Development of Mathematical Competences with the Use of e-learning

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Abstract

In the PhD thesis discussed during the State Doctoral Examination at the Pedagogical Faculty of Ostrava University I present the possibilities of improving the development of learners' mathematical competences with the use of ICT.

The first part of the PhD thesis includes the presentation of the research problems, objectives, expected results, particular stages of the research and scientific benefit of the obtained results. The research problem was posed in the following way: are we able to develop a system for the implementation of individual Mathematics teaching with the use of information and communication technologies for the purpose of improving the level of mastery of selected abilities – in particular those which are mastered the least during matura examinations?

The aim of the doctoral dissertation is to develop and evaluate the system for the implementation of individual Mathematics teaching with the use of information and communication technologies, with an elearning course teaching tool which:

- Includes a MatLearn teaching module which shapes learners' mathematical abilities;
- Is enhanced by elements of programmed teaching;\
- Works on the basis of the principle of gradual increasing the degree of difficulty according to Niemiero's taxonomy of learning objectives

The theoretical part describes mathematical competences specified in EU documents, their identification in relation to the mathematical competences for secondary schools in Poland. The author's own system for the implementation of individual Mathematics teaching (Mathematics with Moodle), which helps learners to improve their mathematical abilities is created by means of ISD (Instructional Design System), which is also known as the ADDIE model. Additionally, two well known taxonomies of learning objectives were presented, i.e. taxonomies by H.Niemierko and B.Bloom. Also used was the theory of constructing a system of education in an elearning environment.

In the doctoral dissertation there will be analysed results of the pretest, test and retest of 30 closed-ended tasks of the matura examination in Mathematics.

The parameters of the compared groups (experiment and control groups) are the following:

- classes with similar number of learners;
- parallel classes of the same school;
- classes taught by the same teacher;
- classes with the same arithmetic mean at the end of the last but one school year;

- classes with a similar degree of preliminary knowledge of Mathematics;
- classes with a similar degree of preliminary knowledge of using a computer.

Data will be inserted:

- manually into an EXCEL table;
- by means of a computer into the EXCEL program by copying from the Moodle platform Database.

The data structure is following:

- identification symbol of experiment and control groups;
- identification number of learner;
- identification symbol of learner's sex;
- identification symbol of learner's motivation;
- digit grade (mark) in Mathematics;
- percentage grade of the pretest, test and retest;
- identification number of mathematical competences in the scope of 3 areas of Mathematics: Functions, Analytic Geometry, Planimetry and Stereometry;
- identification number of the taxonomy of learning objectives in the scope of 3 areas of Mathematics: Functions, Analytic Geometry, Planimetry and Stereometry;

In the experiment group (ES) and control group (KS):

- for the purpose of testing the significance of differences between the experiment group (ES) and the control group (KS), an independent two-sample Student's t-test will be applied;
- for the purpose of testing the significance of differences between the pretest, test and retest within the experiment group, a dependent two-sample Student's t-test will be applied;
- for the purpose of testing the relationship between probabilities of passing from one stage to another in the MatLearn module and the results of learners from the experiment group, a correlation coefficient will be applied.

Question

Give your evaluation and opinion as well as comments on the presented system for the implementation of individual Mathematics teaching containing the MatLearn Module shaping learners' mathematical competences.

Keywords

ICT, key competences, mathematical competences, e-learning, Niemierko's taxonomy, Bloom's taxonomy, programmed learning, MatLearn Module

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Biography

Agnieszka Heba is a lecturer of mathematics and statistic and administrator on the remote teaching platform Moodle of the Higher School of Labour Protection Management in Katowice in Poland. She is student of doctoral studies at Department of Information and Communication of Pedagogical Faculty University of Ostrava