



Teaching of Mathematics to Non-Mathematicians Using Moodle

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Abstract

In recent years, a decrease in mathematical knowledge is observed among first year university students in many countries. Mathematics as a subject has remained quite difficult and unpopular among most students. The time for theoretical and practical classes has been reduced, so it was necessary to modify the way of teaching and learning. New technologies provide teachers with many useful tools that can be used to improve the teaching process. Many universities use the Moodle platform to develop online courses proposed as a supplement to the classroom lessons.

In the article, the experience of three Baltic States universities (Aleksandras Stulginskis University, Latvia University of Agriculture and Estonian University of Life Sciences) is discussed. There are different mathematics course programs which provide different number of credits and also different hours for lectures and practical works. The aim of the courses is an understanding of basic concepts, solving tasks and application of this knowledge in students' further studies.

Our experience shows that the secondary-tertiary transition in Mathematics is very problematic for many of the students. The Virtual Learning system can be a useful and flexible teaching tool, and also can help learners to find information and to observe their own progress. The study shows that the use of information technology for teaching Mathematics is quite problematic due to multiple reasons, primarily due to the particularity of mathematical symbols and graph plotting and also due to a need for live teacher-student communication while solving any occurring problems; therefore, even though it is a very powerful supplementary tool, the drawbacks of Moodle as the primary platform for teaching mathematics to non-mathematicians outweigh the benefits. Nevertheless, it can be used as an addition to the curriculum for students who want to spend extra time mastering theoretical material and solutions of typical problems.

1. Introduction

Aleksandras Stulginskis University (ASU) is a state institution of higher education and research, which is constantly improving its activity and meeting the highest expectations of society needs. It is the only state institution of higher education and research in Lithuania awarding the diplomas and degrees at PhD, MSc and BSc levels in the fields of food sciences, agriculture, forestry, water and land resources management, bioenergy and mechanical engineering, climate change and sustainable use of natural resources.

The goal of the Latvia University of Agriculture (LUA) is to provide the possibility to obtain higher academic and higher professional education in agriculture, veterinary medicine, food technology, engineering, forestry science, social science, information technologies and environment management sectors as well as to develop science and to maintain and develop the Latvian intellectual potential and culture.

Estonian University of Life Sciences (EULS) is the only university in Estonia whose priorities in academic and research activities provide the sustainable development of natural resources necessary for the existence of Man as well as the preservation of heritage and habitat.

Most of the graduates of the Aleksandras Stulginskis University of Agriculture, Latvia University of Agriculture and Estonian University of Life sciences get employed within the infrastructure of agriculture and rural development, in state management and structural funding administration institutions, and modern farmsteads. The programmes of our universities are mostly orientated to the agricultural specifics related areas. Therefore, these studies are popular among students from rural regions.

Mathematical knowledge is indispensable to specialists to draw certain conclusions, make rational decisions and to foresee their consequences in the nearest future. The Mathematical literacy as one of the fundamental general competencies should be gained and improved while studying mathematics-related subjects.

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Mathematics at our universities is a compulsory subject for first-year students but it is not the main specialty subject. What are the objectives of mathematics teaching and learning at the university? To begin with, a further development of mathematical skills is necessary. Next, an introduction to some of the broader areas of Mathematics is beneficial. Finally, it is of great importance to develop students' ability to simulate and understand the mathematical text and to be able to present real-life problems through the mathematical expression [13].

One of the main aims was to renew the process of teaching mathematics and learning using new information technologies as well as to compensate the decrease in studying hours with lecturers, and to improve the self-control means and also to adjust the studying material to the needs of students. Even though many lecture courses involve tutorials, workshops, and/or computer labs, many students require additional help. The teacher and the student roles have changed. The time for theoretical and practical classes has been reduced, so it was necessary to modify the way of teaching and learning [9]. One of the means to help students master the subject which they are studying is e-learning.

2. Materials and methods

In this paper we present an overview of e-learning environments for mathematics teaching that we have implemented using the Moodle platform at Aleksandras Stulginskis University, Latvia University of Agriculture and Estonian University of Life Sciences. The methods of analysis of scientific literature, analysis of Mathematics courses in Moodle, and interview were used in the research.

3. Results

Students from rural areas do not always have good conditions for learning, i.e. there is no opportunity to choose a school, it takes more time to reach the school, or the lack of a motivating learning environment. Therefore, traditionally more students who enter our universities have lower scores than those who get into other institutions of higher education. Besides, the transition from secondary school to tertiary/university presents major difficulties with mathematics courses for an important part of students [4, 11].

The discussions with colleagues have revealed some concern in matters such as:

- First-year students' inaptitude to study independently. Students of all specialties are taught Mathematics from the first semester. Lecturer not only has to read the lectures, but also to help students to adapt, i.e. to teach them how to learn.
- Students have different level of preparedness.
- First-year students have insufficient skills of mathematical text comprehension. This is because students did not consider Mathematics as a priority subject at school; they were not interested in it or even ignored it as an impossibly difficult thing.
- Due to a rise in the use of modern technologies and an overload of information students wish to get information quickly and with no notable effort.

Several authors emphasize that teaching methods in studies of higher mathematics have to be specifically devised so as to meet students' expectations and provide a deeper understanding of mathematics [7, 16]. Thus the process of learning could be more involving, interesting as well as linked with practice [10].

Some of the benefits of e-learning in education, obtained from the review of literature [1, 3, 5, 6, 9, 17] includes the following: the possibility to use video, automatic assessment, links to outside sources and learner autonomy.

Videos have an advantage of, when done objectively, explaining in a few seconds something that needs several pages when written [15] From a didactic point of view, the usage of multimedia tools to create attractive activities makes the learning process friendlier for students [8]. They can pause the lecture while they think through the material, and they can repeat explanations until they are fully understood [3].

The video material prepared by ASU teachers demonstrates only separate fragments of difficult tasks solution (for instance such as matrix multiplication, the calculation of limits, etc.). We think that non-mathematician students would get bored watching long-lasting mathematics lectures.

Automatic assessment is a comfortable tool for both teachers and students. The automatic assessment of the quizzes frees up time for the teacher to concentrate on other aspects of the learning process [2, 12]. The students can check the answer immediately. Regarding the results of our research, closed questions are the most commonly used in the assessment in our courses; however, they cannot measure certain learning outcomes, such as the ability to communicate and articulate explanations, organization of the information, and creativity [14]. Moreover, for higher mathematics

tasks, the right answer is as important as the solution - the chain of logical judgments. Moodle allows using *plugins* to create materials that use mathematical symbols, but often for first-year students such tools are not convenient.

The possibility to insert links to outside sources to material presented in Moodle is a quite important characteristic of e-learning. However, mathematics learning in foreign languages can be a big challenge for many of our students and regrettably, most of the outside sources are not in national languages (Lithuanian, Latvian or Estonian).

It should be noted that one of advantages of e-environment is taking the individual learners' differences into consideration. Some learners can pay attention to certain parts of the course, solve self-assessment quizzes many times, while others are prepared to review the entire course. Thus a student can study at his or her own place and speed, regardless slow or quick.

E-learning, in spite of the advantages, certainly has also some disadvantages. Discussions with colleagues reveal that it will be difficult to control or regulate illicit activities such as piracy, copying, or cheating. Preparing presentations, video and quizzes requires good writing skills from teachers and learning requires good reading skills from students, in order to correctly understand information or interpret the questions. Often consultations face-to-face are less time consuming, more effective and more enjoyable than communication by internet. Finally, the success of learning depends on the individual student's motivation and rigorous work discipline.

4. Conclusions

Our experience shows that the studies in Mathematics at universities are very problematic for many of the first-year students. An e-environment can be a useful and flexible teaching tool for helping students to find information and to observe their own progress. The research shows that the use of Moodle for teaching Mathematics is quite problematic due to multiple reasons, primarily due to the particularity of mathematical symbols and graph plotting and also due to a need for face-to-face communication while solving any occurring problems. Nevertheless, it can be used as a supplement to the curriculum for motivated students for mastering theoretical material and solutions of typical problems. The research has also shown that it is beneficial for mathematics teachers in different countries to exchange their knowledge and experience in order to improve the quality of their courses.

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