



School Education Programme – Challenge for a Change

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Abstract: The paper describes some characteristics of the current educational reform in the Czech Republic and contrasts them with the present prevailing forms of teaching. The project teaching is hoped to be one of the means of reaching new goals of teaching. Three student projects used in the author's own teaching are presented as the illustration of the theoretical ideas.

1. Current Reform in the Czech Republic

In the Czech Republic, mathematics is often perceived as an unpopular subject on all levels of school (see e.g. results of TIMSS). If we disregard students from schools with the extended teaching of mathematics, then only young children from the elementary school are not afraid of mathematics. Where does this initial excitement for mathematics disappear? Why are older students not attracted by mathematics? Why do they not feel its beauty and appreciate its value for solving problems?

Hejny and Kurina (2001, p. 157) say: “Many justified objections to the teaching of mathematics are connected to the reality of teaching which we are not satisfied with either. A teacher teaching in such a way that students do not understand mathematics, but still get through the subject successfully, contributes to the public erroneous opinion that mathematics is useless. Mathematics acquired only ‘formally’ is nearly non-applicable and does not develop any deep cognitive abilities of students. It might only develop their mechanical memory ... This approach to teaching leads ... to the decrease of the quality of education.”

The conception of the Ministry of Education (or MSMT) (so called National Programme for the Development of Education, [1]) considers a starting point of the construction of the curriculum the definition of key competencies of primary students (learning competence, problem solving competence, competence of communication, social and personality competence, civic competence, working competence) and their elaboration into concrete goals, which in turn lead to the formulation of the compulsory and optional subject matter. Thus, the reform of the content of teaching was started in the Czech Republic which corresponds to the current European trends. It opens a space to show that mathematics greatly develops key competencies of students.

On January 1, 2005 a new school law was passed in CZ which, among others, anchors the reform legally. The National Programme [1] was theoretically elaborated into General Educational Programmes which are to be used for primary and secondary schools to prepare their own school education programmes that take into account specifics of each school and its students. These programmes should become the basis for teaching in the school year 2006/2007.

2. Traditional Teaching and New Goals

If we look into everyday practice, the model of teaching prevails in which the teacher holds a dominant position that helps (Kubínová, 2002, p. 73)

- *to fix* a universal scheme of teaching with an unvarying structure of lessons based on the whole-class teaching and



- *to eliminate* activating teaching methods because of their time demands and “inefficacy”.

Thus, the present school is characterised by the dominance of the content of the curriculum and absence of the development of key competencies.

The main characteristics of the traditional teaching, which are often considered to create optimal and equal opportunities for all students, are

- *transmitting* ‘ready-made’ subject matter in the given schemes and relationships (“the school does not have any right to violate the system of mathematics as a science and students are not able to work in mathematics creatively”),
- *separating* school and out-of-school worlds, which is apparent in the teaching of mathematics as the parts of the curriculum are only rarely connected to real life and
- *narrowing* space for the individualities of students, which is often justified by a necessity to keep equal conditions for everyone.

If the planned changes are to take place in primary schools, it means, according to the proposal of MSMT ([1], p. 34), first of all a transition from transmitting ‘ready-made’ knowledge to the ways it is found, from the prevailing teacher’s dominant role as a mediator of subject matter to the use of natural activity of students and their out-of-school interests and knowledge and to the elaboration of one’s own projects and works on the basis of searching for and classifying information.

If we accept that *the goal of school education in mathematics is not only acquiring knowledge and skills but also creation of abilities going beyond the school context*, then we have to create conditions which will respect students’ natural need

- to acquire new experience, knowledge and abilities (including the ability to learn) using various tools and in different ways allowing for the construction of knowledge,
- to meet the world outside the school in an active way even at the expense of initial failures and to connect this world with the school world (mathematics becomes an efficient way of solving real-life problems and stops being a world on its own),
- to develop their responsibility for their work.

A study of literature (e.g. Davis, Maher & Noddings, 1990; Grugnetti, Rogers et al., 2000; Kilpatrick, Swafford & Findell, 2001; Tall, 2004), results of our theoretical work (Kubínová, 2002; Kubínová, 2004) and our practical experience from a long-term teaching at the primary school confirm our belief that is possible to change the teaching of mathematics in such a way that a natural space is created for the development of students in the above way. To this goal, we use student projects which we construct according to the needs of students we are dealing with. Some results were presented at CIEAEM conferences (Kubínová & Novotná, 1999; Kubínová, Baresová & Hanusová, 2000; Kubínová & Baresová, 2002), others will be briefly described in three illustrations.

3. Illustrations of Student Projects

The three projects will be illustrated by students’ work during the presentation. For each of them, the aspects of the key competencies (formulated by the reform) which it mostly develops will be pointed out. These aspects are taken from the official reform documents.

3.1 Mathematical Calendar



CIEAEM 57 – Italie – Italy
Piazza Armerina,
July 23-29, 2005

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This project was realized in the autumn of 1998 by three Grade 7 classes and one Grade 8. The graphic sheets (in coloured chalks) for all months of the year and the title page were elaborated in art lessons. In mathematics lessons, each class chose mathematical problems thematically appropriate for the months of the year. The proposed problems were discussed and solved, their assignments were modified if necessary. In the lessons of the Czech language, the final editing was done and thus the class calendar for 1999 originated. The calendars were printed in colour. One “school” calendar was made from the class ones and its texts were translated into English and German.

The project was very successful. It was also used to represent the school in cooperating schools in Germany, Spain and Sweden within a Socrates – Comenius project and established a tradition of school calendars (in 2004 we repeated it for the fifth time).

The project mainly develops *learning competence* (students look for and sort information), *social and personality competence* (students work in pairs and cooperate, each student contributes to the discussion both in groups and in the whole class), *problem solving competence* (students suggest problem solving strategies and develop mathematical skills and abilities).

3.2 Smog on the Highway

This project is an example of connecting school with solving real-life problems. It was prepared by Grade 8 students in connection to the lessons of civics in which they discussed ecological problems of Prague. The project was based on a statistical survey in which students wanted to monitor the movement of vehicles on a highway near the school for the period of one hour. The observation was prepared very well, including record sheets. There were to be two observers for each observed phenomenon. However, there was so much smog on the footbridge above the highway that after 30 minutes, the teacher had to stop the observation (against the will of students). The students analysed the results and prepared a report. However, we were not able to find any institution or person who would like to use these results and do something about it. It is a sign that the public is not prepared yet for the fact that schools could take part in the solution to real problems or at least, point to them.

During the second repetition of the project, one of the parents supported the students. The results were not used in practice, but at least they were discussed in the common meeting with the city council.

The project contributes to the development of *learning competence* (students independently observe phenomena and experiment, critically evaluate knowledge and formulate results), *problem solving competence* (students suggest solving strategies, use mathematical procedures for the solution of real-life problems and are not discouraged by the initial failure), *social and personality competence* (students work in groups towards a common goal, seek common solutions and accept compromise).

3.3 There Are no Cars Here

It is an interdisciplinary project whose results were used outside school, too. A group of eight graders noticed that seniors had problems when crossing a busy street in front of the Club for Seniors. They, therefore, elaborated a statistical survey of the number of cars passing through the street and suggested a diversion of traffic to a parallel street. Thanks to one father, the students’ proposal based on a survey was accepted and the traffic was diverted. The students considered this a great success.

The project develops *learning competence* (students plan their work, suggest ways of fulfilling the task and discover relationships among matters), *problem solving competence* (students are sensitive



to problem situations outside the school, distinguish the problem, plan its solution, look for and sort information, critically evaluate the information, defend their solutions and use mathematics for solving problems from real life), *civic competence* (students understand basic ecological relationships and environmental problems).

4. Conclusions

The realisation of the three projects (and others as well) confirmed our theoretical considerations concerning project teaching as an educational strategy which enables

- students to be responsible for their learning (they have to find information, formulate problems, solve them, and thus often make more work than in the traditional teaching, see Smog on the Highway, There are no Cars Here).
- students to self-regulate their learning; the teacher often does not influence the students' work and let them make their own decisions (see There Are no Cars Here).
- teachers to motivate students for further work by a public presentation and appraisal of their work by the government of the school, by the teachers or by the city council (all three projects above illustrate this).
- teachers not directly participating in the projects to see merits of other types of work than the whole-class teaching.
- teachers and students to overcome the isolation of teaching subjects; The integration of subjects, even a short-term one, such as the Czech language, foreign language, art and mathematics, bring together not only students from different classes, but also teachers of the subjects who do not usually cooperate (see Mathematical Calendar).

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[1] *Národní program rozvoje vzdělávání v České republice*. Schváleno vládou České republiky dne 7. 4. 1999 pod c. 277.

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