Mathematics Education -
Relevant, Interesting and Applicable

Newsletter 5, November 2017

What are MERIA scenarios and modules?

One of the results of project MERIA will be a digital repository with scenarios and modules for inquiry-based mathematics teaching. A scenario provides a classroom situation together with a detailed lesson plan that anticipates and describes the actions of both the teacher and the students, while a module also contains additional materials that help to realize the scenario, students' work from previous implementations of the scenarios and various comments on the different phases of the plan.

MERIA scenarios and modules will be designed to provide teachers with clear instructions on how to orchestrate the classroom in order to ensure a potential for inquiry and learning based on a rich situation. These rich situations will be selected with the aim to motivate students and to engage them in activities that have a potential for students to experience that mathematics is relevant, interesting and applicable. The methodology for developing scenarios and modules is supported by two theories – one is the Realistic Mathematics Education and the other is the Theory of Didactical Situations. Both theories are explained in the context of inquiry based mathematics teaching in the booklet of project MERIA called "MERIA Practical Guide to Inquiry Based Mathematics Teaching".

Each scenario contains the description of the target knowledge, broader goals, prerequisite mathematical knowledge, time frames, required materials, the problem and possible ways for students to realize target knowledge. Each lesson phase is described following the practice of the Theory of Didactical Situations.

Test scenario – proportionality and areas

The first scenario that was developed and tested in project MERIA is concerned with the notions of proportionality and areas.

The main problem that students encounter is the following:

Look the picture. If you open it at your smartphone or computer, you can easily drag the picture in order to enlarge it. What happens with the area of the picture covered by the pyramid when we enlarge the picture?

The target knowledge for this scenario is the statement:

Whenever the side lengths of a polygon are enlarged by a certain factor k the area of the polygon is enlarged by the factor k^2.

Co-funded by the Erasmus+ Programme of the European Union

The problem and the target knowledge serve as the motivation to engage in different mathematical activities that will enable students to develop broader goals:

Autonomous algebraic and geometric reasoning, student formulation of general statements and proofs based on formulas of perimeters and areas of different shapes, the notion of similar polygons, possibly to include the sine function as well as additivity of area when cutting the polygon in parts. If students are used to work with ICT they could generate hypotheses in a graphical environment and use them as a starting point of a proof.

In this lesson students need to investigate the problem on their own using pen, grid paper, rulers, calculators or ICT. First, they should recall different ways to measure and calculate areas of geometrical shapes. Next, they should gather and organize data and formulate their hypotheses. The main activity of the lesson is for students to formulate their own conclusions, discuss them with peers and to find justification for them.

Of course, different students will work on different levels and with different speeds, so their conclusions will be different as well. The role of the teacher is to encourage each of them, or each group, in their autonomous inquiry and to organize mutual discussion and presentation of the findings. In this way all students build a sense of common ownership and connect mathematics at hand with their own actions and ideas.

Results of questionnaires for teachers and students

After the class with the test scenario, teachers and students have provided feedback through a questionnaire designed for this occasion. The results of 119 students in four schools in Croatia already show that 75,7% of students found the lesson more interesting than their regular lessons, while 47,1% after this lesson have a feeling that mathematics is relevant and connected to everyday life. In their comments students emphasize that the lesson was different than usually because they worked in groups, used computers, and that they had to work on their own. Teachers confirm (in 85,7%) that their students were more active, but they emphasize that the lesson was very challenging for the students and only a minority of students have reached the desired conclusion autonomously.

Further work - meeting in Ljubljana

Encouraged by the positive effects that the scenario had on students' motivation, we believe that further adjustments of the scenarios will make them more suitable for achieving the desired target knowledge, too. The results of the questionnaires from all partnering countries will be analyzed at the next MERIA meeting in December 2017 in Ljubljana. At the same meeting further scenarios will be designed.

Co-funded by the
Erasmus+ Programme
of the European Union