MATHEMATICAL COMPETITIONS
AND STUDENTS' SELF-ESTEEM

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Abstract. Educational system and mathematical competitions in Slovenia were revised in the recent years. The impact of these changes to students' self-esteem and to students' affect towards mathematics is analysed.

*Keywords***:** Educational system reform, mathematical competition

1. Introduction

The society is changing continuously and the educational system is following these changes. In Slovenia the largest reform of the educational system in the recent years was in the nineties when in the year 1996 a new law on primary schools was approved. The most obvious change was an extension of compulsory education from eight to nine years. Together with this change many other changes were introduced, perhaps the most visible were those aiming: to make the school more „friendly" to children, to „improve children's self-esteem" and to „improve children's grades" in schools. Mathematical competitions in Slovenia were also reformed in the nineties. The main aim was to use mathematical competitions not only for determining the best young mathematicians but also for popularization of mathematics.

In the following paragraphs some of the recent changes of the educational system in Slovenia will be described, a short history of the development of mathematical competitions in Slovenia will be given and finally the author's views on the described changes and their impact on students' self-esteem will be presented.

2. The reform of the educational system in Slovenia

Slovenia was part of the Austrian Empire until the end of World War I, therefore the school system in Slovenia was much influenced by the Austrian school system. For example, in Slovenia the first compulsory education was introduced in 1774 under Maria Theresa and at the beginning it was 6 years long [3]. In 1869 compulsory education was extended to eight years [3] and that remained the same for more than 100 years. In the 20th century, when Slovenia was part of Yugoslavia, attempts of unification of the school system in all Yugoslavia were made. Since different parts of Yugoslavia had very different educational traditions, for example with less mandatory years of education, unification many times resulted in lowering the education standards [1, 2].

Soon after Slovenia became independent in the year 1991, preparation for a new school reform started. The law on reformed primary education was approved in the year 1996 [5, 12], first schools entered the new educational system in the school year 1998/1999, and all schools were obliged to follow the new law in the school year 2001/2002.

Some of the most important reform changes were the following:

– Nine years of compulsory primary school education (for the children from the age of 6 till the age of 15),

– Presence of a childcare worker in the classroom together with the teacher in the first year,

– Descriptive evaluation instead of numerical grades in the first three years,

– Introduction of differentiation of pupils according to their skills,

– Introduction of extended curriculum (optional subjects),

– Introduction of numerical grades at physical education, music, art, technological education,

– Revision of Curricula, etc. [13]

As a side effect of the reform, many schools in Slovenia were renovated so that they met the new requirements. The reform was well accepted among the majority of parents and teachers. In the following years the implementation and the results of the reform were very carefully followed and analysed ([9, 10, 13], etc.) and after one decade the reform was amended in 2011 [7], for example:

– Numerical grades in the third year were reintroduced (one year sooner than before),

– Revision of the Curricula,

– Additional external tests were introduced.

3. Mathematical competitions in Slovenia

Mathematical competitions in Slovenia have a very long tradition. In the year 2012, the 48th primary school mathematical competition and the 56th secondary school competition were organized by the Society of Mathematicians, Physicists and Astronomers of Slovenia [4].

In the past, mathematical competitions in Slovenia, and also in the majority of other countries, were designed for the best students, who were faced with difficult, mostly theoretical questions. In Slovenian primary schools mathematical competitions were organized for pupils older than 9 years on a school level. Only in the last two years of the primary school (13 and 14 years old pupils) three rounds were organized (school, regional, national). In secondary schools two rounds were organised, the regional one and the national one.

In the nineties, ideas to use mathematical competitions for popularization of mathematics also among a wider circle of students were initiated in many countries. André Deledicq from France, inspired by the Australian mathematical competition, proposed to some European countries to organize together an international mathematical competition, named Kangaroo, with mostly easy and attractive problems on a multiple choice questionnaire. In 1995 the association Kangourou sans frontiers [6], responsible for organizing Kangaroo competition, was established and Slovenia was one of the first ten members of the association. The Kangaroo competition is a story of success. In the year 1995 less than one million students from 12 countries took part in the competition and these numbers increased to more than 6 million students aged from 6 to 19 years from more than 50 countries in the year 2012 [6].

In Slovenia we decided to use Kangaroo competition problems for the first round of our mathematical competitions, i.e., we introduced a new type of problems into a scheme with a long tradition. There were some concerns among teachers, because they were not used to multiple choice questions, and they were afraid that the best students will not perform as well in the competition with this type of questions. However, results proved that this fear was not grounded. Through the years, the number of pupils taking part in the Kangaroo competition in Slovenia was increasing till it reached 98 thousand competitors (primary and secondary school together) in 2009 [4, 6]. The number in the following years remained larger than 90 thousand. For example, in the year 2012, when the number of children being enrolled in the first year of the primary school was slightly above 18000 [11], the numbers for each class were as follows [4]:

Primary school

1	2	3	4	5	6	7	8	9
12136	11668	10411	9025	8752	7950	7189	7078	6514

Secondary school

1	2	3	4
4379	3517	2908	2178

4. The impact of mathematical competitions

In the past the impact of the results of mathematical competitions in Slovenia was limited. The number of competitors was relatively small because for the youngest students the competition was not organized while in other categories only the best students took part. In addition, those competing already knew that they are „the best" in their local environment.

After mathematical competitions in Slovenia were reformed, this changed and the impact of competitions became larger.

The most important reason is a huge enrolment of, especially primary school, students. In the first three years (students aged 6-8) more than half of the generation is taking part in the competition. The obvious reasons for this are:

– Problems are easy, attractive, for students the competition is more playing than solving mathematical problems.

– There are not many other competitions at that level.

– Small prizes are given to students.

– Teachers are motivating the students to take part in the competition.

Additional, less obvious reasons for so many competitors are in my opinion the changes in the society and the described changes of the educational system. Nowadays children on the one hand have less working habits, while on the other hand parents are more ambitious concerning their children's future and they expect from their children to be the best in school. Therefore, there is a constant pressure on schools to be more friendly, which usually means not too demanding (e.g., Slovenian children have in the first three years of school one of the smallest number of school hours compared to other comparable countries [8]) but giving good marks to children.

Schools are not immune to these demands and in the last decade the grades in the primary school improved substantially. For example, in Slovenia for every student „an overall grade for total achievement'' as some kind of an average of all subject's grades was written in student's report at the end of the school year. In the year 2008, when this grade was abolished, 39 % of students in the primary school had the best mark and 32 % of students the second best mark on the 5 step scale [11].

Also, with the introduction of descriptive evaluation in the first years of the primary school it became completely unclear how successful the children are. In student's descriptive evaluation report only the long list of goals achieved by the student is written, therefore giving an impression that each student is very good in school. To avoid the stress, the descriptive evaluation report does not state which goals were not achieved by the student. These descriptive evaluation reports are given to students in the middle of the school year and at the end of the school year. It is indicative that some teachers do not even give these evaluations to parents in the middle of the year, not to give the parents the wrong impression about the performance of their children.

So nowadays, especially in the first three years of primary education we have the situation with all the students being „equally'' the best and having very good self-esteem. More and more students (and their parents) are therefore eager to find out how good they really are, i.e., many of them taking part in various competitions to prove themselves

that they are really good and the others to prove themselves that they are better than their schoolmates.

For many young students mathematical competition is the first opportunity to compare themselves with the other school mates and therefore an opportunity to build a more realistic self-esteem. Many of them, realising that they are not as good as they thought they were, give up mathematical competitions in the following years. Similarly, according to TIMSS 2007 [9], in Slovenia 71 % of students aged 9 had a positive affect toward mathematics, however this number decreases to only 25 % of students aged 13 (the smallest percentage among the countries taking part in TIMSS).

Following this reasoning one would expect that in Slovenia the number of competitors would decrease more quickly in higher classes. However, Kangaroo problems are not directly connected with the curriculum and multiple choice questions are more accessible also to students who do not practise standard solving techniques (results of the Kangaroo competition, especially in the lower classes, are not completely dependent on student's school grades). This is one of the reasons that also in higher classes many students are taking part in the mathematical competitions. As a consequence the best students are not stigmatised (as it was the case many times in the past) but considered with some admiration, because other students are also familiar with the problems, which they can understand but do not know how to solve.

So, as it was pointed out, mathematical competitions in Slovenia have an important impact on students' self-esteem, especially in the first three years of the primary school. However, taking into account the results of TIMSS 2007 [9], many challenges how to improve students positive affect towards mathematics in higher classes are still in front of us.

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