

# Improvement of Teaching Methodology of Mathematics in Riga Technical University by Using Video Lectures

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**Abstract** – Improvement of teaching methodology of mathematics by using video lectures is a current issue in Riga Technical University because teaching methodology largely determines the quality of studying. The aim of the article is to explore the possibilities of how, based on students' motivation, to improve the teaching methodology of mathematics and to promote active studies of mathematics. The material "E-learning materials made by Riga Technical University" was worked out to achieve the set goal which will help secondary school pupils to prepare themselves for studies at the university.

**Keywords** – Active studies, methodology of mathematics, video lectures.

## I. INTRODUCTION

The long-term goal for the development of Latvia is to have educated, creative and enterprising people. Nowadays the world needs specialists able to analyze complicated phenomena, determine the essence of problems and their solutions, synthesize and integrate various elements and can use information effectively and constructively cooperate with other people. Engineers are valued and needed specialists in labor market, which is why quality education in the professional activity for new engineers have important role in the future of the country. Experience shows that it is easier to study if one has accumulated good basic knowledge in sciences [7]. That is why YouTube channel was created in Riga Technical University, where learning videos were added that could help secondary school pupils to prepare for studies in university. Practical testing of this methodological material was done, paying special attention to promotion of the methodology of acquisition of mathematics [1]–[4].

Using method of theoretical literature analyses, psychological understanding of the adults was described in the article, as well as necessity of education for adults and motivation to study was discussed.

## II. PSYCHOLOGICAL ASPECTS OF ACQUISITION OF MATHEMATICS. MATERIALS AND METHODS

The theoretical ground for learning mathematics was worked out within Mathematics Education (ME).

At the beginning ME research was developed within cognitive psychology. Constructivism as a theoretical ground appeared in 1985 – 1995 and became a dominant theory, based on which ME research was carried out and justified [6], although, it should not be forgotten that traditional teaching of

mathematics is based on the grounds of behaviorism. The essence of ME theoretical ground is:

- Behaviorism – based on the observed changes in human behavior. New behavior model is repeated until it becomes automatic.
- Cognitivism – based on thinking process, which occurs in behavior. Changes in thinking are evaluated by changes in human behavior.
- Constructivism – based on each individual's individual organization of experience in report system, which serves for understanding the world. Facing a problem creates opportunity to save the change in the created report system.

Theoretical grounds of learning mathematics also determine the lecturer's role in the learning process.

In Behaviorism lecturer is thinking more about the teaching outcome than about the process. The learning process is isolated and not connected with other subjects. The methods used in work are one-way methods: from lecturer to student, the feedback is minimal.

In Cognitivism lecturer prefers evaluation methods that require constructive answers, projects, summaries, and tasks with several steps – everything that can reveal person's conceptual understanding better than tests or short answer tasks. Lecturer activates all stages of students' cognitive process – detection, realization, remembering and using.

The role of the lecturer seriously changes in Constructivism, because one of the main principals of constructivism claims that knowledge can never be transferred directly from one person to another. The only way that people can gain knowledge is either create, or construct it themselves. Thus, the task of the lecturer is to change the environment of students, so that they can construct themselves such cognitive forms which the lecturer wants to give them.

## III. SIGNIFICANCE OF UNDERSTANDING OF PSYCHOLOGICAL PECULIARITIES OF ADULTS IN ACQUISITION OF MATHEMATICS

Nowadays adult learning is becoming a lifestyle. Exploring the data from the employment statistics and their relationships with the educational level in European countries, we get proof that lifelong wholesome realized learning provides personality's fruitful action in professional and social life. As the role of mathematics increases not only in scientific-research but also in school, while working with various

computer programs, great attention must be paid to the quality of studies of mathematics in university study programs.

In adult education it must be taken into consideration that part time students gain education parallel to taking care of family and work obligations. Such students are not always psychologically ready to restart intensive study process; there are steady pictures in their minds about their abilities and knowledge that not always correspond with the reality. Pedagogue's first task is to assure students of their positive abilities and give the necessary knowledge about the study process in general. During the study process the lecturer is the person who is responsible for the students to gain or take over his/her experience or knowledge. Lecturer ensures quality study process through his/her own life experience, professional competence and arsenal of methodological techniques. Student is a person who wishes to gain this experience or knowledge and to take the opportunity in order to improve, to become creative in taking independent decisions and actions.

The pedagogue must create appropriate teaching plan and teaching methods for each specific group, where the stress is put on cooperation, positive motivation and perspective. The adult's personality and chosen goals must be taken into account during the contact.

As experience shows, the greatest problem for the applicants is the big amount of repetition material, which is why the lecturer must successfully organize both, usage of visual consumables, and atmosphere of positive contact, which would encourage the cognition in students and willingness to achieve good results. To facilitate the repetition process for the participants, great attention must be paid to usage of visual learning materials.

It is advised that the learning materials for studies are visualized as much as possible, giving the opportunity to see the material both as a whole, and in details. Parallel to the example of the task solving, theoretical grounds and explanations must be given. Students, who are combining studies with work and are able to attend only part of the offered classes, want to receive short and specific information. Their attitude towards obligatory homework is negative, thus they want to receive learning material that is appropriate for independent work – concise, understandable and with ready examples of problem solving. To create the interest, lecturer must be not only knowledgeable but also organize lectures so that students are not bored and they do not lose attentiveness. Nowadays pedagogy suggests that most important is the correlation of the lecturer and the student that involves psychological and practical preparation for action, realization of action and evaluation. The mastery of lecturer is in the ability to choose such teaching methods that evoke activity in students and create positive atmosphere in the study process. During the process of educational changes methods have more significant role than study programs, textbooks or teaching computer programs, because textbooks, or computer programs do not promote the quality of education, if the pedagogue does not have the necessary skills to use them.

Nowadays a significant place in the list of teaching methods

is for e-learning. UNESCO experts define e-learning as „studies with the help of the Internet and media” [12]. E-learning can easier be defined as the usage of the Internet and digital technologies to create experience that requires improving learning methods in education.

The usage of technologies during the study process allows differentiating creation of skills of problem solving during the lessons. It gives a chance for a teacher to demonstrate also his/her own creativity and talents. H. Borko and A. Vitkomb's mention an important aspect of the teachers' knowledge of language, which in multicultural environment is especially important [12].

ICT usage is approved in all countries, thus, data from international surveys state that ICT is being rarely used in mathematics lessons. Wider research and data about positive influence of ICT usage in teaching mathematics could promote and push it to an effective use. Each student is a personality with his own skills, information acquisition speed, abilities and interests. That is why study programs of mathematics and didactics must be improved based on ICT (devoting more attention to the use of mathematics, including using ICT), creating learning materials based on modern technologies and ensuring access to them in internet. It provides the opportunity to:

- Facilitate lecturers' work during the classes and in preparation for them through using ICT to visualize learning materials and in continuous improvement of them;
- Place the materials in internet, which would significantly facilitate studies for those students that work and are not able to regularly attend lectures;
- Gain skills and habits to use ICT widely in students' everyday work when acquiring e-materials.

Thus, by using ICT possibilities during the implementation of the study programs of mathematics, we will not only facilitate the work of lecturers and make adult study process more interesting and effective, but also significantly improve the quality of the higher education and the level of training of specialists for labor market.

Although the development of technologies has promoted the progress of this type of teaching, technology cannot be considered an end in itself, but as a tool for better and easier learning. It is confirmed by Hannafin, Land and Oliver [13], suggesting that technological tools must be used under psychological and pedagogical preconditions. Mioduser, Nachmias, Oren and Lahav [15] warn about the tendency “for technology to go one step forward, but pedagogy – two steps back”.

#### IV. NECESSITY OF THE ADULT EDUCATION AND MOTIVATION TO STUDY

Mathematics has many practical applications both in our everyday life and also in fields of modern science and technology. Mathematical models are used in many economic and social processes of our lives, they are more and more included in technical and social artifacts and that is why often become „invisible” for ordinary people [14].

For the work of mathematics lecturer to be effective, he/she must know the subject well and must understand how to teach it. Positive attitude towards mathematics and self-confidence in the acquisition of it is also connected with better results in mathematics. These motivating aspects influence the decisions about involvement in the learning trends or educational programs with deeper acquisition of mathematics. As the motivation to acquire mathematics is a set of motives that create and keep an active learning process in the acquisition of mathematics, learners should be helped to structure and plan studies to motivate them. One of the conditions to find out the most effective ways to motivate the learners to actively acquire mathematics is relying on peculiarities of the age of students.

Methodology of teaching greatly determines the quality of learning. Pedagogue's task is to help students to acquire knowledge and skills, the most important of which is – the skill to learn.

The word “method” comes from the Greek language and in direct translation means „road to something”. Teacher's and student's didactic cooperation system is the teaching method, with the help of which students gain new knowledge, skills and abilities at the same time developing also their own cognitive skills [9]. Teaching method means teachers and students joint methods of activity during the learning process that help to carry out certain tasks.

There is no single comprehensive classification of teaching methods, different authors group them differently. Voldemar Zelmenis [10] suggests the following division:

- By types of cognition (mutual, visual and practical methods);
- By main tasks of methods (knowledge gaining, creation of skills and abilities, development of abilities and methods of evaluation);
- By the activity of students' cognition and independency in studies (dogmatic, reproductive, problematic and research methods).

It is important to evaluate the level of learning motivation in the acquisition of mathematics of learners, because, only after the pedagogue knows it he/she can better organize the educational process for students. Professor J. Mencis points out that during the process of acquisition of mathematics minimal level can be distinguished, and reaching it has the crucial role in whole further mathematical development. The minimal level refers to understanding and remembering separate mathematical concepts, as well as to creation of the separate „node” abilities. Professor J. Mencis stresses that the acquisition of mathematics can happen only if students actively think along during the solving process of tasks [11]. Moreover, to achieve the minimal necessary level basic exercises have crucial role.

“Learning mathematics is a road from the known to the unknown, from understanding to the not yet understood, from question to answer. A system that gives opportunity to save efforts and achieve as much as possible is needed here,” that is what professor E. Ģingulis writes in [5].

## I. EXPERIMENTAL VERIFICATION OF HANDOUTS

The author carried out a survey of groups of students in RTU where she works. In the beginning of the semester students were informed about the research, about its significance in the further activation of the cognition process of learning and what students will gain from it.

## V. RESULTS OF SITUATION ANALYSIS

The task of the pedagogue is to keep the interest of the learner with pedagogical methods. The subjects that are not closely connected with the future profession or other life plans of the learner must be offered in the way that is acceptable, so that it does not cause aversion. The video material [8] that was made and tried out in practice by the author helped learners to understand separate mathematical questions, gave support for individual work in the acquisition of mathematics, helped to prepare for the tests and, as a result, promoted motivation of learners for active studies of mathematics.

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