinds of errors they are making, the hyperdoc can direct students to different learning activities that are targeted for their individual needs.

Differentiation by content can be achieved in a variety of ways, but the two main strategies are: 1) using different content to teach the same subject to students with different needs, and 2) enhance/ expand/ adapt the available content so that it is accessible to all learners [14].

Regarding the first strategy, the World Wide Web now provides a wide range of available materials for teachers and students, including digital books, simulations, visualizations, applications, illustrations, graphs, scientific videos, audio and video files, animations etc., which can present and explain concepts of the learning content. This enables students to interact easily and directly with the educational material in many different ways, by using media that best responds to their learning styles. At the same time, instructors are provided with rich resources, often with a different level of complexity.

Regarding the second strategy, educators should extend and/or adapt the existing content. Specifically, some of the ICT tools which can adapt content to students' needs are: conceptual maps (Kidspiration, Inspiration, Bubbl.us, Cmap and Webspiration), screen reader software NVDA (NonVisual Desktop Access), digital textbooks, eBooks, audio books and word processors, such as Microsoft Word. Web quests such as Internet Scavenger Hunts, simulations, Wikis, can both engage student in research based on their interests and their strengths. Educators may use e-learning platforms such as Moodle and Blackboard to enrich, extend and personalize their instruction. These platforms can also support on-line lessons thanks to asynchronous e-learning, which eliminates physical obstacles and saves time, thus giving opportunities for flexibility in time, space and learning pace. In teaching mathematics, teachers can use Excel to teach basic graphing and statistics skills.

4.2. Differentiating the process

When differentiating by process, educators can focus on students' readiness, their interests and their learning profiles. ICT tools are able to differentiate the processing, manipulating and recording information, but also the time each student needs for these functions, and adapt it accordingly. It can enhance teamwork by supporting students not only individually but also as a group, thus offering flexibility in the classroom. Hence, educators and students have a variety of different ways at their disposal to explore, research, study and evaluate both the concepts to be taught and the learning objectives.

There are many opportunities to differentiate the process of teaching with technology. One of the most common is Power Point. This production software is good teaching option especially for visual learning style's students. Other technology for differentiation of process includes: Web 2.0 Tools, Blogs, Podcasts and Wikis, Ebooks, social networks, Forums, YouTube, online magazines, graphic organizers, and mind mapping. All these enable students to learn according to their preferred learning styles.

Teachers can organize different assignments for different students using a variety of lessons, curricular units, videos, and worksheets from websites such as CK12.org, www.khanacademy.org (extensive video library, practice exercises, and assessments), and others. This makes it possible for teachers to provide additional instruction for students who need more practice and review. When assigning homework using technology, teachers must ensure that students have proper access to these

tools. While these tasks might seem daunting, using one portal, such as Google Classrooms, makes it possible for teachers to keep materials organized.

Wikis can be used in many ways to create powerful and dynamic learning environments that are especially suited for collaborative writing and project-based learning. The collaborative encyclopedia, Wikipedia is one of the best-known examples of the wiki format. A wiki is a page or collection of web pages designed to enable anyone who accesses them to contribute or modify content, using a simplified mark-up language. Because a Wiki is web-based, contributors do not need to be in the same geographical area, nor do they need to be working synchronously.

Blogs, short for “web logs,” can be used for a range of educational projects from simply posting a classroom notice board and resource center, to hosting student work, to global collaboration projects.

The potential for using blogs is limited only by the imagination and creativity of its users. Blogs not only provide a place for the author to write, they also invite other readers to comment on what has been said. Blogs can also include links to websites, other blogs, news articles, or even pictures. Blog writers can also “tag” their entries with keywords. For example, if a teacher writes a blog entry about the book the class is reading he can “tag” it with identifiers such as the author’s name or subject matter. Instead of simply using the internet for reading information or to look something up on the web, blogs allow for interaction as people write and react.

Podcasts are a series of audio or video digital media files that are distributed over the internet by syndicated download. In podcasting digital audio or video files are available on the internet in such a way that others can set their computers to automatically download new episodes in a series as they are posted. This downloaded information can go through web feeds to portable media players and personal computers, without having to go to a specific site to download it.

E-mail is a tool most educators are familiar with using. However, even e-mail has been transformed to support great information storage and collaboration. For example, Google mail, or Gmail, gives users endless storage opportunities to collaborate on documents, using Google Docs, instant messaging, and video conferencing. Other video conferencing websites include Skype and Oovoo.

Graphic organizers or mind-mapping can also be used to help differentiate instruction with technology. The website (<http://www.graphic.org/goindex.html>) helps create and utilize graphic organizers. Graphic organizers offer the opportunity to differentiate for visual learners as the content and concepts are being taught.

4.3. Differentiating the product

Differentiation by product means choosing a different way, by which each student will show everything he/she has acquired and understood in terms of the knowledge and skills taught. Consequently, educators should allow and accept the various ways by which each student chooses to express the acquisition of the new knowledge.

Differentiating the products that students use to show mastery of content knowledge or skills can greatly be enhanced with the use of technology. A first way of differentiation by product using ICT is to provide the learner with the opportunity to demonstrate their learning with Web 2.0 tools. Specifically, Web 2.0 tools such as Podcasts, Blogs, Wikis, digital narrative applications, shared /collaborative presentations (e.g. Prezi), YouTube and social networks enable students to show what they have learned through creative and collaborative projects. Therefore, ICT tools can contribute to the enhancement of students' creativity and skill development. A second way for educators to differentiate their instruction by product using ICT tools is to give students the opportunity to demonstrate their understanding through multimedia. Multimedia supports students who face difficulties in organizing and expressing their thoughts by providing them with different ways of expressing their writing, while simultaneously respecting individuals' strengths and weaknesses. Such tools are: digital posters (i.e. Gloster platform), digital storytelling (i.e. Storybird, Storyboard) and Voicethread.

Rubrics and rubric development websites such as “Rubistar,” (<http://rubistar.4teachers.org>) offer teachers tools to differentiate instruction based on specific goals and objectives for each student in the class. A rubric is any established set of statements (criteria) that clearly, precisely, accurately,

and thoroughly describes the varying or developmental levels that may exist in a student's work. Rubrics also provide valuable information for guiding or coaching student to their desired level of performance. Technology offers the ability to create, customize, and share learning activities via websites like Quia Web (www.quia.com/web), one of the world's most popular educational technology web sites that give instructors the ability to create customized educational software online, built around their own course materials and made them available to students over the internet.

4.3. Differentiating the learning environment

Organizing the learning environment is a critical component of successful teaching and learning. Even the best content, taught with an appropriate learning process in mind, will be unsuccessful if the classroom environment is not conducive to learning. Students with strong learning-style preferences show a greater academic gain as a result of congruent instructional interventions, than those students who had mixed preferences or moderate preferences [15].

Personal learning environments are designed around each student's learning goals, and have the capacity for customisation. It involves: considering the look and feel of the classroom, providing a safe and positive environment for learning (setting guidelines, routines and procedures), allowing for individual work preferences, managing the learning space (creating distraction-free and/or collaboration areas). When students have a preference towards a particular environment, the teacher can make adjustments to sound, light, temperature and design, as needed. The student-designed spaces may encompass different types of content, including videos, apps, games, and social media tools. The components used in the personal learning environments may be chosen by students, to match their identified learning goals, personal learning styles and pace.

Differentiating the learning environment is an ongoing process and can take considerable amount of time. While personal learning environments sit in the hands of students, various vendors are currently developing learning analytics software to analyse student performances and behaviours, and to provide that aggregated information to teachers.

5. Conclusion

Traditional instruction has been equated with teachers who teach to the middle or use the 'one-size-fits-all' approach, which has prevailed due in part to the lack of time or interest of teachers in devoting their efforts to tackle individual learning needs. The advent of new technologies, however, has enabled teachers to resort to multiple tools and applications that contribute to a differentiated approach to learning.

Differentiation is a time consuming, dynamic process that takes years to be fully incorporated and is always dependent on student's needs. Many of the obstacles to implementing DI can be overcome with the effective use of technology. Technology can equip teachers to address students' needs in a great variety of ways, through content input, learning activities, and opportunities to demonstrate comprehension. Today, there are more and more students who come to the learning environment already knowledgeable in the use of digital resources, and therefore technology can become an intermediary that supports the relationship between teacher and student. The result is an individualized learning process that contributes to a more lasting and deeper acquiring of knowledge, the formation of positive motivation to learning, creation of a comfortable learning environment, building students' self-esteem and making them more autonomous.

Web resources and multimedia software greatly expand learning options and provide information access way beyond the school textbook and media center. Technology can help teachers shape and deliver instruction to meet the needs of all students, assist in the improvement of student thinking, provide for research and presentation products, and improve communication. At the same time, it supports students to process information by helping them to organise new information, link it to their existing knowledge and use memory aids to retrieve information. It engages students, thus making them more attentive, knowledgeable, and higher achieving.

While effective teachers always differentiate to some extent, it is unrealistic to expect an individual teacher to be able to fully address the wide variety of backgrounds, skill levels, interests, talents,

personalities and learning preferences of the large numbers students found in many of today's classrooms.

It can be very helpful for teachers to share good instructional methods and examples. Peer coaching and the sharing of effective models can encourage teachers to improve their DI practice. There are alternatives to DI such as Universal Design for Learning and the increased use of Technology Enhanced Learning in order to accommodate individual learning differences.

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E-learning in the Slovenian armed forces - an example of good practice

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Abstract. E-learning (EL) as part of the information society has, both within the Slovenian Armed Forces (SAF) and the Ministry of Defence of the Republic of Slovenia (MoD), been facilitating the acquisition of knowledge through the world wide web, encouraging innovation and creativity of participants, and, at the same time, enabling better responsiveness and adaptability of training in terms of place, time and subject matter, which can be adjusted to individual needs. The basic aim of the EL integration in the SAF/MoD was to establish a virtual classroom, which will enable the exchange of on-line knowledge and access to all members of the defence system, both at home and abroad, who have expressed interest in using the contents offered by EL. The major part of e-learning presently used in military education and training system has been designed as combined education, where the information and communications technology (ICT) serves solely as a means of help to traditional education, delivery of learning material, and communication between participants and education providers. Self-study is conducted in the form of on-line courses (e-courses) without the presence of a tutor or a teacher. The users can freely choose the place and time of their study obligations, be it at work, at home or abroad. This form of education has proved as highly suitable for the entire defence system by enabling simple use of and access to e-courses through the E-learning Centre website (<https://cei.mors.si>)

E-learning

The state-of-the-art e-learning is embodied in online learning, which derives from on-line interactive and multimedia-supported teaching materials (that are not equal to materials delivered through e-mail or downloaded from a website). Such e-materials or related electronic educational systems enable effective learning, online assessment of knowledge, and synchronous or asynchronous communication among participants.

In other words, e learning is any form of education using information and communications technologies. There are different combinations of didactic forms of e learning, namely: distance learning, online self-study, webinars, combined education etc. All these forms of learning encourage the e-learning process as a set of cognitive processes within an individual. It can be carried out as distance learning and also in the classroom in the presence of the teacher and students. It can be organized as self-study or as interactive learning.

Distance learning is a form of education carried out at a separate location, away from the teaching site, and demands specific techniques of designing teaching materials, instruction and communication through ICT as well as a special approach to the arrangement of all organizational and administrative matters. Distance education is hence appropriate as a supplementary form of education and training, knowledge revision and updating, familiarization with individual special topics, browsing for answers to concrete questions, as replacement for regular education in emergency situations, when regular forms of education cannot be provided or due to absence of participants for health reasons and other activities.

The main advantages of distance education lie mainly in the adaptability to participants' restrictions in terms of place, time and ability (participants may freely choose their tempo), possibility

of self-study, design of materials by the best experts, possibility of on-line revision and updating of materials (access to current data), use of computer services: storage of learning topics, editing, searching, processing, presentation.

The disadvantages of distance learning are the following: less control of participants (participants must be self-disciplined), organizational matters, lack of social impact of the group and educational component, skills of participants for using technology, price of individual technologies, equipping level of participants, copyrights, privacy and security matters, etc.

Online self-study means learning from e-materials without the presence of a tutor. The main goal of such education is to enable users access to pre-designed high-quality materials. The teaching process in this form of learning is carried out by means of technology. It is suitable for short forms of education and highly motivated individuals.

Combined education links conventional and e-learning. E-learning can also be guided, participants may decide for self-study, or both strategies can be combined. Through the concept of combined education participants and tutors may utilize the best from both worlds (physical and virtual).

Introduction of e-learning in the Slovenian armed forces

Today, e-learning (EL) as part of the information society, and hence the Slovenian Armed Forces (SAF), facilitates acquisition of knowledge through the world wide web, boosts innovation and creativity of participants, and, at the same time, allows for better responsiveness and adaptability of training in terms of place, time and contents that can be adapted to individual needs. E-learning was introduced in the SAF/MoD on the basis of the Target Research Project titled »Slovenian Armed Forces' e-learning and training systems and studies, and possibilities of distance learning introduction«. The project was financed by the Ministry of Defence of the Republic of Slovenia and Slovenian Research Agency.

The basic aim of introducing EL in the SAF was to set up a virtual classroom that will enable distance knowledge exchange and will be accessible by all members of the defence system, be it at home and abroad, who have expressed interest in using the contents provided by EL.

The advantages of EL are the following:

- Enrichment to and greater attractiveness of the education and training process,
- Enabling teachers and instructors the design of education and training materials to be available to a target group through the education and training process,
- Reduction of absence from work,
- Cost reduction.

The project of EL introduction in the SAF/MoD was carried out in three stages encompassing the following activities:

- Development of the concept of EL introduction and implementation in the SAF/MoD,
- Preparation and conduct of staff training involved in the implementation of the EL integration in the SAF/MoD,
- Development and integration of the existing contents in the EL SAF/MoD system.

The project included several activities leading to the following results:

(1) In-depth analysis of the e-learning teaching approach and concepts:

- Analysis of teachers and participants, selection of SAF topics and teachers to be included in the development of individual subjects,
- Workshops on adult education and teaching topics for lecturers,
- Drawing up of plans on the implementation of subjects in the form of e-learning (as a means of support to lecturers in the preparation of scenarios),

- (2) Specification of the upgrading and development of established standards SCORM (Sharable Content Object Reference Model is a collection of standards and instructions for online e-learning. SCORM also defines the methods of generating ZIP files. SCORM was developed by Advance Distributed Learning - ADL on the initiative of the US Department of Defense.) In support of didactic concepts and interoperability with NATO,
- (3) Advising on the establishment and upgrading of open-source LMS,
 - Different learning management systems (LMS) were tested in the adoption stage to the evolving international standards of e-content work. Among them was also the open-source education and e-topic management system LMS Moodle, which has been gaining in the number of users of LMS systems. Moodle itself offers quite complex and sufficiently user-friendly environment. Consequently, this stage of research included testing of the export of e-contents directly from Moodle in the form of Sharable Content Object Reference Model (SCORM) packages. Through the actual work, the situation of the proposed SCORM standard upgrade and support provided through various standards by LMS systems and text editors were verified as well. Arh, T. : Analysis of existing e-learning standards, development of upgrades and relevant links to didactic approaches. IJS, Laboratory for open systems and networks.
- (4) Creation of development testing environment,
- (5) Development of selected subjects in the form of e-learning in English and Slovene languages (2 x 40 hours),
 - Analysis of e-learning teachers and participants was carried out during the first stage of the project and it included a detailed survey conducted among teachers and participants on the basis of several questionnaires as well as further processing of result evaluation. The analysis involved 90 teachers and 170 participants of e-learning in the SAF. The aim of the research was to assess the equipping level of e-learning participants, their ability of using computers and computer solutions, and frequency of internet services use. In addition, the survey provided an analysis of the frequency of using individual teaching methods and their suitability for participants and their learning styles.
- (6) Design of the operations and troubleshooting manual in Slovene and English languages,
 - Teachers and tutors of e-learning also attended advanced forms of training, which was well received among the participants, who rated the applicability of training with a good 4 on a five-level scale. Participants acquired additional skills that can be utilized in the design of teaching materials from their area of expertise for the purposes of e-classroom.
- (7) Design of tutor's handbook in Slovene and English languages.

The selection and development of the EL system was based on the following premises:

- EL system represents only the qualifying condition (tool) for the implementation of distance education,
- EL system must meet the set criteria and must be simple for use,
- Continuous support for the introduction of new systems – users should not feel the difference.

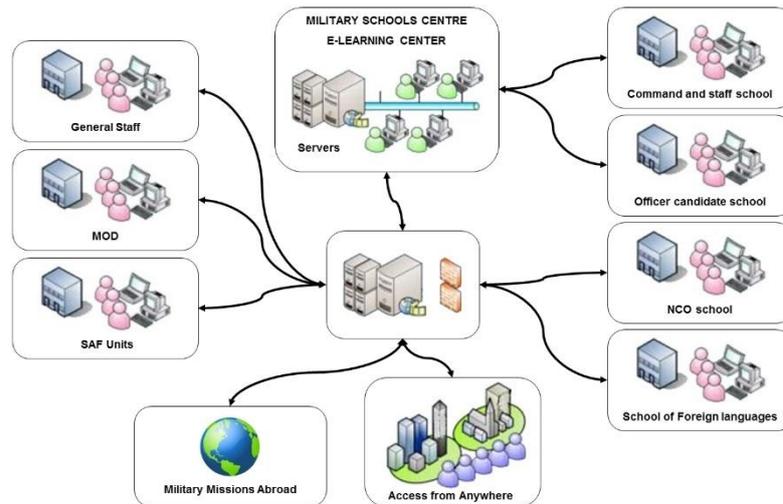


Figure 1. EL organization in the SAF.

Technical capabilities

In view of the selection criteria, a decision was reached within the SAF for the operation of e-classroom based on open-source Moodle environment that was slightly adjusted to SAF requirements. The adjustments referred primarily Windows 2012 R2 Server. The base used is MySQL. to the form and restrictions of user rights. The applicative part of e-classroom is based on virtual environment of

The Kadetnica Military Post (VOK) server cluster consists of 2 host servers IBM System 3650 with a total of 24 GB RAM and SAN 2-processor storage unit VNX 5300 with a total of 2.3 TB space on RAID-5 (current capacity – may also be expanded).

The hosts are placed on VmWare ESXi 5.0 platform and are not accessible from the external network. Full live redundancy of both hosts is ensured. The management and control of the entire cluster is only possible from the internal network via V-Centre of the server.

Table 1. Technical characteristics of the system.

Host	IBM System 3650
RAM	24 GB
CPU	8 x 2,992 GHz Intel Xeon CPU 5450 @ 3 GHz
OS	ESXi 5.0.0.- 496512 Standard

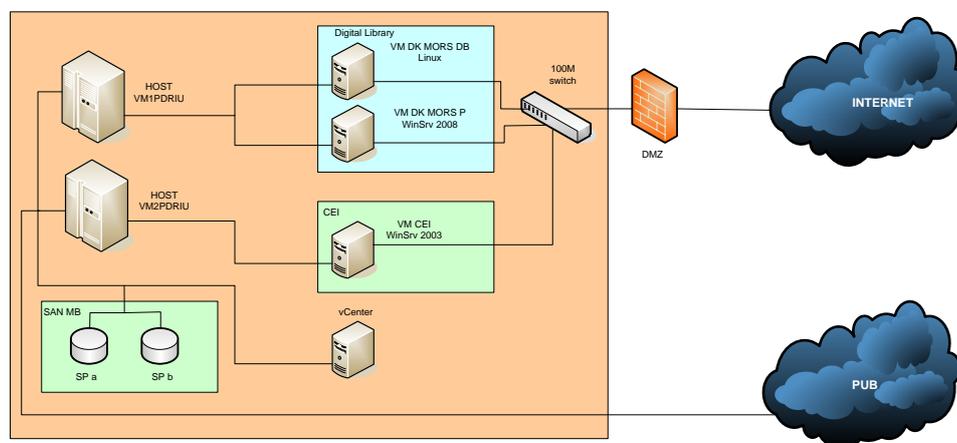


Figure 2. Layout.

Aspect

The major part of e-learning in the military education system is being designed as combined education, where the information and communications technology (ICT) serves solely as support of traditional education and means of delivery of learning materials and communication between participants and education providers.

Combined learning

The teaching materials designed for combined learning in e-classroom of the E-learning Centre (CEI) are being prepared by the personnel conducting military education and training (VIU). These include primarily teachers and tutors from the organizational units of the Military Schools Centre, and partially also other members of the SAF and employees of the MoD as well as external teachers involved in the VIU system. In contrast to self-study courses, combined learning demands active participation of the teacher throughout the education and training process.

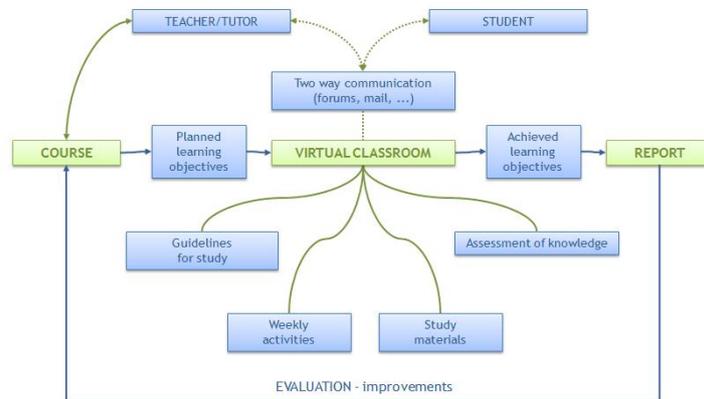


Figure 3. EL organization chart.

Self-study

Self-study is carried out in the form of e-courses without the presence of a tutor/teacher. Its users are free to choose the place and time of their study obligations, be it at work, at home, or abroad. This form of education is highly appropriate for the entire defence system as e-courses can be used and accessed simply via the CEI website at <https://cei.mors.si>.

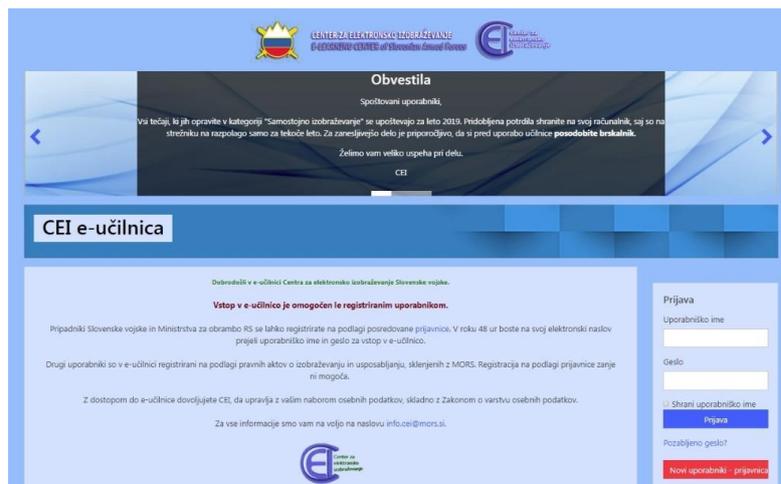


Figure 4. CEI – E-classroom.

Moreover, the EL service is designed for individual on-the-job training (UPnD) and functional training, where individuals can, through the information means, become familiar with individual UPnD topics, take tests of prescribed knowledge, and access electronic distance learning sources

through internet links. Considering past experiences from the incorporation of e-learning in the defence system, the introduction of e-learning in the SAF was both sensible and highly required. The needs and requirements of users, and the specifics of target environment are clearly demanding the introduction of up-to-date information and communication technologies and multimedia in the process of military education and training.

On the basis of the attained results we have decided to conduct courses for the users of information solutions aiming at improved qualification level, efficient use of information solutions, and consequently long-term improved data, since the granting of access in the future will be conditioned on successful completion of e-learning.

In pursuit of a wider application of e-learning, CEI provides continuous training for teachers, updating of its software and promotion of the opportunities offered to the military and other interested parties through the available tools. The training of teachers and education providers lasts 14 days in a combined form. The introductory and the final sessions are carried out live, while the rest of the learning process is carried out in e-classroom.

The training includes the following topics:

- E-learning and e-classroom basics,
- Procedures to be applied by teachers in designing subjects,
- Use and development of individual study resources and activities,
- Assessment methods,
- Organization of group work.

Content development

The concept of content development designed for the needs of e-learning in the SAF is derived from target environment specifics. The major focus lies on the development of one's own topics meeting specific military training requirements, thus enabling their exchange and application in different environments. The self-study courses designed in this manner (usually in accordance with SCORM standard) are closed sets. SCORM consists of several components or SCOs. A SCO (Sharable Content Object) is a group of related resources representing a complete unit with teaching contents and a basic component of a course. It may have a form of one lesson, chapter, page, etc.

Users sign up for courses individually, irrespective of the place and time, fulfil the prescribed obligations and receive certificates of course completion. This type of e-learning is particularly suitable for contents where participants are required to revise their knowledge periodically. E-courses are developed within the framework of the available software tools of the SAF and human resources without the presence of subject matter experts.

SCO usage:

- One SCO = 1 lesson
- Multiple SCOs = course



Figure 5. Structure of SCO course (Sharable Content Object).

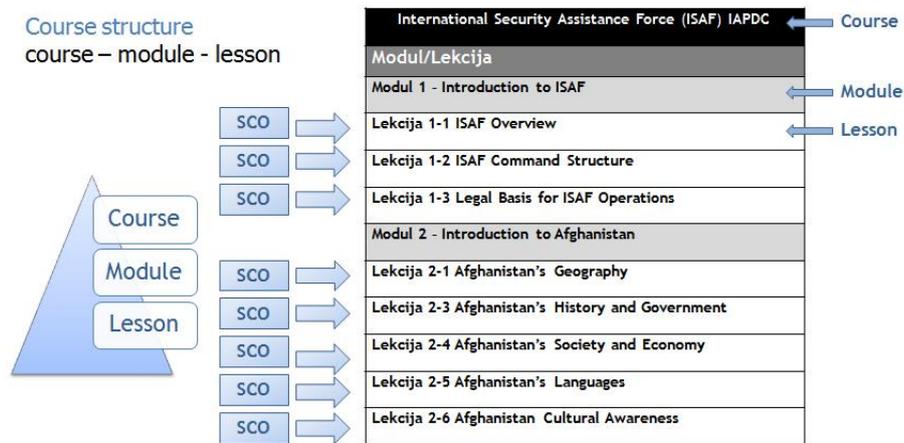


Figure 6. Course structure.

The planning process of an e-course should take into account the following seven key points: clear demands and requirements from the teacher or ordering party, availability of subject matter experts for professional guidance, course review by subject matter and management personnel, testing, identification of end users and course delivery, embedded reporting (feedback on success level) and assessment. From the subject matter expert perspective, the team designated for e-course design is only regarded as a means of achieving the objective.

Key points of development

- Clear demands and requirements from teacher
- SME availability
- Course review from SME and management staff
- Testing
- Identify target users and course delivery
- Feedback and evaluation

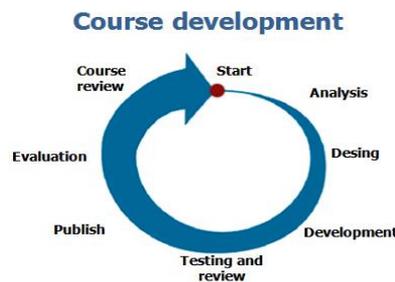


Figure 7. E-learning course development/cycle.

Always to be carried out by the same sequence with all those involved.

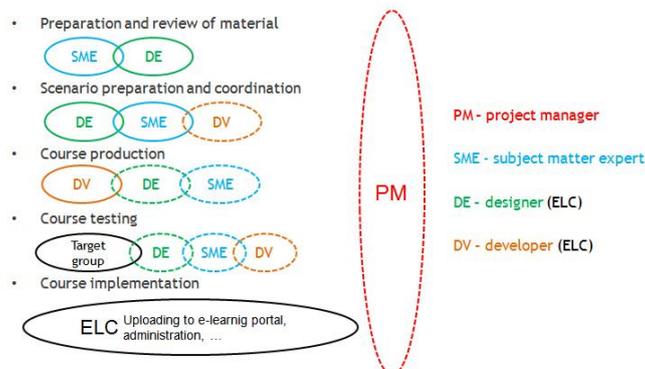


Figure 8. Course development with all involved.

E-classroom

The CEI e-classroom enables autonomous login of users to e-classroom. The login right for e-classroom is granted only to two persons (e-classroom administrators). Upon logging in, users obtain access only to those subjects they have expressed their interest in and/or are available to all users within the SAF and MoD.

One of the requirements for user login is the user's MoD identification number (ID). Some of the subjects enable »guest« access. In this case, users have free access to subjects but their progress is not recorded by the system.

Military schools' students may be granted access only to subjects required by their curriculum and subjects available to all SAF and MoD personnel.

Users who are not employed in the SAF and MoD can also be granted access on the basis of a signed cooperation agreement. Upon logging into e-classroom they are subject to the same rights, rules and restrictions as those applicable for SAF and MoD users - access is granted only for specific subjects.

The results of work and use of EL in the SAF over the past three years have confirmed good work and useful value of the introduction of the CEI e-classroom for the needs of the defence system and, lately, also in the wider public administration. In 2010, 224 new users logged into the system, and until April 2019, the CEI e-classroom recorded already 12366 users.

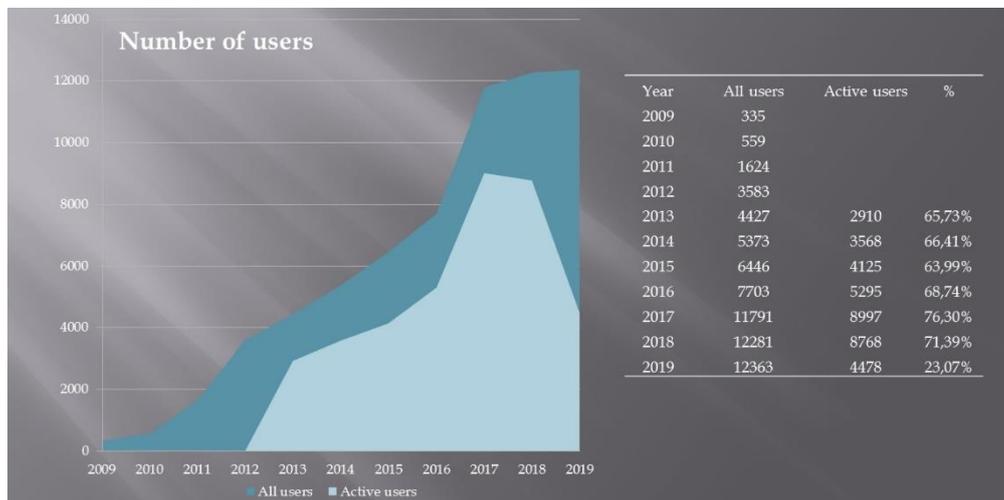


Figure 9. Analysis of user numbers.

Data depict e-classroom activities during work and free time of users.

	Activities
Free time	49%
Work time	51%

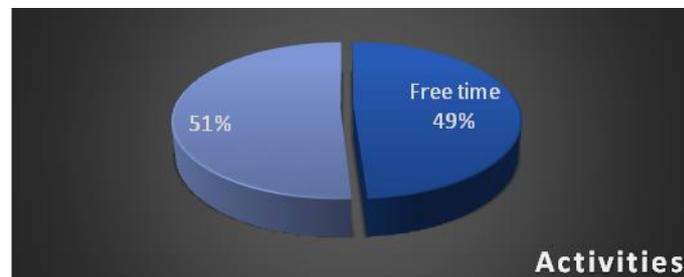


Figure 10. Activities in terms of time.

Overview of users of e-classroom activities covering the years 2013 and 2019. Activities include publication, viewing and transfer of contents in e-classroom.

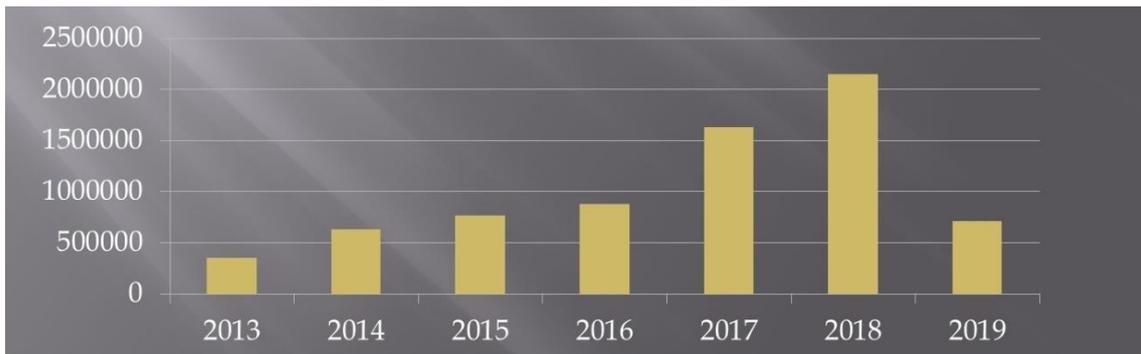


Figure 11. E-classroom activities.

Total number of courses in e-classroom available to users.



Figure 12. Overview of course numbers.

Conclusion / the way ahead

The E-learning Department of the Military Schools Centre of the SAF ensures the use of distance learning programmes, design and development of individual courses, and training for subject matter experts in the use of application and implementation of individual e-courses both within the defence system and beyond, for the purposes of the entire public administration. The Department cooperates actively with the Police and Police Academy, notably in the field of introducing combined education, the Ministry of Foreign Affairs in the area of introducing and designing e-contents, the Slovene Intelligence and Security Agency in the field of training of e-education training, and the Employment Service of Slovenia, the Ministry of Justice and the Ministry of Finance in the field of designing e-courses. Discussions are being underway on cooperation with the Ministry of the Interior and the Administration Academy.

The further development will focus mainly on the design of own standardized military and non-military e-learning contents and e-contents required by the entire public administration. An important shift was made in the field of IT support training to remedy inefficient use of available information solutions. This form of education will lead to significant reduction of cost and duration of individual forms of training.

The present and future EL success as part of military education in the SAF can be seen in the fact that teachers of individual education programmes are becoming increasingly engaged and, based on the needs and execution ideas, create their own e-classrooms and encourage candidates and course participants for their use. This will undoubtedly result in higher education quality and destroy the myth of e-classroom as a library. EL will have to be identified as a mandatory supplement to conventional forms of VIU.

Based on the needs and experiences, the scope and content of future individual education processes will have to be identified for implementation in the form of EL. The occurrence of the internet has changed everyday life and, consequently, the field of education. In the future, education will become a combination of classic and electronic forms of education. The division between the both will not be clearly defined, and the anticipated change will definitely take time.

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E-learning

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Abstract. In this paper e- learning in the Republic of Macedonia will be explained, with special accent put on the opportunities that could be offered. Also, it explains advantages of e-learning, and its implementation in the infrastructure of the universities in Republic of Macedonia, based on experience taken from world class universities. The paper uses information and data collected from users that are using this type of learning. Objectives of e-learning will be presented, also with questions „What is e-learning and what are its benefits?“. Furthermore, reasons why e-learning is so effective and what benefits users have are also included. Based on these presented facts, we can conclude that e-learning is much more effective from everyday traveling to our universities, because you can save your time and your financial resources, man gets more desire for maximum exploitation on information and data that is accessible 24 hours in a day.

1.Introduction

With the development of Internet technologies and the global network and their continuous advancement, new ways of learning are being developed simultaneously. With the very process of modernizing the education system, e-learning is becoming popular as well, which is a new way of teaching and learning [1].

Electronic learning dates back a long time, and developed in parallel with the development of technology. Namely, the term "e-learning" was first used at a seminar on CBT systems in 1999, while at the beginning of the 21st century businesses adopted this type of learning as a central way of training and training workers [2].

Some authors define that e-learning involves distance learning methods supported by the Internet. In this way, the user has almost at any time virtual contact with his mentor, or other user, as well as constant access to the teaching activities run by the professor in the electronic classroom [3].

In contrast, Pein and Heron define distance education as a planned learning that takes place in a different place from the lecture and requires special techniques of curriculum planning, special teaching methods and special ways of communicating through electronic devices, Internet and multimedia [4].

Additionally, e-learning is also defined as a kind of self-contained use of the produced teaching materials outside the classroom, ie from another location [5].

According to the e-learning team at FON-Skopje, e-learning is a virtual electronic learning tool, which in some part supersedes and supports standard learning [6].

Electronic learning is synonymous with: multimedia learning, advanced teaching technologies-TEL, computer-based learning - CBI, computer based training and the like. A broad term covers a wide range of methods, techniques and tools for learning with the support of information and communication technologies.

This includes email, discussion forums, collaborative software, open access platforms for courses, webinars and books; therefore, for e-learning, several different terms are used, such as: Online Learning, Distance Learning, Computer Learning, Online learning[7].

One of the many advantages of E-Learning is that effective instructional methods can be provided, such as: exercise with feedback on the exercises, activities of combined collaboration (with other students and students, lecturers and professors), individualized learning paths which are based on the needs of students, as well as using simulations.

Most often, e-learning courses are prepared in order to build cognitive skills. On the other hand, the disadvantage is that e-learning is more expensive than the preparation of teaching materials, the training of lecturers and professors, especially if multimedia methods or extremely interactive methods are used.

However, the costs of e-learning, including server and technical support costs, are significantly lower than they are necessary for the classroom facilities, the time of the lecturer, student travel costs, and time. On a large scale, today's educational system is still oriented towards the traditional approach, where the student must be physically present at the lectures and notice information from the new teaching unit.

On the basis of all the above, it can be established that electronic education is a complex system that includes various elements of learning and teaching by applying different technologies., includes printed and audio-visual teaching materials and can be an individual or group approach to learning.

E-learning is one of the methods for implementing e-education and focuses on the student's central role in the learning process. The student is more motivated because the course content can be chosen according to his needs, at a time when it suits him with flexible hours, which increases productivity.

Within the Macedonian education, computerization and digitization of education are intensively promoted after 2002, when a Chinese donation was received in 2005 for the first time. Subsequently, the implementation of the National Program for the Development of Education 2005-2015 started. Draft Program for the Development of ICT in Education (2005-2015), National Policy for Information Society and the National Strategy for the Development of the Information Society[8].

The aim of the projects is to provide software tools for teaching subjects, interactive on-line instruction, interactive teaching methods and a test system. In higher education back in 2007, "Goce Delcev" University in Shtip started using the Moodle eLearning platform as the basis for the e-Learning Center.

The aim of this paper is to give an overview of e-learning with the advantages it offers and an overview of its representation in the Republic of North Macedonia in the educational system.

2. Classification of e-learning

Falch (2004) suggests four types of e-learning classification divided into six groups[9]:

2.1. *E-learning with physical presence and without e-communication*

It refers to the traditional lecture where both the student and the teacher are physically present, but is classified as e-learning due to the use of e-learning tools in order to transfer the new teaching unit.

2.2. *E-learning without presence, without e-communication*

It is self-study, when students receive the material, which is usually pre-recorded, or is access to archived footage, through an e-learning platform.

There is neither a physical nor a virtual presence, nor communication or e-communication between the professor and the student.

2.3. *E-learning without presence and with e-communication (Asynchronous)*

Asynchronous e-learning represents the student-teacher relationship that is physically and temporally distant.

The interaction between them is enabled with the help of streaming media, email, discussion panels, social networks. It also provides working relationships between the learner and the tutor (an instructor who teaches individual students on a subject) even when participants cannot be online at the same time. It is a key component of flexible e-learning.

2.4. *E-learning with virtual presence and with e-communication (synchronous)*

Synchronous e-learning supports student-teacher interaction in real time and reminds of face-to-face educational environment. Synchronous communication takes place online and is supported by media such as audio / video conferencing, instant messaging, real-time collaboration applications, chatting, and so on.

This learning allows students and teachers to get more socialization by allowing questions and answering in real time. It features a dynamic student-teacher interaction and a quick response supported by traditional pedagogies.

2.5. E-learning with occasional presence and with e-communication (mixed / hybrid asynchronous learning)

The teaching of the new teaching unit is accomplished by occasional physical meetings between the lecturer and the student, and through e-learning technologies in the rest of the time. This type of e-communication learning is widely used, as in asynchronous e-learning. Therefore, this type of learning is a combination of traditional learning and asynchronous e-learning.

2.6. E-learning with attendance and e-communication (mixed / hybrid synchronous learning)

This type of learning is a hybrid e-learning approach with the presence all the time, independently physical, or virtual. Some sessions are conducted according to the traditional way, while the remaining sessions are realized through a virtual presence or synchronous learning.

Table 1 provides a tabular overview of the types of e-learning classifications.

Table 1. Classification of e-learning

Classification	Presence	e-Communication	Term
Type I	Yes	No	Traditional approach
Type II	No	No	Self-study
Type III	No	Yes	Asynchronous
Type IV	Yes	Yes	Synchronously
Type V	From time to time	Yes	Mixed / hybrid asynchronous approach
Type VI	Yes	Yes	Mixed / hybrid synchronous approach

In the classification, the term "presence" refers to if the lecturer and the student are simultaneously present, physically or virtually, during the lecture.

The term "e-communication" refers to if there is e-communication between the lecturer and the student during the lecture, or if e-communication is the primary medium for communication to complete the course.

3. Benefits of using e-learning

In many cases, e-learning is used as a combined strategy, that is, a combination of e-learning and conventional learning methods. E-learning is based on concepts such as: independent learning, active learning, self-centered learning, problem-based learning, simulations, and learning based on a work assignment. In all of these models, the student becomes responsible for his own progress in the learning and education process, which has reduced the need for face-to-face consultation meetings. Consultations can take place electronically (discussion forums, email, video conferencing, etc.).

The traditional way for the most part involves the methods in which the professor plays the role, while e-learning is a student-centered approach. This way of learning other than requiring a physical presence at the same time both the professor and the student, also the content of the unit is temporarily limited due to the predetermined time of the lesson.

On the other hand, with e-learning, students can communicate with their lecturers at any time, every day of the week or via e-mail or other forms of on-line discussion with flexible learning

duration. With this type of flexibility, students are involved in a learning process that is suited to their needs, according to independent and individualized learning methods. The e-learning process provides skills analysis because professors are able to analyze the skills and competencies that students possess, as well as developing new skills. With the need for e-learning material to be virtually accessible at any time, a process of creating materials is in place to master the thematic units, as well as appropriate questions for exercises, repetition and determining the acquired knowledge[10].

Pupils and students can work with exercises through which they can be self-assessed, and be evaluated using questions made according to the set goal. The teacher assesses each student through the results of exercises and tests. In this way students become independent and more motivated. In all these models, it is crucial to generate student motivation[11].

A distinction can be made between "external" motivation that relates to the pursuit of activities in order to achieve a certain result and "internal" motivation that relates to the pursuit of activities that result in satisfying the interests and satisfaction of the holder of the activity. In e-learning, the so-called internal motivation with its related characteristics is of particular importance, such as curiosity, profound learning aimed at understanding, research, and the like. In order to understand the link between e-learning and the motivation process, it is necessary to understand the creation of learning materials in order to increase motivation.

Through e-learning, students are enabled to develop their own concept, to make basic decisions and to develop skills, while students have the opportunity to get a higher level of education in order to adopt new, socially based knowledge.

Another advantage that makes e-learning of extraordinary importance is to save money associated with travel, providing a room, providing materials, additional time engagement of the teaching staff, or providing trainers, consultants, and mentors. For example, when investing in e-learning software in Macedonian, it is a one-time investment. The cost of the time and means of providing e-learning materials is one-off. In this context, time and energy will be put into the function of improving the materials.

During e-trainings, internal trainers work on the program part for learning. During any e-training, no additional costs arise, such as when training is repeated when there is a cost of renting a room, refreshment, lunch, overnight, etc. E-learning helps to cushion the problems that arise in this complex process[12].

The complexity of the organization of the teaching and / or training stems from the need for the most appropriate way to engage all the resources (to match the timing, space capacities, etc.).

4. Representation of E-learning in education in North Macedonia

In the course of 2010, the Ministry of Information Society launched the project for free electronic textbooks and the web site "e-ucebnici.mk". It publishes textbooks in Macedonian, Albanian and Turkish, which can be freely viewed and searched through their contents. A complementary project of this is the "skool.mk" website prepared by the MIS and the Bureau for the Development of Education, and part of the "skool.com" network.

The site provides tools and contents in the field of mathematics, physics, chemistry and biology. New media, the so-called "Web 2.0" open wide space for the creative use of digital tools and free services and resources. In this context, the increased use of these funds for innovation and creative approach in the Macedonian education is noticeable. As an illustration, several mini-projects of this type, derived as independent individual or group endeavors, the following registered cases can be listed:

"E-school"

The platform is an on-line collection of educational courses in several areas: Informatics, Physics, Chemistry, Electrical Engineering, Digital Systems, HTML, etc. The collection is based on the concepts of "Moodle". "Moodle" is a Course Management System (CMS), also known as "Learning Management System - LMS", or "Virtual Learning Environment - VLE". It is a free web application that users can use free, and are free to create educational content on education websites.

"ToolBox"

It is a website that, according to its authors, is a "collection of materials for 21st century teaching". On this page there is an electronic archive of professional text and video materials from the fields of mathematics, chemistry, physics, biology, geography, and technical education[13].

„Teachhoot“

Teachhoot is the first educational internet platform in North Macedonia that has professors, tutors from different subjects. It has been officially launched since September 15, 2017. It is a platform for online classes in a virtual classroom. With the help of TeachHoot, the entire process of searching, scheduling, retrieving, and maintaining private tuition classes takes place on-line without the need for physical presence on any of the parties. The idea for Teachhoot comes from the advances in educational processes in the United States as a leader in online tutoring[14].

Another example of an institution that uses the concept of e-learning is the e-Learning Center at the Goce Delcev University in Stip, which since 2007 has been using the Moodle eLearning platform[15].

The private university FON also has an e-learning system that is closed for wider use, i.e. it is limited only to employees and students of the higher education institution, who provide their university email address so that they can use it.

In December 2010, the Workers' University "Pere Toshev" from Prilep started with the realization of online lifelong learning courses electronically following a pilot project of DVV International, available at <http://elektronskoucenje.mk>. The courses are in the field of IT, foreign languages, medicine and accounting.

In September 2010, the modules of customs and e-business studies (E-learning) at the Customs Administration were officially promoted, aimed at contributing to better and more efficient application of customs laws, as well as harmonization and simplification of customs procedures[16].

Another example of a higher educated institution with an e-learning system is the International Slavic University, which is also limited to the use of employees, and students who provide their index number and / or university address[17].

In terms of e-learning accessible to secondary schools, the Fifth Private Gymnasium also offers an e-learning system for students and teachers that has been operating since 2009. The system, among other things, is used by teachers to place materials and schedules for their students. This system is closed to the general public.

The Algorithm Center (Private High School) has implemented an electronic assessment and testing project. The aim of this project is to enable teachers in primary and secondary schools to use information technology in support of school work that will contribute to the improvement of the whole process of teaching, electronic assessment and testing, on-line learning through the Internet network, etc. In this system, students from primary and secondary education, teachers who are given a username and password, and guests who can test questions. The system after the given answers indicates which answer is correct and wrong, so it is a system of learning, but the educational materials are only available offline.

Conclusion

From all of this, we can conclude that nowadays with e-learning, things are much easier with regard to learning and access to information. The division of 6 e-learning classifications allows everyone to easily adapt to the way it is easiest to overcome the matter, and therefore there is no barrier between the recipient and the source of information. However, each classification needs to be well studied so that the recipient can know where to look for the information he or she needs. With this type of flexibility, students are involved in a learning process that is suited to their needs and they have an easy approach to materials they need to learn every time they want.

Learning has many benefits, and the best ranked benefit is that it encourages the student to engage himself in finding information and enriching his knowledge. That is, it overshadows the role of the professor as the main actor in the lectures, so that the role of the student is now.

Regarding e-learning in the Republic of North Macedonia, with the introduction of electronic textbooks, access to student and citizen information in the Republic of North Macedonia is significantly facilitated. In addition, saving money and time due to the economic situation of the state is of great benefit.

Because of the above facts, e-learning is a great plus in education and should be introduced in all schools and faculties for easier and effective distance learning. It is also an incentive, because students are not limited in time and space, but they can expand their knowledge to the extent they like it.

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Implementation of the Advanced Distributed Learning (ADL) concept in the Ministry of Defense and the Armed Forces of Bosnia and Herzegovina

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Abstract. We live in an age of modern technologies, where almost every person can use cell phones, computers and the Internet, and therefore quick access to information. The development of information and communication technologies (ICT) has made so much progress that we are simply unable to take advantage of its capacities and benefits. These facts support the development of distance learning, which is intensively used in the modern world. Distance learning is an innovative concept in education, which focuses on the development of a knowledge-based society based on lifelong learning, ICT development and other technological advancements. In 2016, the Ministry of Defence and the Armed Forces of BiH recognized distance learning as an exceptional benefit, innovation and advancement in education-training through the NATO Regional ADL Initiative (RADLI), where significant support was provided (training, IT resources and equipment, development ADL lesson, etc.). A project has been launched to implement the ADL concept in the AF of BiH, which focuses on the following development areas: organization (establishing an organizational unit for ADL), equipment and resources (ICT for developing ADL capacity), training (basic and advanced ADL training, developing of our own basic ADL courses) and procedures and regulations (establishing ADL regulations at all levels). The aim of the project is to introduce a modern concept of distance learning into the AF BiH training system and adapt it to NATO standards, which significantly require the modernization of the AF BiH training and education system and the integration of available capacities and resources. This paper will offer suggestions and solutions for the full implementation of the Advanced Distributed Learning (ADL) concept in the training, education and other areas of organization within MoD BiH and the Armed Forces of Bosnia and Herzegovina.

1. Introduction

The modern age in which we live and work is characterized by rapid technical and technological development and advancement in all fields of society and social relations, which ultimately logically imposes different changes in many spheres of our life, work and participation in a society built on knowledge and competences, so-called knowledge society.

The accelerated development of Information and Communication Technology (ICT) contributes to global change in society and social relations, then truly becomes an inseparable and binding part of people's daily lives, in the family environment, during leisure time, as well as in every other human dimension. These facts raise an open question and dilemmas about the impact of the development of ICT in the education system at different levels. It is evident that the development of ICT is changing the system of traditional teaching long ago established by J.A.Komenski, almost three centuries ago, that is, modern teaching technology is now emerging as a key fourth factor in the teaching process and its impact is becoming increasingly significant on a daily basis. An educational institution will be more modern, innovative and successful if key actors in the teaching process, instructors/teachers and

planners of teaching, understand the fact that teaching and other modern ICT is crucial for the development of a modern education system. The greatest value that the users continue to teach (attendees, students) can be gained by building information literacy, which is the basis for accessing and searching for useful and necessary information. This indicates that it is necessary to bring innovations into the ICT-supported teaching process, which are aimed at improving the system, quality and efficiency of the educational process. Of course, in modern education the role of the lecturer, instructor and teacher is changing significantly as the lecturer changes from the traditional form to the organizer, innovator, implementer, advisor, leader and direct partner in communication with the consumers of teaching, because there are also direct positive changes in the application content, methods, and principles of the teaching process. Here, it is important to distinguish between modern teaching technology and modern teaching technique. In this case, Suzic (2005) emphasizes: "Modern teaching technology is not the same as modern teaching technique. The difference is that the concept of technology is broader than the concept of technique and encompasses the concept of technique. Unlike technique, technology also involves work and learning organization, assessment and analytics. Teacher training in modern technology is best done through practical training on a specific technical device, working with a specific group or similar." [1]

The focus of our interest is the application of ICT in the system of training, education and other spheres of organization of life and work within the Armed Forces of Bosnia and Herzegovina (AF BiH). The AF BiH strives for an efficient, cost-effective, rational and modern education and training system that will ensure the AF BiH's compatibility and interoperability with NATO members and other partners. A key problem with the introduction of ICT into the education system of the AF BiH is the creation of an adequate theoretical and practical model on the use of modern technologies.

The AF BiH recognized Advanced Distributed Learning (ADL) as an adequate model of the benefits of modern ICT in the overall development of the AF BiH education system, which should be compatible with the education systems of modern armies in the world. Commitment to implementation of modern ICT and ADL into the Military-Educational System of The Ministry of Defense of Bosnia and Herzegovina (hereinafter referred to as "MoD BiH") and the AF BiH have openly expressed in 2016. through meetings with NATO Group for training, the Individual Training and Development Education Subgroup, and joining the Regional Advanced Learning Initiative (RADLI) through direct NATO projects, involving the Republic of Serbia, the Republic of North Macedonia, the Republic of Slovenia, Bosnia and Herzegovina as well as project partners: NATO, MoD of the Kingdom of Norway, Jefferson[®] Institute - USA (<https://www.jeffersoninst.org/about-us> - *The Jefferson Institute is an independent research and education institute. We deliver solutions for on-line learning, digital heritage, and making open data easy. We create and deploy digital tools and integrate them with research and education systems to transform society by empowering engaged access to information.*).

Promotion of capacities and opportunities for ADL through the RADLI project within the AF BiH and MoD BiH is being implemented more actively. Several courses were hosted on the regional RADLI AF BiH server, and the latter offers the opportunity to consume other courses hosted by the RADLI partner countries. Considering that we need to have developed national ADL capabilities for active participation in a regional project, the current focus of the AF BiH and MoD BiH in implementing the concept of ADL is to establish organizational units that would exclusively deal with ADL activities (ADL Section) and the development of key regulations from strategic through operational to tactical level that will recognize and integrate ADL into the system of training, education and other spheres of life and work organization within the AF BiH. Of course, providing adequate material support, which includes the necessary ICT, software and other teaching aids, is one of the key elements in the implementation of this project. In addition, the development of the project is significantly dependent on the training and education of staff in the field of ADL capability development, which is also a task that requires a systematic approach and adequate training solutions, including the use of training capacity within the RADLI project.

In the following, we will present ADL as a contemporary approach to education, and will provide key information on the activities of establishing an advanced distributed learning system in the AF BiH and MoD BiH, based on the draft proposal of an implementation project of implementing the

concept of distance learning in the AF BiH training system from of the Training and Doctrine Command (TRADOC).

2. Distance Learning – A Contemporary Approach to Education

Modern innovation in teaching and learning is a need and a great challenge for all participants in the teaching process, including distance learning, as a modern trend that is increasingly present in education systems. While many are still skeptical of these modern ways of teaching and learning as well as innovation in teaching, many analyses show the significant advantages of modern distance learning methods over traditional ones, and more and more people are opting to use new methodological approaches to teaching and learning.

Distance learning is a contemporary approach to education that is offered to all (pupils, students, workers, unemployed persons, pensioners, etc.) who are in some way physically distant from the source of information (lecturers, teachers), and most commonly involves the use of new *ICT* and new methodological approaches to teaching (the use of new interactive teaching methods).

Distance learning is a term that has deep roots in the history of education and has been upgraded over time. Initially, correspondent schools were used, which distributed, by mail and later by e-mail, to potential users, students, various teaching materials and books that they processed, studied and, after completion, did exams on materials that were returned to evaluators, teachers, in the same way (by mail or e-mail).

The development of *ICT* has contributed to the transformation of distance learning from hard copy forms into electronic, which has given us a new form called electronic learning or e-learning. The concept of distributed learning is a phenomenon that accompanies global change in the world, which touches on structural changes in the entire education. There is a growing need for more efficient and high-quality knowledge that accompanies overall scientific and technological progress, and one of the responses is the introduction of new technologies in education and the development of an *ADL* concept compatible with globalization changes in other spheres of social development. Modern education requires changes in the organization of the education system itself, changes in content and methodological approaches to acquiring knowledge, skills and abilities. The traditional approach to education must be intensely changing and moving towards interactive forms, enabling more meaningful empirical research that will positively influence the continuous innovation of knowledge and the acquisition of new values. An interactive approach and innovation in the teaching process are the best response to the advancement of traditional teaching and learning methods, which are focused on one-way communication between the teacher and the listener (student). There are significant differences between traditional class-based teaching and interactive teaching, on the basis of which Krneta (2013) states that “interactive teaching is a relatively independent didactic model of teaching organization, which has its own characteristics and specific characteristics... it is a model in which they can be applied. Different teaching methods and different forms of teaching, and that different teaching aids can be used, with the important note that some teaching methods are smaller and some more appropriate to the essence of this didactic model.” [2] We can see that interactive teaching involves the concept of distance learning, which also creates various forms of continuous interaction through its process, which also makes this model more effective and challenging. Introducing the concept of distance learning is a method that moves away from the traditional approach to education, where much of the work done by the lecturer (teacher) is taken up by modern technology for the collection and distribution (presentation) of a wide range of information. Distance learning consumers are enabled to interact continuously with various sources of information that are significantly distant from their place of residence or educational institution. Practically, *ICT* has enabled rapid access to a wide range of valuable information needed to participate in a modern knowledge and development society.

When considering distance learning as a modern phenomenon in education, we need to keep in mind the key prerequisites for implementing this significant and advanced concept, which are mainly related to educational and technological aspects. Educational aspect implies the establishment of regulations and the institutional application of distance learning as a form of learning, the organizational capacity to prepare teaching materials in accordance with modern and available *ICT*,

the opportunities, abilities and limitations of teaching, as well as the control of its efficiency and quality, direct support to users of learning resources in distance, etc. Of course, when it comes to technology as a key teaching tool in the first place is certainly the ability and possibilities of using it by users (students), that is, knowledge of the possibilities of teaching technology by users.

Very often distance learning and e-learning are viewed in the same form and meaning, although there are differences. Distance learning is a much broader concept that involves the traditional distribution of materials and tests by mail or email, while e-learning concentrates on the comprehensive application of ICT in the education system. Essentially, they have a common goal that is aimed at improving the quality and efficiency of education. E-learning is also a modern term based on the use of ICT and computer systems in the learning and learning process, and includes various multimedia content, interactive tools (application of dedicated software), web-based materials, learning and teaching management systems, laboratories for learning, electronic testing, testing and evaluation of acquired knowledge, etc. Essentially, the concept of e-learning is a modern educational tool used in combination with distance learning and traditional teaching, which makes the education system more efficient, better quality and more accessible to potential users.

Distance learning in a simple way is an integral combination of the joint activities and efforts of the lecturer (teacher) and the auditorium (students), that is, the combination of ICT used by the teacher in teaching and the very act of learning (knowledge acquisition) by the student, whereby the teacher and the student have a common goal, temporally and spatially separated and distant, fulfilling the basic pedagogical goals.

Of course, the separation between teacher and student in this modern concept is offset by the use of modern ICT that allows the student to access specific and desired teaching material from any location and at any time, which is certainly a key advantage of this learning method. The development of e-education starts from traditional classroom teaching, through ICT-based teaching, then through mixed teaching (a combination of traditional teaching and ICT-based teaching) we arrive at an online education that applies modern technology and multimedia approaches to teaching via Internet and server. All this ultimately gives one a modern concept of education called distance learning, which is of paramount importance to the concept of lifelong learning. There are many advantages and benefits of distance learning, mentioned by different authors, mainly focused on the development of modern education systems, the application of ICT in education, flexibility in the work of teachers and students, the temporal and spatial freedom to acquire knowledge, independence and organization of one's time and tempo for learning, facilitating continuous learning, choosing a place to learn (at work, at home, on vacation, etc.), one's own choice of learning methods (active or passive, basic or advanced, different intensity of interaction and communication), access to the highest quality educational programs, the ability to study with work, etc... All the mentioned advantages of applying distance learning in modern systems of education for users (students) require possessing an adequate level of computer literacy, good program support and of course a quality lecturer (creator of learning materials). On the other hand, the lecturer must also be computer literate - must be able to use the available ICT to prepare and guide the teaching process; then he / she must be a good creator and leader- he/she must be competent in guiding his/her students through a wealth of information, exactly in the direction they need to acquire the desired knowledge, skills and abilities; ultimately, he must be a good educator and counselor - he must be able to assess the capabilities, abilities and needs of his students so that he can guide and direct them to the desired level of education. Of course, the before mentioned competences of the lecturers indicate that he is still a necessary factor in the teaching process, but with a much-changed role. On the other hand, students have a wide range of educational courses through the concept of distance learning, which give them the freedom to acquire new knowledge, skills and abilities as part of their desired education. All this requires new skills, which are reflected in developing communication skills, building self-learning skills, teamwork and effective thinking skills, flexibility, motivation, interest, sociological aspect (sociability), constant adaptability to new circumstances and a range of other skills. Finally, when looking at the demands and benefits of distance learning, through all its forms, we can freely state that the AF BiH, with its educational capacities, can and must fully implement the concept of distance learning, as a value and innovation in the teaching process, which will certainly improve overall fulfillment of educational goals within the

institutional training and other forms of training of the AF BiH. The implementation of this concept will contribute to the compatibility and interoperability of the AF BiH with modern NATO education systems, modern armies, partner countries, which have implemented the distance learning concept at full capacity. Initial predispositions possessed by the AF BiH, as well as NATO requirements through education projects, and commitments to the RADLI will enable more intensive implementation of distance learning into the AF BiH training system, as well as other areas of the AF BiH organization, where the same concept is applicable.

3. Implementation of the concept of distance learning in the AF BiH training system

The concept of distance learning was officially recognized in 2016, when the AF BiH did not have sufficiently developed key elements and component concepts (hardware, dedicated software, learning management system (LMS), teaching material, network infrastructure, trained staff, etc. At the meeting of the NATO Training Group, Sub-groups for individual training and education development, contacts were made with representatives of the Norwegian Armed Forces, who for many years implemented the project of developing ADL systems and capacities in the Armed Forces of the Republic of Serbia. The idea for establishing regional cooperation was promoted, which would promote the values and benefits of ADL, with the establishment of a RADLI with the project members and partners shown earlier. The training system and other spheres of the AF BiH organization, the RADLI project has significantly helped to rewrite the ADL concept knows as an acceptable, significant and useful step in the overall improvement of the training and education system of the AF BiH, as well as other organizational segments. The RADLI project provided the AF BiH with ADL training, IT support, software support, better regional and international cooperation on ADL, then access and the ability to use a regional ADL server.

The AF BiH within the TRADOC organizational structure formed a temporary working group for the implementation of the ADL concept in the training, education and other spheres of the AF BiH organization, which would function until the formation of the ADL organizational unit (temporary or permanent), which would exclusively deal with the business ADL.

The Working Group has made several positive steps in this project from establishing a local server in the structure of TRADOC, creating a logo for the future ADL organizational unit of BiH (BAADLI - Bosnia and Herzegovina Advanced Distributed Learning Initiative), developing a comprehensive project of implementing ADL concepts into the system. Training of the AF of BiH, drafting a proposal for a future section for ADL with formative positions, responsibilities and competencies, developing a curriculum for a future basic ADL course within the AF of BiH, reviewing the need for IT and communication support and a range of other activities.

The proposal of the AF BiH ADL Initiative's logo (Figure 1) is based on the US Department of Defense's ADLI program logo. Some national specifics were added to the original logo to accommodate the actual recognition of the AF BiH and the MoD BiH. Of course, the project of implementing the concept of distance learning into the training system and other spheres of the AF BiH organization has a set goal, purpose, project tasks and implementation steps, which we will outline in the following work.

The aim of the project is to introduce a modern concept of distance learning into the training system and other fields of education and organization of the AF BiH, and to adapt it to NATO standards, recognizing the fact that we implement partner goals and other obligations towards NATO, which significantly require the modernization of the AF BiH education system, and thus, innovating didactic - methodological approaches to the teaching process by introducing distance learning (e-learning) as a contemporary form of teaching. In the initial phase, distance learning capacities would be exclusively used at the local level (local area network and server), and in the future the ultimate goal of the project would be to consume e-learning products online, of course, by making all the necessary assumptions.

The purpose of the project is the modernization, innovation and improvement of training and education systems, and the integration of



Figure 7. AF BiH ADL Initiative's Logo

available capacities and resources (personal, material) into modern education and training systems, of which the concept of ADL takes an important place in order to gain better expertise and efficiency. In providing training at all levels and improved the overall educational process of the AF BiH. In the next period, it is necessary to provide and develop the capacity for self-sustainability of ADL capacities in the AF BiH, which would increase the efficiency and better productivity of the curriculum and establish better interaction between the trainees (students) and lecturers (instructors). This would highlight their expertise in addressing teaching problems, and students would not only be passive students, but everyone would be actively involved in teaching.

The terms of reference are as follows:

- In accordance with NATO standards and new trends in the education of modern societies, this project has the basic task of integrating ADL into the AF BiH training system in accordance with the available capabilities, capacities and resources (personal, material). The emphasis is on the initial phase of integrating distributed learning into TRADOC educational institutions, primarily in the Center for Professional Development (hereinafter referred to as "CPD"), and in other stages (COOPM-Training Center for Peace Support Operations actively involved in the RADLI project), as well as in other units of the AF BiH.
- Since this is a project that requires intensive staff training and the introduction of modern resources (IT equipment and resources), and a project that initially requires significant material and financial investments, it will be necessary to involve all levels in the command system and controls (C2) of the AF BiH and MoD BiH regarding professional and material support to the project.
- Initially, the project concentrates on establishing a local server (local area network), without Internet access, for a number of reasons (lack of IT and communication equipment and resources, lack of sufficient quantities of licensed software, security and protection, staff training, lack of LMS administrators, etc.). In the future, the project should ensure that e-learning (distance learning) products are consumed online as a final stage.

The project steps are as follows:

- Establishment of an organizational unit for distributed learning in the structure of TRADOC (permanent or temporary) - ADL Section of the AF BiH.
- Establishment of normative - legal and organizational regulations for introducing, organizing and implementing the concept of ADL in the system of training and education of AF BiH (policies, regulations, directives, SOPs - standard operating procedures, orders, plans, etc.).
- Provision of necessary equipment and resources (ICT) for the development of ADL capacity.
- Establishment of a national server on the local network - initial phase of project development (provide server with adequate technical capabilities).
- Training - education of personnel for participation in ADL (basic and advanced ADL training, training of administrators for LMS) - use of available courses organized by partner countries within the RADLI project or within NATO structures.
- Developing a basic ADL course in the AF BiH.
- Development of capacities and products of ADL at TRADOC Centers (CPR priority).
- Development and use of ADL products in the AF BiH units (through the project development stages).
- Introduction of the concept of ADL, by stages, into the complete system of training of the AF BiH, as well as other spheres of organization of life and work of the AF BiH.
- Creating conditions for integration - migration of ADL capacities of the AF BiH from the local network to the Internet (ultimate goal).

The project of implementation of distance learning or ADL in the AF BiH is implemented in the following areas:

Organization

Current state: There is currently no organizational unit in the structure of the AF BiH to develop and implement ADL activities. There are very few AF BiH staff who have completed basic or

advanced ADL training organized by the RADLI regional project, and who are on various duties, which complicates their more active involvement in the development of this project.

Developmental state: In line with a series of coordination and organizational meetings, at different levels, related to the establishment of the concept of ADL in the AF BiH, the idea of establishing a TRADOC Working Group currently run by the TRADOC Doctrine Department, and a working group consists of personnel from the research department, personnel from TRADOC who have completed certain ADL courses and training, then personnel from the field of communications and information systems, and personnel from the TRADOC Training Department. At the CPD level, an interim team of instructors from all departments in the military courses is assigned to work on the study of matter and software (Adobe Captivate 2017, Camtasia), and the development of ADL products (lessons or courses). Establishment of a temporary organizational unit at the level of TRADOC for ADL (ADL Section).

Desired final state: Establishment of a permanent organizational unit at TRADOC level (ADL Section of the Training Department structure) with structure, competencies and responsibilities.

Equipment and means

Current state: The current state of ICT for the ADL project is at a satisfactory level, with a tendency for improvement. Due to the uneven technical characteristics of ICT equipment and resources, it is necessary to carry out additional cabling and installation of new network equipment in order to satisfy the basic conditions for the launch of the ADL system into active operation. Donated IT and other equipment by the Norwegian MoD to support courses in CPR also supports the development of ADL capacities, for which a minimum has been primarily donated. The status and needs for communication support are fully understood, analyzed and presented in detail in the project itself with all the necessary professional details.

Developmental state: Strive to balance the characteristics of ICT equipment that will be used for teaching, through ADL, as well as expanding the capacity of ICT resources for trainees and teaching staff. Expanding server capacity and training staff (administrators).

Desired final state: Improvement of server capacity for LMS to securely store and distribute learning materials, continuous and satisfactory flow of information from server to user (establishment of new generation network equipment for higher throughput - information flow). Ultimately, advance ICT to the extent that it achieves the ultimate goal of establishing a platform LMS and accessing ADL lessons online.

Training

Current state: Few TRADOC staff have completed basic or advanced ADL training organized by the RADLI or NATO regional project, which is certainly not enough to implement this modern and complex concept of learning and education. Within TRADOC, joint military training of key personnel was implemented, covering the basics of distance learning and the RADLI project, which will continue in the future.

Developmental state: Develop lessons and courses that will provide education in the field of the modern ADL concept. Intensify joint military personnel training and information at all levels to integrate ADL as easily as possible into the education system and other areas of the AF BiH. Develop a curriculum for a future basic ADL course at TRADOC level that would provide institutional training for unit staff in this segment.

Desired final state: When it comes to training, the intention is for the final state of staff training to enable the implementation of the ADL concept at all levels of the AF BiH, where the future ADL Section in the TRADOC structure would certainly be the carrier of the activity. Also, key personnel in the ADL system should undergo basic or advanced ADL training. Of course, the final goal is the development of the Basic ADL Course of the AF BiH, which would enable regular systematic education of the AF BiH personnel of all categories and levels, and thus improve the functionality of all available capacities in the training and education system of the AF BiH, as well as other organizational segments.

Procedures and regulations

Current state: MoD BiH and AF BiH do not currently have sufficiently developed documents, regulations and procedures that address the field of ADL, and it is only superficially mentioned in certain publications and key training documents of the AF of BiH. The Training Doctrine of the AF BiH in Chapter 3 "Military Training System" emphasized the obligation of professional military personnel to complete on-line courses and modules. [3] The Methodology of training in the AF BiH in Chapter 1 "General methodology", as a form of individualization of the teaching process, recognizes the individualization of the teaching process using computer educational software (programs), which are certainly the foundations of the ADL concept. [4] The new Rulebook on the Education and Training of Professional Military Personnel formally recognized "distance learning (on-line)" in its Article 4 "Definitions" and facilitated the development of other necessary regulations. [5]

Developmental state: Develop an implementation project for the implementation of the ADL concept in the AF BiH at the TRADOC level that will be supported, developed and implemented by all C2 levels within the AF BiH and MoD BiH (project developed and delivered to the superior levels of the C2 AF BiH and MoD BiH). Develop a temporary SOP for ADL at TRADOC level, which would provide basic guidance and guidance for the implementation of ADL activities. Development of normative - legal regulations at the operational-strategic level (policies, directives, regulations, orders, etc.).

Desired final state: Developed necessary regulations and procedures from operational-strategic to tactical level, which will regulate the application of ADL in the AF BiH and MoD BiH. SOP and other regulations developed for the functioning of the future ADL Section of the AF BiH.

4. Conclusion

Distance learning or ADL is a modern concept that is widely and daily used in modern educational systems. In order to follow the educational systems of modern societies, knowledge based on lifelong learning must use fast, efficient and productive ways of reaching information, as well as acquiring the wide range of knowledge required by modern education and overall globalization processes. It is the concept of ADL that helps us to be effective participants in this modern knowledge society and to embrace the values that modern man strives for. ADL is widely used in modern armies around the world, as well as in the armed forces of surrounding countries, which is certainly a significant concept implemented and promoted by NATO, and on the other hand, a logical obligation that is imposed, given the very fact that the MoD BiH and the AF BiH are active participants in the RADLI project. The implementation of the ADL project in the AF BiH is a very challenging and demanding endeavor that must involve all organizational units within the AF BiH and MoD BiH structures. The introduction of a modern ADL concept into the training and education system and other areas of the AF BiH is a challenge on the one hand, but a huge and invaluable benefit on the other, which by its developmental capabilities and wide application, helps the overall development and progress of the AF BiH as a whole.

The development of ADL capacities in the AF BiH must be well and systematically supported by normative - legal, material - financial and organizational assets of all levels of C2 in the structure of the AF BiH and MoD BiH, and the completed implementation project is an efficient and productive guideline for the implementation of the concept whose benefits in the future will really be immeasurable.

The RADLI project is the first step of the AF BiH and MoD BiH to systematically introduce the ADL concept, with the professional and material support by the project partners. This concept "opened the door" to us and gave us ideas to develop national ADL capacities within the AF BiH, which resulted in the elaboration of the implementation of the ADL concept into the AF BiH training system, as well as other ADL development activities being carried out within the AF BiH.

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Next Generation Digital Learning Environment (NGDLE)

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Abstract. Today, the global educational landscape is changing due to the advancement of technologies and services, where some have termed it as the „climate change“ in our education. The students of today engage with the learning environment differently from the students of yesterday, due to many climate changes that happened in the last years. The traditional landscape is often perceived as „formal“, „passive“, „direct“ and „push“ learning environment designed largely for the knowledge consumers where the students results of learning were lower, and the modern landscape is often perceived as „informal“, „active“, „collaborative“, „social“ and „pull“ learning environment designed not only for the knowledge consumers, but also for the knowledge creators where the student results of learning are higher than before. This paradigm shift in education and learning is imminent and has gathered a lot of interest in the recent years to create and adapt the education and learning environment for this century. An exciting path forward in achieving the New Generation Digital Learning Environment (NGDLE) vision is a next generation learning system designed to create great learning experiences that improve learning outcomes. This learning system will understand learning outcomes, learner assessment, the learner record, and how to launch the right learning moment for each student.

1. Introduction

Now, in our society many institutions for higher education aspire to make the education more personal and more flexible. They also strive to provide digital education system that matches the learning needs of each individual student. With information technology (IT) it is possible everyone to study and work from distance. Today it has been widely acknowledged that studying or learning can happen also in different places than the traditional classroom. The purpose of Next Generation Digital Learning Environment (NGDLE) is to design a digital learning system that will improve the learning skills, learning outcomes and learning experience of students. This digital learning system will understand the learning outcomes, learner assessment, the learner record and how to launch the right learning moments for each student. The Next Generation Digital Learning Environment (NGDLE) is conceived as an ecosystem or a learning environment consisting of different learning tools and different components that adhere to common standards.

2. Importance of technology in education

Education institutions, like all service organizations in the digital information era, must seek every means to enhance quality of service delivery and drive efficiency and cost-savings. In other words, the journey for digital transformation in education should lead to a broader vision that enables constant innovation and enhancement of teaching and learning all the students where it also must improve the operational efficiencies of administrative and management services for the students, educators and for the community [1].

The observation of forward-thinking education institution shows that the right integration of technology and pedagogy with the strategic and operational vision of the university is essential for the return on investment and continued success of digital initiatives. This type of approach can help the institution ensure all digital learning environments – both physical and virtual – can meet the changing needs of education, the labor market and community of this century. Historically, education institutions adopted digital technology in education with the purpose to increase the efficiency of university administrative processes such as scheduling classes, managing different budget, tracking in

different ways the students, reducing the operational cost of energy in the buildings, enhancing safety and security and also providing different informational tools for staff, academics, students and researchers [3].

After many years, the forward-thinking educational institutions are now seeing the power of technology in education to transform the learning environments, merging the physical with the virtual and realizing better student outcomes. These different institutions understand the current change of dynamics, and are moving rapidly to innovate and transform their different business models, acknowledging the evolving role of faculty or university, understanding the requirements of the students, of the future, and examining their educational delivery methodologies. The leaders of this century who are still of the mind that only modest incremental shifts are necessary to increase the results of learning could miss the next generation of learning and teaching and for this reason the next generation digital learning environments are so important, because they can help the increase of the positive results on learning of the students [4].

Now, it should be clear that education as an industry is poised to go through a monumental shift that will leave some wondering what happened to the traditional university or college campus. The potential for disruption in this community is high as new technologies, as well as new generation of student, come onto the scene [2].

Some of the impacts of digital disruption in education are seen through student demand for changes in traditional processes of teaching and learning such as:

- Should mobile devices and personal computers be banned in class?
- Do students really need to attend lectures in person?
- Why aren't video – recorded lectures and other course materials readily available to help all the students learn more effectively and reach those who may not be able to attend class?

Other type of questions that shows the level of vulnerability that now the education industry faces with the digital disruption wave, such as:

- How can traditional modes of classroom instruction engage and inspire students when life outside the classroom now has changed so dramatically?
- What does it mean when students are not receiving education that prepares them effectively for a job market that is changing so rapidly?
- What happens when students stop coming to class?

Now, most universities and colleges have still not completed a transformation of their physical learning environments. Classrooms, libraries, auditoriums, cafeterias, study spaces, and campuses overall are still largely based on dated, traditional models. Today, not only are virtual teaching and learning nonexistent, but also many universities, colleges and campuses are far from conceptualizing the physical with the virtual, which helps more students to be successful in studying and learning in this century [5]. Leaders from different fields complain that universities, colleges, and different traditional institutions for studying and teaching are not producing adequately prepared job applicants, where many studies and researchers show that there is a big difference between a recent graduated student and the employer who worked for many years and has a lot of experience in that field of work. For these reasons many countries now try to involve the technology in universities and colleges to improve and increase the results of students, which can make the new leaders ready to work and learn in any field. Digital disruption in the industry will force universities and colleges to transform their learning environments in both ways, physical and virtual, as part of the way courses and classes are taught [6]. This kind of change will meet the expectations of the students, citizens and employers of this century. The way to realize success in the future, the forward – thinking universities and colleges need to find new, innovative and creative ways to attract and retain students and faculty, to

differentiate themselves from their peers and in effective way to demonstrate the value of a degree from their different institutions while simultaneously evolving the institutions business model [4].

The positive impact of digitally transformed environments will not come by simply presenting and arranging content in virtualized or even in more different personalized ways. Rather, it will come through the synergistic combination of benefits for different stakeholders such as: leadership, teachers, staff, and even necessarily students and the community. The digitally transformed learning environments, which are properly designed and implanted in higher educational institutions according to strong pedagogical practices among many years can indeed function as a set of different tools and different processes that augment human learning or studying and intellectual capability [3].

Benefits for students:

Students will benefit from the online component of socially and collaborative networked learning and studying, and they every time will be able to choose and build an approach based on how the best learn, study and teach through a smart curriculum path that is more relevant to their personal context and their different areas of interest. Students will be more actively engaged, have a better learning and studying experience or opportunity, be better prepared for the careers of the future, because they are the leaders of this century and every day to find different, new, creative, and innovative ways to solve problems in the way to help more the community.

Benefits for teachers:

Teachers will be able to innovate their different teaching methods and ways, and every time to try to make their classes more engaging, interesting, creative, collaborative and effective. Whether working with a single student or a large number of students face – to – face or on – line, they will be able every time to make timely, targeted interventions and provide personalized feedback to individuals along the way.

Benefits for the institution:

The adoption of new learning and studying technology in higher educational institutions will enable innovative and creative solutions that promise to improve learning and studying processes while enhancing the cost effectiveness of campus services and different tools. Integrated information systems, based on a connected and secure environment, will help leaders identify and manage key impact areas that they would like to prioritize for focus and investment and to determine the type of experience they would like to deliver across all constituents such as: faculty, administrative leaders, staff and students.

3. Proposed framework for digital transformation in education

While now, in this millennium, there are many paths education institutions can take to transform, there are some key design principles that are critical for all leaders to consider as they look to build a more effective plan and ensure successful implementation through the major market transitions they are experiencing. From helping to define a vision, identifying gaps to providing a unifying technology architectural design and a comprehensive set of solutions that address these different gaps, this kind of framework will help education institutions transform two major dimensions: safety and security, and research and knowledge.

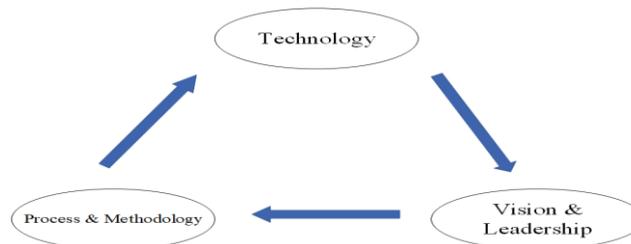


Figure 1. Framework for digital transformation in education.

3.1. Process and methodology

The process and methodology of transforming learning and studying environments should focus on creating the right capabilities for educators to adopt effective teaching methodologies and innovation that put the learner at the heart of the learning process, whether engagement is face – to – face, at a distance or through blended learning modes. These include collaborative knowledge and different learning methodologies that foster innovative approaches to empower learners to develop key competences and succeed in this century such as: flipped learning, project – based learning, adaptive learning and personalized learning [3]. The impact of the new technology makes it possible to create new environments where students get what they need and when they need it. Now, the new social collaboration spaces or environments make it easier for educators and students to connect before, during, and after traditional or virtual classes. These spaces or environments create persistent learning environments with ongoing interaction that helps the educator serve as a coach and mentor to students and that enables students to help one another [4]. This is why now the process of defining how transformed learning spaces or environments will look must consider the teaching methods that will provide the types of experiences we want to deliver to educators, staff and students such as:

- For students to take classes anywhere, anytime or on any device
- To deliver a range of learning models, including online, hybrid and flipped learning
- To connect with outside experts and bring them into courses as lecturers or guest educators
- To work with other universities and colleges in the area, state or nation to share courses, content and educators, thus increasing the number of courses offered and the number of students served
- For faculty, staff and students to connect seamlessly to the network
- To ensure a secure, safe and reliable network
- To help ensure student safety across the campus
- To easily obtain cost – effective storage, compute and processing resources for researchers
- For educators, staff and students to connect and collaborate, regardless of location

3.2. Technology

Technology in this century plays a key role not only in enabling new ways and methods of learning and studying, but also in establishing new business models required to drive the very transformation that institutions for higher education are trying hard to effect it [3]. Today's students always demand an access to the network, information and resources, needed to realize success, such as:

- They expect speed in their wireless access and a simple and seamless online interface to their courses, administrative or academic information and student services or tools.
- They want access to information when they need it and where they can most easily find it.
- They want to attend classes anytime, anywhere. They do not necessarily want to physically attend every class.
- They want a persistent social and collaborative environment that is easy to find and that creates a continual learning and studying environments before, during and after class.

Some of the key success factors of a digital education platform rely on the core network infrastructure such as: wired and wireless connectivity and the underlying cybersecurity solutions that enable everything what is essentially the heartbeat of an institution [4]. Everything that follows is dependent on a strong, reliable core network that ensures:

- The network: ubiquitous campus connectivity;
- Cybersecurity;
- Virtualization of the digital campus, and
- Collaboration and personalization for distance and blended learning.

Each of these layers of technology delivers specific roles and benefits to ensure the success of a digital transformation roadmap implementation.

3.2.1. The network: ubiquitous campus connectivity

It is important now the infrastructure to be stable, reliable, capable and scalable of handling an increased rate of traffic from the explosion of mobile devices and personal computers, the use of video and the implementation of new applications for communications and collaboration [3]. The network represents the confluence of multiple technology trends, such as:

- Mobility (ubiquitous, high – speed mobile networks, different smart devices and applications)
- Cloud computing, social networks, instant collaboration with anyone, anywhere
- Data analytics
- An explosion in connected things, including different sensors and cameras

Today, the network must be secure, safe, reliable, wired and wireless, easy to manage and administer and designed to meet future growth requirements for the connection of people, processes, things and data [4].

3.2.2. Cybersecurity

Cybersecurity has become an enormous issue across all markets, but particularly in education. The education sector is among the top three most vulnerable targets for cyberattacks. The expected academic culture of open access to knowledge and information for better research innovation has created a unique and growing up challenge not only for the information technology (IT), but also for senior management protecting confidential and sensitive information against threats and attacks over the Internet [2]. Best practices from education institutions highly recommended a strategic and holistic cybersecurity plan and idea that combines a robust technology and architecture, people awareness and training, and security policies and different data management processes [4].

3.2.3. Virtualization of the digital campus

An intelligent digital campus allows for the connection of people, data and different things [3]. It incorporates a wide range of applications operating over the platform to support the business of the university and college, where it enables outdoor teaching and learning activities and delivers a good student, such as:

- Student services
- Campus Wi – Fi
- Smart buildings
- Smart parking
- Smart lighting
- Campus security systems

Virtualizing IT infrastructure with such capabilities increases business agility and financial efficiencies of on – line administrative services and tools to educators, staff, students and also to community [6].

3.2.4. Collaboration and personalization

Collaboration is already the tool of today's learners and should logically become the tool of today's teacher, universities and colleges or the education systems as a whole. Educators and students can adopt connected and collaborative technologies to support online and blended learning. Connected and collaborative environments (physical and virtual) allow students, educators and staff to use video and virtual interactive spaces for cost – effective on – line distance and blended learning [5]. Technology can help to break down the walls that have traditionally existed in education to make collaboration more ubiquitous. The ability to hold online courses and meetings and deliver collaborative workspaces helps people to connect and enables more frequent sharing of best practices, course design approaches and access to different outside expertise [2]. These new collaboration technologies make it easier for students to engage on their own terms and receive the personalized attention they needed to be more successful in university or college [4].

3.3. Vision and leadership

The starting point is the digital vision building process, to establish a strategy for the future of the institution and a clear understanding of the direction to take, in terms of different digital initiatives. In this digital vision building process the main goal is to help the educators, students and institutions to be more successful with their goal setting. Today, the digital vision should articulate the institutions future state as an example: What are the most important and relevant areas of focus? What type of experience would you like to deliver for students, staff and faculty, both on and off campus? Every successful educator must know where to focus most of the time, which are the main tasks, to prioritize tasks that must be done on time, and in which direction they have to move to achieve success and that to give positive results to the new generation leaders [1].

A strong vision will help all the stakeholders align around a key theme, in this case, the transformation of traditional and physical learning to robust, engaging, different virtual learning environments, where the physical and virtual converge for maximum benefit of faculty, students, staff, and the community. This type of strong vision will transform our education system to a higher level, which makes our generation leaders so successful in every field of their job or profession. Leadership, financial engineering and accountability are essential components of digital transformation success [3]. The essential components of the digital transformation success must contain every educational system because that makes their institutions successful in our generation. Always, after the vision is set, the work to deliver on the vision begins and the tracking of results and returns on investment starts. The assigned leader or champion will work to firmly establish the vision created by the broader team, and set it into motion [4]. He/she will help to propagate understanding of the need to change across multiple departments and identifying other like-minded. The champion will drive the initiative until it is complete. Involving the right people in the visioning process is highly important because many of these individuals will naturally become standing members of task forces that implement the strategy and plan. A collaboration effort among senior management, educators and IT experts is essential to build an adequate plan and begin the implementation [6].

4. Conclusion

The journey toward the digital transformation in education is dependent on a broader vision and a structured framework for implementation of selected priorities to enhance the quality and innovation in teaching, learning, and research, while improving operational efficiency of management and administration. The effective adoption of new digital technologies and approaches will make our education more engaging, relevant, collaborative, active and motivating for learners, enabling faster time to mastery. However, educators must every day implement these new technologies in a way that transforms learning environments, creating more virtual opportunities for students and also for

educators, and to start merging the physical with the virtual. Implementing this ideal technologically enhanced education model in this century in every educational system requires many resources and great investments; however, as technology continues to evolve, many educators are looking for ways to implement this kind of technology in many educational systems to match the needs of teachers and students.

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Use of Technology

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Abstract. Today, we live in a world surrounded by advanced technology. Technology is present in all areas of our lives. The term technology is broad, but we will explain it as creating products and processes that make our daily things easier. The use of technology makes us more competitive, more successful and creative. We can use it in communications, education, agriculture, banking, transportation, human relationships, etc. The world has undergone a huge change. The 21st century is the century of change, the century of technology. We are witnessing the everyday innovations that contribute to the population. Opportunity and contribution to a more functional society, world connectivity, globalization and all kinds of cooperation, allowing flexible management and creating a more beautiful world of living. We almost become slaves to its advanced products. Our task and responsibility is to recognize and limit the resources of technology that lead to the evasion of the true human values. On the other hand, our mission is to dedicate ourselves to realizing the advantages of technology and step towards a new modern world, dominant in simplicity and efficiency. The goal is to be courageous enough and accept the challenge.

1. Introduction

The history of technology is the history of the invention of tools and techniques, and it is one of the categories of the history of humanity. Technology can refer to methods ranging from as simple as stone tools to the complex genetic engineering and information technology that has emerged since the 1980s. The term technology comes from the Greek word 'techne', meaning art and craft, and the word 'logos', meaning word and speech. It was first used to describe applied arts, but it is now used to describe advancements and changes which affect the environment around us.^[1]

New knowledge has enabled people to create new things, and conversely, many scientific endeavors are made possible by technologies which assist humans in traveling to places they could not previously reach, and by scientific instruments by which we study nature in more detail than our natural senses allow. Since much of technology is applied science, technical history is connected to the history of science. From those resources, technology produces other resources, including artifacts used in everyday life. Since technology uses resources, technical history is tightly connected to economic history.

Technological change affects and is affected by society's cultural traditions. It is a force for economic growth and a means to develop and project economic, political, military power and wealth. Therefore, this document will represent the benefits of modern technology in the fields of army and social life.

2. What drives the technology towards magnificent innovations that can change the world?

The human condition allowed us to drastically shape our environment to suit our needs. We have now evolved so far down that line, we almost completely depend on technology for our survival. This dependency motivates a drive for new innovation and efficiency. The technology advancement is caused by the needs of more technology innovations, as well as the needs of population. Our personal life is highly dependent on the technology that people have developed.

When it comes to the military forces, any of the innovations that can increase army power are welcomed. There is a technological war going on. Whoever creates the smarter or better, wins the race. We have witnessed the railguns, the nuclear submarine and missiles, but nowadays, the world has to prepare to meet with something unexperienced before, something that has big chances to change the way of fighting, forever.

3. The technology in education

The face of education has changed over the past years, and that is the result of the impact of technology. The effective use of technology has created more educational opportunities both for teachers and students.

“Digital education is generating new learning opportunities as students engage in online, digital environments and as faculty change educational practices through the use of hybrid courses, personalized instruction, new collaboration models and a wide array of innovative, engaging learning strategies.

Furthermore, a 21st century view of learner success requires students to not only be thoughtful consumers of digital content, but effective and collaborative creators of digital media, demonstrating competencies and communicating ideas through dynamic storytelling, data visualization and content curation”^[2] – said David Goodrum, director of academic technology and information services, Oregon State University, in Campus Technology.

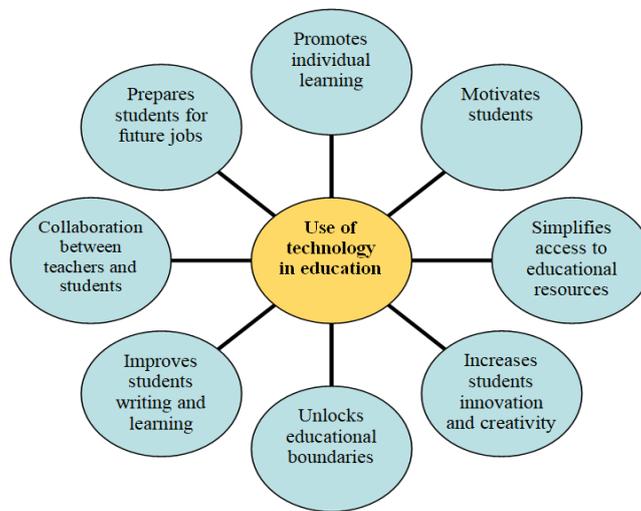


Figure 1: The quality of future learning.

Educators are planning to personalize learning for students. Technology can help them to reach new levels of exchanging knowledge. Modernization of education is underway. With the new era of learning going on, the students will become problem-solvers, critical thinkers, collaborators and creators. Therefore, the right devices in student’s hands help prepare them with the career and technical skills they need to be successful today, and in tomorrow’s workforce.

The pros of technology leading education are visible. They have the power to encourage both the students and educators to receive better interaction, so then, better future.

3.1 The advances of modern learning

1. Increases students innovation and team work.

Many studies have discovered that integrating technology in the classroom can lead to increased student’s engagement in the classroom.

2. Unlocking educational boundaries.

Once the learning is flexible, there are no obstacles. Unlike the physical classrooms, the students from different geographical locations can attend the class. The advancement is definitely an ability to use virtual communication tools like Skype, allowing to perform an online education. This type of learning is overtaking the world because of its opportunities, that anyone can attend.

3. Easier access to educational resources.

Students have wider and easier access to educational resources. Over the World-Wide-Web, anyone can reach the freely available resources, including electronic books (e-books), pod-casts, tutorials, and much more. Also, teachers can upload their lesson video on the video hosting platforms like Youtube.

4. Motivates and encourages students.

Computers are patient compared to humans. Some of the students feel more comfortable learning home or alone. The use of technological devices during the process of studying makes them feel in control of what they learn. This gives them a chance to select their subjects, more available time to study on their own and no fear of making mistakes. It is a clutch for the anti-social students who can not open themselves because of the fear of others.

5. Promotes individual learning and creativity.

Using their cell phones or tablets, students are allowed to learn through given tasks at home. They play various interactive educational games and software to develop different academic skills.

6. Prepares students for Future jobs.

Nowadays, the advantages of knowing how to work on a computer and its programs are limitless. In the future, today's most popular jobs will be of no value in the next 10 years, because technology will automate most of these tasks. Therefore, the students should get prepared to work their future jobs.

7. Improves students writing and learning skills.

Students are able to learn different languages via internet. They can use various word processing applications that have auto-correct spelling, so they can learn from their mistakes, on their own. The goal is to encourage them to be creative on the way of learning how to compose sentences and paragraphs.

8. Increases Collaboration between teachers and students.

The flexibility in interaction and communication between teachers and students is increased because of the modern devices and applications. Teachers can use them for informing the students about future activities or events, meanwhile the students are able to ask or collaborate online with educators from all around the world.

4. Military advanced technology

Technology directly influences the battlefield, or it changes the tactics of warfare. The reality is that robotization and new advanced systems with greater precision and payload will become indispensable in the army. Whereas old weapons and equipment will be left in the past.

The US Army is leading the race in military technology. Their inventions have contributed to the quality of war.

4.2 The impact of technology on warfare

There is a technological race in the military field between the greatest states. The US Army is leading the race, but China and Russia breathe down their backs. Their inventions have contributed to the quality of war. The Defense Advanced Research Projects Agency, known as DARPA, is an agency of the United States Department of Defense, responsible for the development of modern weapons for use by the military. It has dozens of ongoing projects, such as:

- humanoid robots,
- communication systems,
- neural implants that repair human loss,
- anonymous vehicles,
- remote control of brain activity,
- bullets that change course in Mid-Air,

- brain-chips,
- autonomy indoor and outdoor drones,^[3] etc..

Here is a figure representing the crucial innovations that definitely contributed the most in the process of changing warfare:

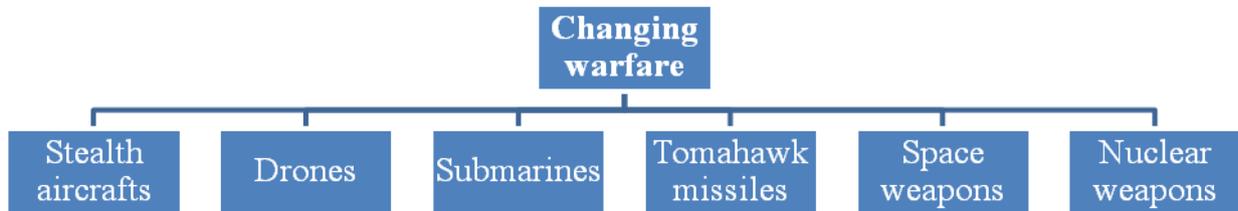


Figure 2: Military modern weapons.

4.1 Tailoring 3D printing tech for defense

The potential for additive manufacturing - also known as 3D printing - has been recognised for several years, but while printing technologies and processes continue to mature in the commercial sector, technical and institutional challenges still need to be overcome for wider adoption in defence manufacturing.

Manufacturers, defence organisations, and military end-users are continually assessing how 3D printing can be used to decrease costs, increase the pace of development, and strengthen supply chain resilience. Previously, the idea of 3D printing parts and equipment did not see any significant adoption. 3D printing entered a “trough lowered expectations” by the mid 2010s, but now, it began to see growth again by around 2017. The sales on the 3D printing market, surpassed \$2.7bn this year and are heading towards topping \$3bn by 2020. The growth is being attributed to the increased number of materials that can now be printed, at a quicker pace to reduce lead times and with larger dimensions.^[4]

The additive manufacturing is important because of the units that are deployed on operations, particularly where units are deployed on operations, therefore, where the units are in remote locations that are difficult to supply by sea, road or air.

The US Marine Corps (USMC) are a force that regularly finds itself deployed to the far reaches of the earth, where there is little infrastructure, and receiving parts can take several days, weeks or even months. It is not surprising that the USMC are looking for the best way to use 3D printing on their battlefields to improve operational readiness and mission effectiveness.

Already, they have managed to print some parts that immediately helped the mission success, such as:

- impellers on several of its M1A1 Abrams tanks;
- small and simple plastic bumper for the landing gear door, used for F-35B aircraft;
- the unit also developed a 3D printed lens cap that can protect the expensive camera on ground robots that the unit has also deployed;
- also, the US Army are looking forward to 3D print body armor for the soldiers.^[5]

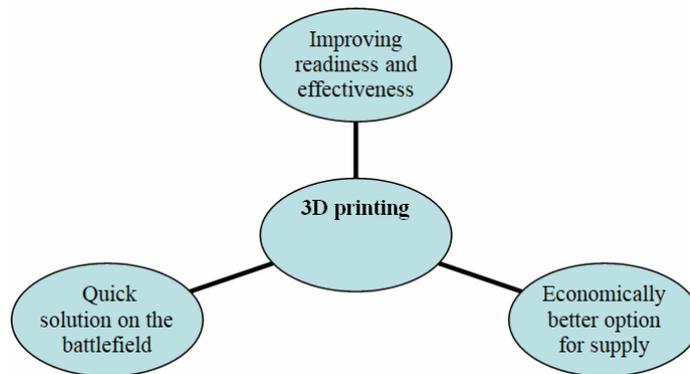


Figure 3: The pros of developing 3D printing.

“We are in a race with potential adversaries to operationalize autonomy, and we have the opportunity to demonstrate autonomy in a way that we don’t believe any nation in the world has demonstrated to date. Developing hardware and tactics that allow us to operate seamlessly within a close combat ground environment is extremely challenging, but provides incredible value”^[6] - said the lieutenant colonel Phil Root.

However, the era of 3D printing is newborn, and it has some technical challenges to overcome but we are looking forward to the future and maybe one day, 3D rifles or even army vehicles. We should never underestimate the power of technological growth.

5. What are the future prospects for 3D printing?

The development of printing is remarkably similar to the development of the Internet, especially in terms of impact. In the late 1990s, the world thought that the Internet was a trend for a short period, but nowadays few people dispute the magnitude of change the Internet has wrought upon humanity.

Therefore, just like the Internet, 3D printing is having its tough breakthrough in technology. The power to make will be democratized, more people will be able to make more things. Like the internet, there will be limitations. Few people will be able to print life-size passenger planes from their garage. Mountains of changes and developments are waiting to be explored and implemented, so we have to be patient and wait for the new waves of technological growth and benefits of 3D printings.

3D printing is also allowing us to use old materials in new ways that are more sustainable. For example, researchers have figured out how to convert carbon dioxide into concrete using 3D printing. Utilizing former waste to create future products makes our society have more efficient consumption. 3D printing innovators are even exploring how to make the process itself more sustainable, including using algae based filaments to reduce the energy necessitated for the printing process. The creative use of materials and production methods opens up new possibilities as we approach climate action and sustainable living.^[7]

The price of 3D printers has fallen rapidly and the accuracy of 3D printing has improved. You can now print the engagement ring of your dreams using gold or silver. Engineers at the University of Southampton have flown the world’s first 3D-printed unmanned aircraft, and KOR Ecologic prototyped Urbee, a car with a 3D-printed body that’s built to get 200 mpg on the freeway.^[8]

Table 1: Development perspective of 3D printing.

Period of time	Revolutionary name	Level of achievements
1981-1999	<i>The Infancy of Additive manufacturing</i>	<i>Simple tangible objects</i>
1999-2011	<i>3D Printing's Adolescent history</i>	<i>Faster printing, bigger spectre of materials that can be used for 3D printing</i>
2011-Present day	<i>3D Printing in its Prime</i>	From 3D printed cars to houses, no limitation for materials, AI and robotic objects

6. Conclusion

The world needs to be aware of the power of technology. We turn our backs on old habits and means, ahead of us are modern technologies that directly affect the way and effectiveness of human life. Whether it is the civilian sector or military advances, we are thrilled by the speed at which technology dominates the world.

From a civil point of view, robotization replaces the workforce, people get the opportunity to do their jobs easier, the internet opens up different jobs for young people, etc. The level and quality of education will increase for sure.

Meanwhile, the armies are getting ever stronger because of the process of modernization and technological overtake. The growth of technology can bring security, but at the same time increased economic growth due to the sale of modern weapons and systems. We need to be ready, but at the same time calm for the future. We should expect achievements that we have only dreamed of before.

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Advance distributed learning – ADL Motivational and pedagogical learning strategies

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Abstract. Many would agree that learning may be difficult for individuals who lack motivation and self-regulated learning skills. Using a social cognitive view of academic motivation and self-regulation, the objective of the present study was to investigate the relations between students’ motivational beliefs, their perceptions of the learning environment and their satisfaction with a self-paced, online course. I think that every academy needs to have online training. Especially training about motivational and pedagogical learning strategies. We must help all the students to adapt to their school, to the new friends, new living place. But we must especially help the cadets who are at the same time soldiers and students. Psychologists and pedagogues cannot afford so much time to talk to each individual equally, and equally pay attention. But that is why we can use online support, platforms and similar activities. Online learning can be a great help in such environments.

1. Introduction

In our society we must take the studying to the next level, because the old types of learning are not interesting and productive for today’s type of fast life.

We are using computers and the modern technology the most, so we should find a way to use them for our needs. We should use them and find a good motivational and pedagogical learning strategies. E-learning can be considered to be highly related to learning and teaching. Therefore, pedagogy and didactic are important aspects for all facets of e-learning, reaching from the creation of the courseware and the application of an e-learning system to the evaluation of the learning progress. It was already shown that an online course for a certain topic may be implemented in various ways and each method differs from each other with respect to aspects of the teaching process, such as the instructional design, the effort for the teacher, the effectiveness of the teaching strategy, or the applicability of an e-learning platform (in our academy the platform used is Moodle).[6]

2. Motivation for Learning

The e-learning is technique that is used for facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources. It includes online learning, where mobile technologies are used, m-learning and computer base training.

- Educational technology as the theory and practice of educational approaches to learning.
- Educational technology as technological tools and media, for instance massive online courses, that assist in the communication of knowledge, and its development and exchange. This is usually what people are referring to when they use the term "EdTech".
- Educational technology for learning management systems (LMS), such as tools for student and curriculum management, and education management information systems (EMIS).
- Educational technology as back-office management, such as training management systems for logistics and budget management, and Learning Record Store (LRS) for learning data storage and analysis.
- Educational technology itself as an educational subject; such courses may be called "Computer Studies" or "Information and communications technology (ICT)". [3]

In order to keep up with the events that are happening in the world, with all the new discoveries and new technological improvements, we must educate ourselves every day. To reach that, self motivation is the first think that we need, and then to motivate the students.[3]

One of the challenges faced by those who work in education is motivating the students to learn.

Motivation for education is needed for the students who are uninterested or apathetic, who make the minimum of effort in undertaking academic or other activities. The student's motivation is one of the most important factors for obtaining success in learning activities.[2]

Promoting motivation to learn is one of the main principles for efficient education. Motivation to learn reveals that a student desires to take part in, and learn from, a training activity. Student motivation is often parted into two types:

Intrinsic motivation and extrinsic motivation. Intrinsic motivation: A student is intrinsically motivated when he or she is motivated from within: Intrinsically motivated students strongly involve themselves in learning out of a unique thing, interest, or gratification, or in order to attain their own scholarly and personal objectives. Intrinsically motivated students like to use strategies that need more struggle and that let them process information more extremely.

Extrinsically motivated students are tending to put forth the least amount of struggle necessary to get the most reward. [1]

Among the studies which have investigated students' motivation, emphasis is placed on the studies undertaken by Edward Deci and Richard Ryan who, in the 1970s, in studying the elements which constitute, and the dimensions which determinethe promotion of intrinsic and extrinsic motivation, structured Self-Determination Theory. For self-determination theory, the individual is involved in learning situations with the aim of meeting three basic psychological needs: autonomy, competence, and the perception of belonging or relatedness. Breaking with the dichotomous vision of the classical literature, which established motivation in two distinct categories – intrinsic and extrinsic – self-determination theory understands all human behavior as intentional, motivated by different types of regulation which vary as a result of the level of autonomy and self-determination perceived by the individual. In this perspective, proposed a continuum of internalization of the regulations of behavior which gradually progress through types of extrinsic motivation until they reach the motivational level conceived of as more self-regulated and autonomous, that is, intrinsic motivation. It is worth noting that this continuum also predicts demotivation, conceptualized as absence of motivation. Information regarding this continuum is provided below.[6]

External regulation is described as a classical example of extrinsic motivation, characterized in the actions undertaken, which the individual undertakes in order to respond to external controllers. Behaviors which are extrinsically motivated by external regulation can be observed in those situations in which the student undertakes a task in order to achieve a certain reward, to meet stipulated time periods, or to avoid some form of punishment. In relation to introjected regulation, the controllers are internal, and respond to issues which have been internalized by the individual, as is the case with actions which aim to respond to issues related to self-esteem or, further, which aim to avoid unpleasant feelings, such as anxiety, shame and guilt.

In the regulation identified, the authors foresee a certain level of autonomy, as in this stage, the student accepts the behavior as being on his own initiative, endorsing personal meaning to the action undertaken. One example of a situation which illustrates this type of regulation is when the student decides to dedicate greater attention or more time to studying a subject which he understands as being necessary in order to enter a specific course, or to work in a desired profession.[4]

In relation to integrated regulation, characterized as the most autonomous type of extrinsic motivation, the reasons which guide the actions undertaken were accepted as the student's own choices, assimilated to the self, without pressure. The high degree of development of autonomy confers on integrated regulation a position on the self-determination continuum which is close to intrinsic motivation. Nevertheless, although the behavior presented in integrated regulation indicates the internalization of values which are aggregated to the task, it is only through intrinsic motivation that one can perceive the satisfaction generated through undertaking the activity itself clarified that the first two types of regulation mentioned – external and introjected regulation – make up controlled motivation, which characterizes the actions which the student undertakes in order to respond to a

specified event or pressure, whether this is external or internal. The two last types indicated on the self-determination continuum – identified and integrated regulation – integrate autonomous motivation, understood as the actions which are undertaken on the student's own initiative, accepted by the student as a personal choice or, furthermore, to which the student attributed importance.[1]

2.1. Improving Student Motivation

According to me and using the data from some scientists, researchers and psychologists, it is concluded that there are several ideas to improve students' motivation.

1. **Define the objectives:**

From my view point if students know what is expected from them, and what they actually should do, they will work harder in order to reach their goal and will stay motivated longer.

2. **Know your students**

It is not possible for the teacher to work with each student the same way. The teacher should not know just the name of the students, but also their characters, interests, way of thinking and abilities.

3. **Give praise when earned**

Each student would be grateful if he gets price for what he has earned. Teachers can give students a bounty of motivation by rewarding success publicly, giving praise for a job well done, and sharing exemplary work.

4. **Make goals high but attainable**

If teachers are not pushing their students to do more than the basic minimum, most will not seek to push themselves to work. Students like to be challenged but they will work if they think that the goals are reachable.

5. **Provide opportunities for success**

Students, even the best ones, can become frustrated and demotivated when they feel like they're struggling or not getting the recognition that other students are. Make sure that all students get a chance to play to their strengths and feel included and valued. It can make a world of difference in their motivation.

3. Pedagogical Aspects of Learning and Implications for E-Learning

Education can be understood as “an activity undertaken or initiated by one or more agents that is designed to effect changes in the knowledge, skill, and attitudes of individuals, groups, or communities”. Learning comprises “the act or process by which behavioral change, knowledge, skills, and attitudes are acquired” (see Boyd et al., 1980). Tying up to this definition, the following subsections deal with the learnercentred aspects of the traditional learning process – such as relevant factors for learning, characteristics of learners, and further influences on learning – and examine them within the context of e-learning.[2]

3.1 Factors relevant for the Learning Process

Drawing conclusions from (Bransford et al. 2000), four factors can be outlined as significantly important for the learning process: (1) attention, (2) motivation, (3) emotions, and (4) experiences of the learner.

First of all, the focus of attention determines if a student mentally follows a lecture and, therefore, if the intended behavioural change affects a learner at all. E-learning particularly requires a strategy for getting and keeping the learner's attention.[5] Thus, it is necessary to consider cognitive processes such as the learner's selection of incoming data into the sensory memory, organising and integrating this information by building connections in short-term memory and encoding it by transferring it to long-term memory. Thus, it is recommended to apply certain principles for instructional design, e.g. the ones by (Fleming & Levie, 1993).[2]

Secondly, the motivational states of students are of importance when questioning how the stimuli given by the teacher promotes the learning process. (Bransford et al., 2000) state that “motivation affects the amount of time that people are willing to devote to learning”. Yet, this

willingness to learn is caused by different motives beginning with the intention of achieving something over competing against colleagues or helping other people up to emotional factors like anxiety. (Entwistle, 1981) classified three motivational orientation styles: (a) meaning-oriented, (b) reproducing-oriented, and (b) achieving-oriented motives. Considering motivational aspects for elearning is mainly dependent on the learning content itself. [2]

Thirdly, emotions have, similarly to motivation, a strong impact on the learning process. (Tobias, 1987) points out findings on students' performance depending on anxiety, in particular test anxiety, and proposes special methods for dealing with such problems. On the other side, an emotion – no matter if a negative and positive one – may influence learning due to its special nature. Thus, emotions can be seen as a key cognitive process for transferring data into the short- or even long-time memory. Within the elearning situation, the improvement of the learning process can be realised through emotions e.g. by storytelling, provocations, emotional figures and animations, group works, enabling confidence in the learning content, etc. [2]

Fourthly, knowledge transfer can be improved if learners can tie up to prior knowledge either in the same domain or in a similar context. (Anderson, 1995) states that “interference happens, when information gets mixed up with, or pushed aside by, other information”. [3] Learners can construct new understandings by tying up to previous experiences, which may not have been activated yet. In this way, learners become capable of understanding conceptual changes, adopt knowledge regarding their culture or everyday life, and even improve meta-cognitive abilities. Research findings have shown that the higher the level of prior achievement within a domain or a context, the less instructional support is required to accomplish a task (e.g. see Tobias & Ingber, 1976). [2]

4. Proposed framework for digital transformation in e - learning

In the following scheme that I have created to visualize from what I think that e-learning is consisted of, we can see which part is e – learning built of and which can be gained by motivational and pedagogical learning skills. Each of these factors can be acquired by certain motivation and pedagogical access. And each of them, plays special role in the process of building of e – platforms as in our academy, which is Moodle and is still in process of improving and building. With the help of e – learning, students will have access to studying materials, whenever they want to look at them, store works and notes online, doing homework, creating online portfolio including digital photos and videos or performance as well as text, will be provided with courses and easier way of communication with the teachers and other students. [7]



Figure 1. E-learning

1. **Tutorials** are methods of transferring knowledge used in the process of e – learning. Using them, students are taught by examples, experiences and always they are more interactive than regular books or lectures.

2. **Webinar** uses the Internet to connect the students from the platform allowing them to learn things at the same time. It is alive, web based video.

3. **Coaching** is a form of development during which learners are supported by a person called a coach. Mainly, they are supported in achieving specific personal or professional goals by providing training guidance.

4. By **Communication**, students can create groups by which communication with the other students and teachers will be much easier and much more efficient.

5. **Exchange** is the process of exchanging knowledge, materials for studying, notes from classes, personal experiences related with the lessons, etc.

6. **Education** is the way of teaching the student and preparing them for the future. It is also a process of facilitating knowledge and acquiring skills, values, beliefs and habits. It includes storytelling, different kinds of discussion, teaching, training, and direct research.

7. **Creativity** is a different way of thinking from the other students. Creativity offers us creating something using original ideas and innovating.

8. Knowledge is everything that we have gained through the years of past studying. It is the most powerful weapon that an individual can possess.

5. Conclusion

From the previous, it is obvious that we live in a modern 21st century. Electronic forms and learning platforms have substituted the printed version of studying materials using miniature physical surfaces for saving millions of data which saves time and space for searching. All those files which could occupy large area and for which we would spend two or three hours for searching, with today's technology and especially with the new e – platforms at universities, people from all over the world, the most important for the students, for short time, more precisely for a few seconds can find anything they need. And all those data can be accessible for us from our laptops and even better yet, from the phones which are always kept in our pockets. With the adequate motivation and adequate pedagogical access, we are able to give to the student power and strength for them to properly direct their energy to acquire new knowledge.

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The development of modern distance education

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Abstract. The distance learning via internet includes an important processing in many fields. The rate and the contribution of face to face learning on e-learning integrates important meanings in this learning process. Because of that reason, distance learning is required to use mostly the facilities of face to face learning. Distance learning has a vital role in the process of e-learning's future. By the help of flexibility in e-learning, it includes consistently innovation and development in this approach. Nowadays, the strategy that is required for developing the quality and standards takes over the integration of academic standard, academic supervision and face to face interaction learning in developing distance learning. It is important to design the academic approaches academically, scientifically, and as a completion of dynamic processes. E-learning models are based on high quality, participation and productivity. By the help of productivity, moving the processes into the e-ambient and saving up the expenses, objectives of e-learning can reach to the level of the basics of modern e-learning. In this study, We will give an explanation of what distance education is, and what its effectiveness is. The main focus is on the new technology as the driving force of modern distance education development, such as Data Mining, Cloud Computing, IOT and Triple-Play technologies.

Introduction

A human being is an animate who lives in a cultural environment, has the ability of thinking and speaking, and comprehends the universe as a whole, changeable and flexible according to his/her own symptoms.

The only common point between the early humans and present-day modern humans is the desire to find the answers of the questions why, how and when. With the effort of humans about learning, they continue to interact with their environments and develop their own personalities. Education is a process which helps to obtain the necessary knowledge, ability, and understanding for taking part in society, to develop their personalities in the school or outside of it.

Education is defined in two ways; generally and narrowly. Generally, education is an informal education which starts in primary years to postgraduate years and it occurs in school and foundation of education. Narrowly, education is formal education which provides education-instruction to different areas in society. Informal education contributes to traditional formal education and has the facilities to develop alternatives to distance learning. Distance learning can be named as flexible learning, open plan schools, open university which is defined as a model of education that is done without seeing each other (teacher-student) with using some equipments. Distance learning becomes more of an issue by the help of demand of education, civil and social instruction. Alaku defines the distance learning's facilities such as students' freedom in terms of the duration, place and order of the instruction, the issues are planned for student's self-studies, printed texts, publication of television and radio and provide the other visual and audio equipment; moreover, he defines it as helping students on face to face learning, gathering all of the experts in one's field, and for traditional education providing the costs of education to the lowest level.

The basic aim of this education is to abolish the boundedness partially or absolutely in taking away the services in education, to get benefit from the opportunities not only just for certain groups, but also the persons that are in different conditions; in other words providing the equality of chances in education and instruction. Nowadays, all of the values in terms of social, economic and cultural sense, suffer a rapid change that has never been seen in the history of humans.

The increase in social and individual change in education and instruction causes a great increase in expenditures of education and instruction. With the expenses of education, the demand of distance learning starts increasing in Turkey as in the world.

Life is a journey of constant learning. Cultivating talents can no more meet the needs of developing modern society only from full-time school education, and thus everyone should have the awareness of lifelong learning. All learning has become an urgent need to the individual and the whole society. People must change their ideas to adjust to the need of the age, constantly learn new things and make learning a lifelong activity. As tools of lifelong education, it is necessary to constantly improve modern distance education system, innovative education mode and integrate new technologies, so as to promote educational thought, content, method and mode change, which will deeply affect and better guide learning.

In this study, we will mention four different approaches to the practice of education and distance education and give an explanation to each of them. Regarding the effectiveness of distance education compared to face-to-face education, there are several conclusions mentioned. Then, we will describe the current status of modern distance education and finally give a detailed explanation of the four technologies that influence the development of modern distance education.

What is distance education?

It is the nature of questions that are easier to ask than to answer. This is true of the question “What is distance education?” for several reasons. First, *distance* has multiple meanings. *Distance* can mean geographical distance, time distance, and possibly even intellectual distance. Second, the term *distance education* has been applied to a tremendous variety of programs serving numerous audiences via a wide variety of media. Some use print, some use telecommunications, and many use both. Finally, rapid changes in technology challenge the traditional ways in which distance education is defined. Dan Coldeway, of South Dakota’s Dakota State University, provided a framework useful in helping to define four ways in which education can be practiced. This framework, which considers the two variables of time and place, gives insight into different approaches to the practice of education and distance education. Combinations of time and place result in four approaches to education:

- same-time, same-place education (ST-SP);
- different-time, same-place education (DT-SP);
- same-time, different-place education (ST-DP);
- different-time, different-place education (DT-DP).

Traditional education takes place at the same time in the same place. This is typically the regular self-contained classroom that most often is teacher centered. Different-time, same-place education means that individual learning occurs in a learning center, or that multiple sections of the same classes are offered so students can attend the class in the same place at a time they choose. This is education that is available at different times to students but in the same place, such as a media center or computer laboratory. The last two categories focus on education occurring in different places. Instruction can take place in different places at the same time when telecommunications systems are used. Often, television is used to connect the local classroom with the teacher and students to learners at a distance. Satellite, compressed video, and fiber-optic systems are increasingly used for same-time, different-place education. This approach is also called *synchronous distance learning*. Students can also learn at different times and in different places. Coldeway has said that the purest form of distance education occurs at different times and in different places. In other words, learners choose when and where to learn and when and where to access instructional materials. Recently, World Wide Web courses have been offered to learners anywhere they have access and whenever they choose. This approach is called *asynchronous distance learning*.

The effectiveness of distance education

Many who begin studying distance education wonder about the effectiveness of this approach to teaching and learning. There is no significant difference between distance learning and traditional classroom learning. In other words, distance learning (can be) considered as effective as face-to-face learning. As a matter of fact, it is very clear that instruction delivered to distant learners is effective and that learning outcomes can be successfully attained when offered to students at a distance. Unfortunately, some have misinterpreted the “no significant differences” phenomenon and assumed that instructional technology and distance education do not promote learning. This is incorrect. Actually, the evidence is quite clear that students of all ages can learn from instruction delivered using technology, and that distance education works. It is clear from the research literature that distance education works. Why it works and how it works are important concepts to understand, however. The following conclusions about instruction delivered to distant learners are directly related to effectiveness:

- Training in effective instructional strategies is critical for teachers of distant learners.
- Distance education courses should be carefully designed and developed before instruction begins.
- Visualization of ideas and concepts is critical when designing instruction to be delivered to distant learners.
- Adequate support systems must be in place to provide the distant learner with access to resources and services.
- Interaction between the instructor and students and among students must be possible and encouraged.
- Assessment should be designed to relate to the specific learning outcomes of the instructional experiences.

In summary, distance education can be as effective as any other category of instruction. Learning occurs and knowledge is retained. Students report that they have learned and that they feel their distance learning experiences are as successful as more traditional education. The keys to successful distance education are in the design, development, and delivery of instruction, and are not related to geography or time.

Current status of modern distance education

Now, we are in an information network era, characterized by diffusion and penetration of computers and Internet technologies. Rapid development of information technologies will significantly influence the learning environment. With the development, the forward-looking online education is becoming practical, which brings huge impact on traditional learning way. Judging from the development history, we generally accepted that distance education could be divided to 3 stages. First is correspondence education stage. Broadcast & TV education stage follows, mainly relying on radio, TV, audio and video recordings. Third is modern distance education stage. Modern distance education is a new education form by using network, communication, multimedia and other information technologies to conduct education.

Current distance education mainly adopts computer multimedia technology on Internet. Internet is a global and highly efficient technology in teaching transmission. Its resource sharing can achieve data transmission and interaction across time and space, which greatly supports modern distance education and training. Distance education provides new educational opportunities to those who cannot go to school for various reasons. It is widely accepted by people as a new way of learning. It plays an important role to promote the development of our modern education. However, distance education is still in its infancy and limited by various conditions. There are still certain problems and deficiencies in its development.

As known to all, the essence of modern distance education is educational resources sharing, including teachers, teaching contents and educational thoughts. While many cyber schools only

present their own resources to the public, sharing some resources but in a relatively limited range.

Now, many educational websites establish their own distance education systems, dispersed with each other. These education systems' lack of interaction in exquisite courses, teaching methods and educational thoughts, which restricts a greater share and communication of online education resources, resulting duplication and waste in educational content development.

Distance network education lacks certain vividness and interaction. So far, most of online curriculums are still dominated by large amounts of text. Teachers only mechanically reproduce the book content online, and inculcate it to students. This teaching method is stiff, of no extensibility and richness. Due to space limit, there is no face-to-face communication & discussion between students and teachers. Teachers are not able to observe students' reaction and to know their understanding of content, nor able to timely adjust teaching method or process according to students' feedback; students cannot get teachers' advice timely in the learning process when encountering problems. All these delays will greatly influence effectiveness of learning.

New technology as the driving force of modern distance education development

In recent years, Information Technology, Network Technology, Sensing Technology is developing very rapidly, represented by Cloud Computing, IOT, Data Mining and Triple-Play technologies. These technologies are strong bases of modern distance education and driving force for further development. Then, analysis the prospect of modern distance education in terms of Data Mining, Cloud Computing, IOT and Triple-Play technologies.

The Data Mining Technology

Experts said that Data Mining refers to the process of using new technology and tools to intelligently & automatically extract valuable information from large databases. Data Mining leads data management technology to a more advanced stage. It not only can analyze the historical data and reveal hidden pattern, but also can analyze potentially valuable information, so as to facilitate transmission and use of information.

So far, domestic and foreign experts based on Association Rule and Cluster Analysis, have made certain achievements in researches of the education field. Many experts used Association Rules to analyze large amounts of higherschools' teaching appraisal data and generated some effective association rules through case studies.

Educators can get some useful information through analysis of students' actual achievements and use it to implement individualized teaching and guidance.

Abundant information resources are the core and base of modern distance education. Depending on modern networks, these huge amounts of information sources provide convenience for modern distance education; while at the same time, bringing difficulties in information obtaining, gathering, classifying, and other problems.

- Supposing the situation that we need to make a survey on learners' satisfaction.

Traditionally we use statistical analysis methods such as questionnaires to obtain information, but it is time-poor and inaccurate and can easily lead to decision failed. With Data Mining technology, we can analyze existing data -- learners' behavior, their evaluation of teaching methods and their reaction to different teaching methods, to determine what kind of learners or courses these teaching methods suit for. Pertinently data analyzing and mining could enhance education quality and learning needs. Therefore, with full use of existing data and pertinent data analyzing & mining, we can find effective methods to improve distance education quality.

The Cloud Computing Technology

There is no unified definition of Cloud Computing. According to its principles and features, Li Niu, Ke Chen, Jinxiang Li (2011) described: Cloud Computing is an Internet-centric computing style based on overt standards and service which can provide superior computing power and safe data

storage. Cloud Computing is a mode of resource delivery and use, which means users pay to use resources. Cloud Computing is a huge virtual resource pool composed by hardware, platform, software, etc. It can automatically configure according to the dynamic load size and optimized use of resources to achieve full share of resources. Wherever you are, as long as you can connect to Internet, you can enjoy the mass storage and unlimited computing provided by Cloud Computing Service.

Although the education field is in the initial phase of using Cloud Computing, its promotion seems to be somewhat low. Many companies have developed their own cloud computing education plan. All in all, these programs laid a solid foundation for cultivating talents for domestic and foreign cloud computing industry. At the same time, it builds up cooperation bridges between business and education, further promoting the popularization of cloud computing in the education field.

Cloud Computing has been rapidly promoted in recent years. Its powerful storage capacity and computing power can meet the needs of storage, transmission and on-demand in distance education courseware. At present, though to some extent distance education achieves integration, it has not yet achieved resource sharing in true sense.

The Internet of Things Technology

The Internet of Things Technology, precisely said, is to sense the behavior perception contained by the technology itself. Through the acquisition, processing and analysis of human behavior data, IOT technology finds the perception characteristic and carries out the perceptual recognition. Internet technology is part of IOT technology.

Technology of IOT can be clearer of the learners' identification and can record the accurate learning time and learning process. By practical IOT Technology, distance education and on-site education will be integrated into one.

Practical IOT will achieve a full range of interactive learning between students and teachers. Zhaogong Deng and QingBing Sang (2010) pointed out application of IOT technology has changed the old learning mode of distance education and developed to a new learning style with more teaching scenes and interaction, which not only make students experience the immersive teaching process with more attention, but can improve learning quality. For example, "Looking at Starry Sky" Digital Observatory Project, carried out by primary and secondary schools in Wuxi City, is one of the practical education projects that uses IOT technology to promote students' scientific exploration in school. This digital observatory project makes the use of IOT technology to connect four digital observatories in a network open to all students, which makes the high-end research facilities shared by more students in the region. Reserving online, students can control telescopes remotely on Internet and observe the space. They can also download pictures they observed, share data with others and collaborate in learning.

The Triple-Play Technology

Distance education system is developing toward a real-time, interactive multimedia system integrated with voice, video and data. Triple-Play is the best technology to achieve this process.

Triple-Play refers to the technology & business consistence in the process that Telecom Network, Broadcasting TV Network and Internet develop to Broadband Communication Network, Digital TV Network and next-generation Internet. Network interconnection and resource share can provide users with various services on voice, data, radio and television. Triple-Play is the developing trend of modern information technology integration. It will provide a more rapid platform for the development of modern distance education.

Core business of Triple-Play is video services -- stable, reliable live video & download from Broadcasting Television Network, convenient on-demand service from Telecom Network. This greatly facilitates students to obtain knowledge and meet their diverse needs. Based on computer, distance education covers to intelligent terminal devices like iPad, TV and smart phone. Distance education is developed to an application and published on major operating systems, also compatible with phone and pad, which enables distance education to achieve three-screen interaction and integration in phone, computer and TV and to develop in various intelligent terminal devices.

Table 1. Pros and Cons of the mentioned technologies

	Pros	Cons
The Data Mining Technology	By analyzing historical data, revealing hidden pattern and potential valuable information, it actually analysis achievements and use it to implement individualized teaching and guidance.	Using more data that is irrelevant or old, leading to false evaluation. It can take more than enough amount of time to implement more advanced level of teaching.
The Cloud Computing Technology	It can effectively integrate existing education resources to centralized management, increase resource availability, student initiative and use of quality teaching resources, reduce duplication of teaching content and enable teachers more energy to teaching content and methods design in distance education reform.	Uneven resource distribution, slow update, high construction cost, no cross-platform application and lack of interaction, which seriously restricts further development of distance education.
The Internet of Things Technology	Students online can be absolutely accessible to learn courses through teachers' instruction, blackboard writing, gestures and multimedia methods, and can timely feedback their understanding of the content, while in the same time teachers on teaching site can control the teaching process according to students' performance.	Over dependency on technology. At present, it is observed that the younger generation is a technology freak and they depend upon technology and its devices for every little thing. Losing security on privacy, lesser employment prospects, and complexity.
The Triple-Play Technology	Distance education "On Web, On Cell phone, On TV" makes information comprehensive coverage.	High dependence on the available network based on the current location, that could lead to connection failing.

MOOC

MOOC standing for Massive Open Online Course – is a term likely to enter into our common vernacular. New technology enables the possibility to teach over 100.000 students at the same time in the same online course. Teaching so many students in a traditional campus situation will take more than 250 years.

New technologies enable us to give (the best quality) education to a virtually unlimited number of people. Nowadays the best courses from the best institutions are made available for everyone in the world for free. Institutions are working together to make this possible, for example by Coursera, Udacity, MITx and EdX.

What is a MOOC?

A MOOC is a course or unit accessible, usually with no prerequisites, to anyone who wishes to enrol, usually for free, and with self-assessment or peer assessment along the way. Many now are being offered by household name universities who may not give you credit towards a degree, but will often award certificates of participation, or even a grade.

Most MOOCs are now delivered by acknowledged experts and outstanding teachers. MOOCs are very new, and no-one yet knows what they will mean or what role they will play in the future of education. But many already believe that Pandora's box has been opened. Whatever the future holds in store, you can benefit from these online courses already today.

The difference between MOOCs and OER

The online course material was already available for many years as Open Educational Resources (OER). MOOCs embedded them in courses that start on a regular basis with real homework assignments with a real deadline. However, they differ from OER material derived from distance teaching universities and Open Universities. Most MOOCs nowadays are basically an attempt to move the classroom online, but scalable learning of these massive courses may eventually lead to the breakdown of that model.

How do MOOCs work in practice?

In most of these MOOCs, the study material is broken down into units that require study time of 8-12 minutes each, representing a coherent concept. It gives the opportunity to break away from the one size fits all education. In the end, they perhaps enable massive tailored education to the needs of a student, following a more personalized course and/or curriculum. But these MOOCs also has components to practice what is studied (including retrieval practices) and have feedback on assignments. Feedback to practices and assignments are generated by a computer not only on multiple choice, short answers but also on math, models, programming assignments, etc. However, critical thinking and reflection are still hard to facilitate automatically.

Conclusion

The emergence of Internet and progress of communication technology have directly promoted the rapid development of computer-based online network education. Meanwhile, modern distance education, representative of the education field, is changing the development direction of higher education, carrying the duty to enable every person enjoy a lifelong education. The emergence and development of Data Mining, Cloud Computing, IOT and Triple-Play Technologies will provide a new development platform to modern distance education. But now, we are still in the exploratory stage of these new technologies, with no large-scale application and development, and no thoroughly integrated Triple-Play technology platform. These problems remain to be solved. To better apply these new technologies in the future, there is still a long way to go.

Distance education can be as effective as any other category of instruction. Learning occurs and knowledge is retained. Students report that they have learned and that they feel their distance learning experiences are as successful as more traditional education. The keys to successful distance education are in the design, development, and delivery of instruction, and are not related to geography or time.

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Global education and disaster preparedness

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Abstract. We are increasingly facing the dramatic impacts of intense and unpredictable disasters with ensuing loss of life, destruction of property and cultural heritage. Many of these disasters require citizens to be trained and prepared for self-protection. According to Protection and Rescue law, it is obligation to everyone to become educated in disaster preparedness and management and provide urgent care during disasters. This paper provides the need of establishing Disaster Risk Management preparatory course. It would be the course with brief introduction to policy, role and obligation, disaster preparedness, mitigation, prevention, response and recovery. This paper intends to increase awareness and provide pathways for disaster education and involvement. The objective of this paper is to familiarize with contemporary concepts and practices in disaster management and contribute to the paradigm shift from re-active to pro-active approaches in this cross-cutting field of development. In addition, by establishing a common language and understanding disaster to improve the collaboration among different disciplines and integrate risk reduction considerations using information technology in a pedagogical way. This course targets all stakeholders in the protection and rescue system to raise their awareness and sensitivity in disasters management.

1. Introduction

Disasters do not recognize age. Therefore, vulnerable citizens need to know about the hazards and risks they face, and measures they can take to mitigate and prepare for potential disasters. However, citizens are more vulnerable in the sense that they have reduced capacity and knowledge to deal with disasters. Thus, establishing on-line disaster risk management preparatory course, about natural hazards existing in their specific communities, and the tools available for them to prepare and mitigate potential impacts of disasters will build their confidence and ability in dealing with a life-threatening situation. For disaster mitigation and preparedness, there are specific tasks for the pre, during and post disaster periods. Specifically, it is of vital importance to increase awareness for disasters and to institute necessary skills and resources for mitigation and preparedness. Disaster education is a time and resource intensive aspect of contemporary programs. Despite the widespread agreement in the discipline about the centrality of experiences to learning citizens, little is known about if and how current experiences contribute to learning and readiness for practice. Moreover, in a shared risk landscape, natural disasters do not respect national borders and therefore require increased preparedness. Disasters can occur at any moment and can be at any size or type. Therefore, according to Protection and Rescue law [1], it is an obligation of everyone, to provide urgent care during disasters, assist in policy making relevant to disaster preparedness and become educated in disaster preparedness and management. Many of these disasters requires citizens to provide self-protection.

2. Disaster Preparedness

Studies conducted in Macedonia showed that despite high-risk perceptions, self-efficacy for taking appropriate actions for mitigation is low. Furthermore, responsibility for action, and low levels of preparedness behaviours were observed. We developed a research to create on-line disaster risk management preparatory course to promote disaster awareness to citizens. These materials include

pre- and post-assessment activities, describing physical processes related to disasters, activities on hazards and mitigation strategies. It is not possible to eliminate the occurrence of natural disasters. However, it is possible to minimize damage of disasters since steps and measures can be taken before and after they occur.

Recent experiences have proven that preparatory work like raising awareness must be carried out before they actually take place.

Working with leading experts, the initial task will include a review of best practice in the field of using ICTs in disaster prevention and risk reduction, including information sharing platforms and emerging technologies. Therefore, an active participation in disaster safety plans is desired for moving the world towards a safer living place and sustainable developed society.

Our first approach to the data search was to identify key informants who could either provide us with data or link us to other sources, creating a snowball effect. Our search focused on one kind of data: data on disasters. In this case, the common denominator was attribution in geographic space of the data, the intended link between the datasets.

Our objective is to provide basic protection for each citizen in the community and to prevent possible damages that could happen during and after a disaster. Moreover, establishment of on-line disaster risk management preparatory course of stakeholders on disaster safety team, awareness creation, analysis of the specific vulnerability and hazards of the environment, house and village mapping with evacuation routes and identified safe places, cooperation with the community to be prepared and to act adequately to save lives in case of an emergency. Since, education is considered the best way, for making a safe and disaster resilient society, to reduce disasters risk through knowledge and innovation, the use of information technology in a pedagogical way plays crucial roles in the development of a culture of prevention and preparedness, as they can transfer knowledge and skills to the family and community. When everybody knows what to do and what not to do in a disaster event lives can be saved and damages will be drastically reduced.

Not all emergencies can be prevented. Therefore, an on line disaster risk management preparatory course needs to describe arrangements for responding to such emergencies that might occur in the community environment. A written description of hazards to which the community might be exposed are identified and this allows developing prevention and response activities to minimize them.

Focusing on the implications of the educational process points out the new complex approach related to the extension and deepening of the knowledge and awareness in relation to the process of implementation of disaster risk reduction. With inclusion of on line preparatory course in active learning accessible at anytime, anywhere regardless whether in the compulsory or elective subjects or in both, " people learn easily, but need to be taught", focusing on support of such educative contents.

The UN, International Strategy for disaster reduction (UN/ISDR) in 2006-2007, the World Campaign for disaster reduction have been dedicated to the topic of "Disaster reduction starts in the schools". This topic has been selected by UN/ISDR because it is in accordance with the priority 3 from the Hyogo Framework for action (2005-2015) "use of knowledge and innovation in the education to build culture of security and endurance at all levels. Disaster Risk Reduction is a national and local priority with strong institutional base for implementation. [2-3]

2.1 Why disaster preparedness?

There are realistic results from disaster preparedness. It decreases the fear, anxiety and the losses that accompany the disaster. Citizens know what to do in case of a disaster and where to look for a cover. They are ready to be evacuated to public shelters and know how to cater for their basic needs. The need for preparedness is realistic as disaster destroys great number of lives. Each disaster has permanent effects for the people and the property. It is important to know how to respond to sudden natural changes or any disaster that can occur in our area – earthquake, fire, extreme cold weather or flood etc. Therefore, it is important to make the community safe from disaster influence. What do we mean by better understanding of disaster risk reduction in the education? Compulsory inclusion of issues and topics connected with disaster risk reduction; risk identification and activities related to sustainable development of the educational process; studying the measures for risk reduction and

studying about the preparedness for disaster and response. What is important for the community is the continuous planning and preparation for critical events, which could have serious consequences in identifying proper assessment of the vulnerability. It is an important step to understand the exposure to risks and seriousness and how they can be affected. Risk assessment is the first step to adopt proper and successful measures to reduce the disaster consequences and is an important part in the system of protection and rescue due to the timely and right considerations of all the risks, which could occur in our country.

3. Establishing e-learning disaster risk management preparatory course

Establishing disaster risk management preparatory course for stakeholders in the system for protection and rescue by using information technology and integrating risk reduction considerations in development plans and decisions is more than a need. It would be the course with brief introduction to disaster preparedness, prevention, policy, role, education and response to increase awareness and provide pathways for disaster education and involvement. How can we prepare to cope with disasters? What is our responsibility? The built-in learning tools of the course give an opportunity to participants to monitor their learning progress. To create a common understanding among all forces in the field during disaster response in order to improve the collaboration among different disciplines. Protection and rescue vision is to create our unity in diversity. Disaster risk management preparatory course would be adopted by the protection and rescue directorate-PRD to support the disaster preparedness and to better tackle the new challenges posed by the changing risk landscape in our country.

The on line disaster risk management preparatory course should be simple and easily understandable. The document can be arranged to meet the needs of the stakeholders. It should include the following elements: Introduction about the disasters; List of all stakeholders of the disaster with their responsibilities and contact details, Hazards and Resources identification in the community; Community maps; Do's and Don'ts during an emergency.

A second map should include the environment or the community where they belong. It should be produced in cooperation with employee from Protection and rescue directorate (system) and community representatives. This map shall include the following components:

- Geographical characteristics (higher/lower grounds, rivers, lakes, hills, etc.)
- Transport (roads, bridges, boats, railway, etc.),
- Evacuation routes and safe areas or shelters,
- Buildings including the nearest available resources (Police station, Hospital/Health Center, Protection and rescue forces, Red Cross, etc.)

Hazards that are threatening to strike the community should be identified, according article 35 in the realization of protection and rescue in the area, the local self-government unit will have the knowledge and experience of the dangers.

They can make a list of the dangers in the following: Specify the threat level of the danger as High (H), Medium (M), Low (L), or zero (0). The level of threat is a combined assessment of the frequency and damage potential of a danger. [4]

Listing the past disasters will be useful to address the most frequently recurring danger. Only the dangers that are relevant to the community should be listed.

Concept of civil protection should build on the need to ensure an optimum use of the disaster management knowledge and expertise, through its further integration into existing practice. Within the scope of the research, a series of concrete activities will be designed to test the feasibility and adequacy of the proposed concept.

The aim of the e-Learning programme is to raise the level of awareness and preparedness as well as to enhance the analytical skills and professional competencies of key stakeholders in different areas of disaster risk management and mitigation. The courses are designed specifically to build competencies of disaster management professionals, development practitioners and general public. The course is also beneficial for those who are not able to attend or do not have sufficient time to attend interactive programmes at the training centre under Protection and rescue directorate. The participants enjoy the benefit of flexi-time and flexi-space. They can log on to the course from anywhere and at any time. They can attend discussions and course related activities whenever and

wherever they feel convenient. The courses would not have face to face discussion or final examination. The online discussion allows participants to share their views, experiences, documents, images and videos. Participants can have options to receive discussion entries in their personal e-mail accounts. Unlike classroom-based pedagogy, there is no examination system in the web-based courses.

The success in the course largely depends on certain parameters like completion of personal profiles, participation in the discussion, timely submission of assignments and end of the course etc. Based on active involvement in their concerned courses, participants are evaluated and receive grades. We would like to create two main categories of online courses - Comprehensive Natural Disaster Risk Management Framework and Thematic one. The Comprehensive Natural Disaster Risk Management Framework Course is open for all those who are interested in acquiring Comprehensive Natural Disaster Risk Management Framework knowledge on disaster management, mitigation, preparedness etc. The Thematic Courses we offered to those who have either completed the Comprehensive Natural Disaster Risk Management Framework Course or having thematic qualifications / experiences in their related domains.

The objective of this course is to familiarize practitioners with contemporary concepts and practices in disaster management and contribute to the paradigm shift from re-active to pro-active approaches in this cross-cutting field of development.

It also aims at establishing a common language and understanding among development practitioners in order to improve the collaboration among different disciplines and integrate risk reduction considerations in development plans and decisions.

This introductory course of the program addresses basic questions such as "what are to be considered natural disasters?", "where do they strike the most and how?" and "what are the components of comprehensive disaster risk management?".

It also reviews the institutional arrangements and financing mechanisms of disaster management systems, and identifies the role of national and local actors in the processes related to risk assessment, mitigation and financing. This course targets all stakeholders in the protection and rescue system to raise their awareness and sensitivity in prevention of natural disasters. The built-in learning tools of the course give an opportunity to participants to monitor their learning progress.

The course will cover the following topics:

- Module 1: Introduction to DRM - basic concepts of Disaster Risk Management, players and Terminology;
- Module 2: Prevention, Relief and Reconstruction: from Vulnerability and Risk assessment to Damage and Reconstruction Needs Assessment;
- Module 3: Introduction to Safer Cities, Community Based DRM and best available tools to enhance resilience.

3.1 E-learning course: Comprehensive disaster risk management framework

The Comprehensive Disaster Risk Management Framework is the introductory course on disaster risk management. Successful completion of this course allows participants to enrol in the subsequent specialised courses. The course addresses basic questions such as "why are disasters a development issue?" and "what are the components of comprehensive disaster risk management?" It also reviews the institutional arrangements and financing mechanisms of protection and rescue system, and identifies the role of national and local actors in the processes related to risk assessment, mitigation and financing. This course targets all stakeholders to raise their awareness and sensitivity in reducing the impact of natural disasters. The in-built learning tools of the course give an opportunity to participants to monitor their learning progress.

3.2 The underlying motive behind which we decided to create an on-line disaster risk management preparatory course are many unresolved issues in the field of self-protection. Such is the fact that knowing the contents of protection and rescue is very important for a person's readiness, but also that the problems of disasters in our society are ever-present. Above all, we were interested in the views and opinions of the local governments on the importance of setting up an online course in order to

study self-protection content in newly created conditions. In making this research, two starting points were taken: The existing legislation; and Understanding the importance and need for stakeholder preparation to create an on-line disaster risk management preparatory course.

Constitution emphasizes that human life is inviolable, and all the natural treasures of the Republic such as the flora and fauna and the goods in common use enjoy special protection. The National Strategy for Protection and Rescue has made it clear that in the education system, the annual school curriculum mandates basic theoretical and practical content for disaster management, prevention and protection according to the characteristics of the region. [6] Pursuant to Article 119 paragraph 1 of the Law on Protection and Rescue, a Rulebook on the content and manner of conducting self-protection training in educational institutions is prescribed. [7]

According to analysts' assessment, more and more international documents have been adopted that provide a legal basis in the formulation of civil protection policy and in the definition of the need to address its international status. In this respect, Articles 52 to 57 specify the general protection of civilians necessary for the survival of the civilian population.

3.3 Research methodology

The focus is, in any case, on the individual, on his unhindered and free development, encouraging, empowering and encouraging him/her to protect himself/herself in certain situations, to help himself/herself and others in the environment, society and family in times of disaster. The purpose of our research is to find out the views and opinions of stakeholders We have received encouragement for such an approach because the importance of self-protection content is not a research problem in our country and therefore we believe that the research will have its own meaning and justification.

3.3.1 Research methods, techniques and instruments

According to the subject defined, the purpose and objectives of the research, the most appropriate method for this research is the descriptive - analytical method. The determination of this method came from the subject of the research itself, its purpose and tasks. [8] Empirical data collection techniques were used as a survey technique. During this brief survey, we used questionnaires as a tool for data collection, and the survey was anonymous in order to obtain more honest responses from the subjects.

Table 1. Structure sampled

Profile	Number	Percentage %
Local government forces/ Firefighters	64	46,71
Protection and rescue forces	39	28,47
PRD Main HQ	17	12,41
Mayor - local government	17	12,41
Total:	137	100

Table 2. Structure of the sampled in relation to working experience

Working experience	Number	Percentage %
up to 10 years	31	22,63
from 10 to 20 years	44	32,12
more than 20 years	62	45,25
Total:	137	100

We have made this choice to investigate whether there is a difference in attitudes and opinions regarding the importance of studying on- line self-protection content depending on the work

experience and educational profile of the stakeholder in the protection and rescue system. Respondents were informed in detail about the content of the questionnaires and how they should be completed.

3.3 Analysis and interpretation of the research results

3.3.1 Opinion of stakeholder in the protection and rescue system on the importance of self-protection

Regarding the first question of our research, which is: how important is the study of self-protection content for empowering stakeholders for disaster conditions, the majority (75.19%) think that they are important for empowering participants, that is, of great importance; 22.62% consider it to be of little importance; while an insignificant proportion (2.18%) consider it not significant.

Table 3. Opinions of stakeholders in protection and rescue system about the importance of self-protection

Answer categories	STAKEHOLDERS IN PROTECTION AND RESCUE SYSTEM						TOTAL	
	Protection and rescue forces		Local government forces/ Firefighters		Mayor on local government			
	f	%	f	%	f	%	f	%
They are of great importance	76	73,79	12	70,59	15	88,24	103	75,19
They have little meaning	24	23,30	5	29,41	2	11,76	31	22,62
They have no meaning	3	2,91	0	0,00	0	0,00	3	2,18
TOTAL	103	100	17	100	17	100	137	100

$X^2 = 2,703$ $df = 4$ $p = 0,05$

Almost equal is the attitude regarding the meaning, most of which (75.19%) responded that the contents for self-protection are of great importance and 29.41% that they have little meaning. The results give us the right to conclude that almost all respondents understand the essence of knowing self-protection content, and find it desirable and useful to study it, especially in a disaster preparedness, where it is necessary to act properly. If there is disaster preparedness and self-protection content and acquired previous knowledge and skills, it will be easier to implement, that is, to enable the stakeholders to respond to disasters.

3.3.2 Differences in opinion regarding the role of work experience

In this part of the research, we attempted to find out if and how many stakeholders with different working experience had different opinions on the importance of creating on-line disaster preparedness course for self-protection content. In doing so, we separated three groups of respondents with different work experience. The first group consists of interviewees with up to 10 years of experience, the second group with 10 to 20 years of experience and the third with over 20 years. The results are shown in Table 4.

Table 4. Opinions among stakeholders on the importance of creating on-line disaster preparedness course regarding different working experience

Answer categories	WORKING EXPERIENCE						Total	
	Up to 10 years		From 10 to 20 years		More than 20 years			
	f	%	f	%	f	%	f	%
have great significance	15	48,39	26	59,09	62	100	103	75,19
have little meaning	13	41,93	18	40,91	0	0,00	31	22,62
have no meaning	3	9,68	0	0,00	0	0,00	3	2,18
Total	31	100	44	100	62	100	137	100

$X^2 = 45,448$ $df = 4$ $p < 0,01$

The data obtained on this issue give an opportunity to be analyzed and interpreted from many aspects. We will first present and comment on the total responses received from all respondents regarding the importance of creating on-line disaster preparedness course regarding different work experience. Based on this, it is concluded that although the respondents have different overall length of service, they have relatively the same opinion, 75.19% think that creating on-line disaster preparedness course for self-protection is of great importance. X - the quadratic test is significant, there are differences in the responses of PRD forces, firefighters and Mayors.

Therefore, it can be concluded that stakeholders who have a different working experience have a difference compared to those with more work experience than those with up to 10 years' experience. 100% believe that self-protection content has great importance. There is also a significant difference in the answers given among respondents with work experience. Another confirmation is that employees with more work experience are familiar with the former protection and rescue system and education system and have a different opinion on this issue. It is because they have studied different curricula and programs and have also participated in the activities of civil protection and know well that if we prepare and train youth for disaster we will deal better with it. The need to create on line disaster preparatory course with content in the field of self-protection, especially in terms of preventive character, is evident.

3.3.3 Regarding the question on which content is most often to be realized, 44.66% answered via Introduction to DRM - basic concepts of Disaster Risk Management, players and terminology, 22,33% Prevention, Relief and Reconstruction: Vulnerability and Risk assessment, 24,27% Introduction to Safer Cities, Community Based DRM, and while 8,74% on the best available tools to enhance resilience.

With this question, we wanted to find out which and how the content is of interest to them in the DRM area. The results give us the right to conclude that topics and content are conveyed in different ways, which suggests that forces as carriers of that activity practice different ways for successfully achieving their goals. The results are shown in Table 5

Table 5. Method of realization of contents

Category of answers	STAKEHOLDERS				TOTAL	
	PRD Forces		Local government forces			
	f	%	f	%	f	%
<i>Introduction to DRM - basic concepts of Disaster Risk Management, players and Terminology</i>	35	54,68	11	28,21	46	44,66
<i>Prevention, Relief and Reconstruction: Vulnerability and Risk assessment</i>	14	21,88	9	23,08	23	22,33
<i>Introduction to Safer Cities, Community Based DRM</i>	12	18,75	13	33,33	25	24,27
<i>The best available tools to enhance resilience</i>	3	4,69	6	15,38	9	8,74
TOTAL	64	100	39	100	103	100

$X^2 = 8,718$ $df = 3$ $p < 0,05$

X^2 is importantly, Protection and rescue forces and local forces have different opinion in the way of Disaster risk management content.

4. Brief analytical course preparation:

Vision, Mission, Objectives, Structure Features/ Principles and Participation

<i>Vision, Mission, Objectives</i>	<i>Structure</i>
<ul style="list-style-type: none"> - Fostering e-learning and its activities - Sharing and exchange of knowledge, expertise - Building community and shared understanding - Addressing emerging issues in civil protection and disaster management - Stimulating research, innovation and new technologies - Building bridges between e.g. science and practice 	<ul style="list-style-type: none"> - Administration by PRD in close cooperation with scientist - Permanent steering body with regard to the existing steering structures - Working groups on different themes - Collaborative platform to share information best practice and lessons learned as well as to provide discussion opportunities and linkages to other networks, platforms and initiatives - Building on what exists (e.g. trainings, exercises) and step-by-step approach
<i>Features/ Principles</i>	<i>Participation</i>
<ul style="list-style-type: none"> - Open - Flexible - Needs-driven - Consultative and providing problem-solving mechanism - Network dedicated to the actors 	<ul style="list-style-type: none"> - National civil protection and disaster management authorities, - professionals, teams, PRD Main Headquarters, - Citizens - Training centres, trainers - Universities, academia - Scientific community and research centres - Civil protection related institutions - Non-governmental organisations (NGOs) - Different levels of participation could be envisaged for other possible participants.

According Protection and Rescue Law there is an onus to carry out specific measures, activities and steps to protect and save the lives of the people jeopardized due to natural and other disasters. Also, according the Rule Book about the content and the conduct of the training for self-protection within the educational institutions, and with an aim to accomplish the system of protection and rescue, the Protection and Rescue Directorate is obliged to carry out training, exercises, to establish capacities for protection, rescue and assistance but also self-protection, self-assistance and mutual help. Self-protection represents basic type of protection for people to survive in case of emergencies and other hazards. The point of self-organizing or self-protection of the people lies in the fact that an organized protection in case of disaster will not help everyone who is in danger in spite of all the efforts and engagements. This lack of protection of each organization could be resolved with a massive engagement of the population i.e. their enabling and equipping to carry out tasks within the area of the protection. Therefore, in order to realize the self-protection, it is a duty of the Protection and Rescue Directorate to organize and conduct the necessary activities, which will enable better preparedness in case of disaster. In this case, the self-protection should be well-organized and coordinated activity in function of the general task to protect the people and the material goods in case of disaster. According Todorovic[13], self-protection firstly consists of providing first aid to yourself, your closest family and neighbours as well as applying all the other measures for protection and rescue carried out by the citizens itself. Self-protection is an activity of the citizens to prevent emergence or to mitigate the consequences of the natural and other disasters, which could influence their health or lives. Preparation for self-protection is accomplished through various forms of communication with the citizens carried out by the Protection and Rescue Directorate.

6. Awareness for disaster education

For effective disaster management, public-awareness raising and ensuring their participation is highly important. To ensure this participation and increase preparedness behaviour in the society we should understand the factor motivating the citizens to be prepared.

By analysing the informational factors, which are effective in the process of disaster preparedness, it is seen that two types of evaluations are important with regard to disasters. In the first evaluation, the individual wonders whether there is a hazard, whether there will be earthquake or when it will take place, or if it does whether there will be human casualties and loss of properties. This could be called critical awareness. The secondary evaluation comes afterwards. The questions like could the hazard be coped with, could something be done, what are the sources, or are they adequate, could be asked. The individuals' demonstrating preparedness behaviour can be seen after giving positive answers to both of the evaluations. In other words, for taking the first steps it is required that the individual realize the hazard and believe that he/she can do something. For the citizens' who are aware of the hazard and accept it, knowing what could be done at the individual level (overcoming skills) and with psycho-social sources such as social support, control belief and self-sufficiency etc. is highly important. Preparedness behaviour could only come up, should the citizens' 'overcoming skills and sources are at the level of meeting hazard perception and those that have to be done.

Is the development of awareness raising on line course to reach out the public at large (civil society, workers, decision- makers, etc.) with messages related disaster reduction, better understanding of how human activity can link to disaster and what can be done at the individual level to contribute to disaster reduction? In addition, raising awareness about risk and its underlying causes is crucial in reducing vulnerability. [15]

Finally, establishing a common language and understanding disasters in order to improve the collaboration among different disciplines and integrate risk reduction considerations using information technology in a pedagogical way.

7. Conclusion

From the analysis of the empirical data obtained from the research, we concluded that e learning course is of a great importance. Disasters are integral features of the Macedonian environment and their potential pays great attention to national, local, economic and physical planning. The current situation, especially vulnerability and exposure are the result and continuation of development planning processes that are rarely considered direct and indirect triggers of disasters that are gaining in intensity. It is one of the indicators that there is a clear need to regulate self-protection activities, as this need is constitutive of population protection and rescue activities.

The authors describe the initiative and its implications for e- learning DRM preparatory course for increased attention from educators and education researchers to the opportunities and challenges represented by anytime, anywhere by distributed learning.

"We must always look forward, proud of what we have done but focused on what we still have to do "

The digital age means much more opportunities among which improving the access to broadcasted content across the county as to create our unity in diversity. We should keep working together for prosperity. Having an efficient protection and rescue system that involves cooperative work of all the relevant factors in the system will create experts that will be able to be involved. To make this possible, an efficient system for protection and rescue at all levels should be created. It will help accomplish the new imposed situations in the societal and economic context, which consider principles for sustainable development. This means providing opportunity to gain new knowledge, skills and abilities, basic concepts, features of the natural disaster, consequences of their emergence, means and equipment used for protection and rescue, practicing procedures, preventive and operational measures for personal and collective protection in case of emergencies. Also, further education and training by considering the guidelines for sustainable development of the society as a whole.

Only if citizens are educated well a strong community can be built. In order to increase a community's ability to respond effectively to future disasters, citizens must be prepared about disasters and their associated risks as well as about initiatives that can be taken to reduce these risks.

Finally, we could say that widespread and continuous training programmes are needed in order to raise awareness against disasters. The notion and perception that something should be done for risk perception and hazard reduction have to be stressed in the training programmes. In addition to these, it is necessary to ensure the appropriate skills and necessary sources in order to reduce disaster damages. Preparedness is an important investment against natural disasters.

With good information, strategic thinking and careful planning we can work together to save lives and livelihoods.

An axiom in disaster preparedness is that a successful response to a disaster is directly related to management of preparedness before the event and response after it. [16] It is vital to become actively engaged in the processes involving disaster preparedness on line.

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