ON THE PROFILE OF THE OLYMPIC STUDENT IN MATHEMATICS

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Abstract: *In this paper we aim to study the possible motivations for students to obtain performance in Mathematics. We also try to outline a general profile of students who wish to achieve mathematical performance. The study is based on authors' eight years of experience in coordinating mathematics performance training programs for students in Braşov, Romania.*

Keywords: *motivation;performance; profile of Olympic student in Mathematics;*

1. Introduction

In the present paper, according to Ş. Mircea, we agree that "performance is an exceptional achievement that exceeds the level customarily achieved" (Mircea, 2006, p. 269).

Many authors study the possible factors for students to obtain performance in Mathematics.Some of these are presented in the following. "Proficiency in languages, science, and mathematics is seen as an essential precursor to success in modern society" (Mata, Monteiro, Peixoto, 2012, pp. 1-2). "More recent studies point to a positive correlation between student attitudes towards mathematics and student academic achievement" (Mata, Monteiro, Peixoto, 2012, pp. 1-2). Other factors include: "differentiated classroom instruction, flexible grouping, and immediate intervention for students who are not mastering math standards give students the individual instruction they need to succeed in math. Teacher collaboration, within and across grade levels, acknowledges the importance of year-to-year continuity in mathematics instruction. The quality of math teachers, particularly with regard to their content knowledge of mathematics, is critically important." (Improving Math Performance-US, Department of Education, p.5). T. Williams and K. Williams give another perspective about performance:"studies of the relationship between self-beliefs and performance tend to draw on this or related theories and usually endorse the notion of reciprocal determinism at a substantive–theoretical level. However, attempts to model this postulated mutual influence of self-beliefs and performance are few and are focused on the relationship between self-concept and performance. The reciprocal determinism of self-efficacy and performance seems to be without direct empirical support, probably because the longitudinal, repeated-measures data often considered necessary for this purpose are not available. It is possible, though, to model reciprocal effects with cross-sectional data" (Williams, Williams, 2010, p. 453).

There is an essential goal for educators to identify internal mechanisms which would determine a student to obtain performance in Mathematics. K.R. Wenzel and A. Wigfield consider that "students' social motivation, and their relations with teachers and peers, strongly influence their academic performance and general adjustment to school", and that "ways in which students integrate and coordinate their academic and social concerns has a powerful impact on their academic success at school" (Wenzel, Wigfield, 1998, p. 1). Starting from Bandura's results, B.J. Zimmerman shows that self-efficacy could be an essential reason to learn: "as a performance-based measure of perceived capability, self-efficacy differs conceptually and psychometrically from related motivational constructs, such as outcome expectations, self-concept, or locus of control". From his study it results that "self-efficacy measures focus on performance capabilities rather than on personal qualities, such as one's physical or psychological characteristics. Respondents judge their capabilities to fulfill given

task demands, such as solving fraction problems in arithmetic, not who they are personally or how they feel about themselves in general" (Zimmerman, 2000, p. 83). The general idea of self-efficacy is different from self-concept, this fact being proved by M. Bong and E.M. Skaalvi: "self-efficacy is presumed to explain and predict one's thought, emotion, and action. However, efficacy judgment is less concerned with what skills and abilities individuals possess. It considers more important what individuals believe they can do with whatever skills and abilities they may possess" (Bong, Skaalvi, 2003, p. 5). Here, the authors proved "that self-efficacy acts as an active precursor of self-concept development and suggest that self-concept research separate out its multiple components and subprocesses and invest more effort toward making students less preoccupied with normative ability comparisons in school." (Bong, Skaalvi, 2003, p. 1). But where does the self-efficacy perception come from? Some objective measurements of a students' self-efficacy in mathematics could consist in his/her achievements at several competition (for example Olympiads), the attitude of the teachers, parents or classmates concerning his mathematical capabilities. The internal motivation which determines a student to make an effort to obtain mathematical achievements could be the passion for this subject or the desire to be a winner.

2. Purpose of study

Starting from the previous ideas, the main purpose of our study is to analyse the possible motivations for students to achieve performance in Mathematics. We also try to offer a perspective on the profile of the Olympic student in Mathematics.

3. Method

The participants in the study were 61 fifth-to-twelfth grade students from different schools and high schools in Brasov, Romania. They were all participants in the Mathematics performance training program, 65 % girls, 35% boys aged between 11-18. A number of 46 secondary school students and a number of 15 high school students. A number of 36 parents of the previous students and 11 maths teachers involved in this program (5 women, 5 men) were also participants to the survey.

The following methods were used in order for the aims of the paper to be achieved: the analysis of school papers, with the instrument the curricula of Mathematics (Mathematics performance training programs for students in Braşov). We also used the survey method, having as instrument a questionnaire addressed to secondary- and high school students, parents and teachers, all involved in this program. The questionnaire with 3 multiple-choice closed items (Q2-Q4) and one open item (Q1) was based on students' experience in preparing for participation in Olympiads and other Maths contests. The items were organised around the theme: the profile of the Olympic student in Mathematics. Questionnaires were administered to the participants in order to be filled in, in the last face to face meeting of the program, under the supervision of the second author of the paper.

4. Findings

For the purposes of our paper, there was made the primary analysis of the results related to the 4 items regarding the profile of the Olympic student in Mathematics.

The ability to perform greatly in mathematics could be a native gift, but this is not sufficient to obtain good results at local or national competitions. The scholar curricula contain all concepts that are required by mathematical competitions. However, these curriculaare rather concerned on learning problem solving algorithms and computing

techniques. We prepare our students two hours a week, teaching them how to use the concepts they have learned at school, in a creative way. Furthermore, we encourage students to work a lot individually. Concerning this idea, interviewees have been asked: Q1: "How many hours of supplementary work per week would be necessary to obtain great performance in mathematics?" Most of the interviews considered it between 7 and 14 hours a week. (41% of the parents, 50% of the teachers and 59% of the students). Almost a quarter of both secondary and high school students considered 14 hours a week not enough for an excellent performance. On the other hand, 17% of secondary school children agreed that training less than 7 hours per week is enough for achieving good performance in mathematics. No high school student shared this opinion.

For the item Q2, referring to the possible motivations for students to obtain good performance in Mathematics, whose general statement is: Q2: "Which is, in your opinion, the main motivational which influence students' performance in mathematics?

a) Passion
b) Results at competitions
c) The desire to win
d) Prizes offered for the winners", the answers given in Fig. 1 and the interpretation are the following:

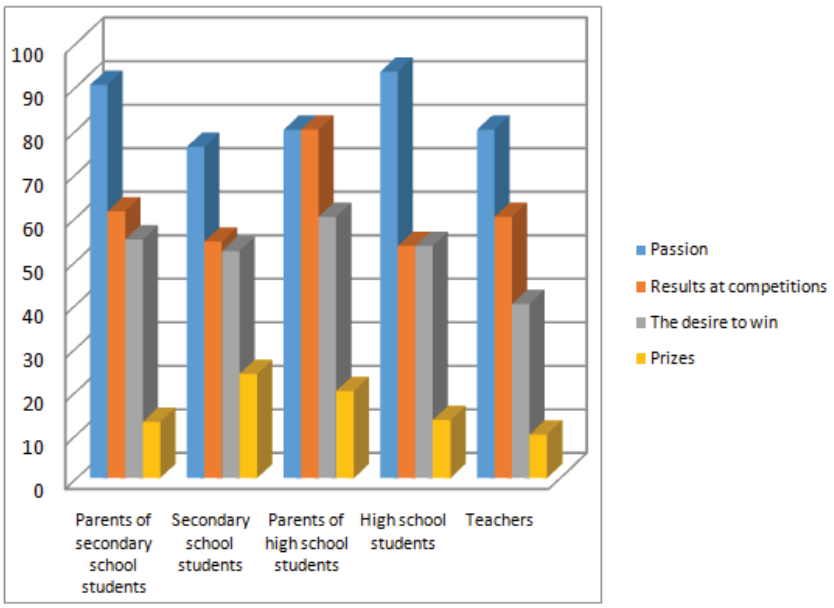

Fig. 1. The best motivation for a student

It was predictable to find out that all categories agreed with the internal motivation, the passion, and considered the offered prizes not such important. However, prizes seem to be useful to motivate some of the secondary level students, 23,91% of them choosing this motivation. An interesting fact is the difference between the high school students and their parents. The students consider passion to be the main motivation (93%); results at competitions and the desire to win are perceived as a good motivation, both around 50%. Parents of the high school students feel that results of competitions are as important as passion, these being the main motivation for their children to achieve great performance in Mathematics.

Also, for the purpose of finding to the possible motivations for students to excel in Mathematics, when the participants were asked, by administrating the Q3 item: Q3: "Which would be the most appropriate methods to increase students' motivation for performing well in Mathematics?

a) Parents' support
b) A special timetable schools
c) The attitude of classmates
d) The appreciation from teachers", the answers obtained are given in Fig. 2.

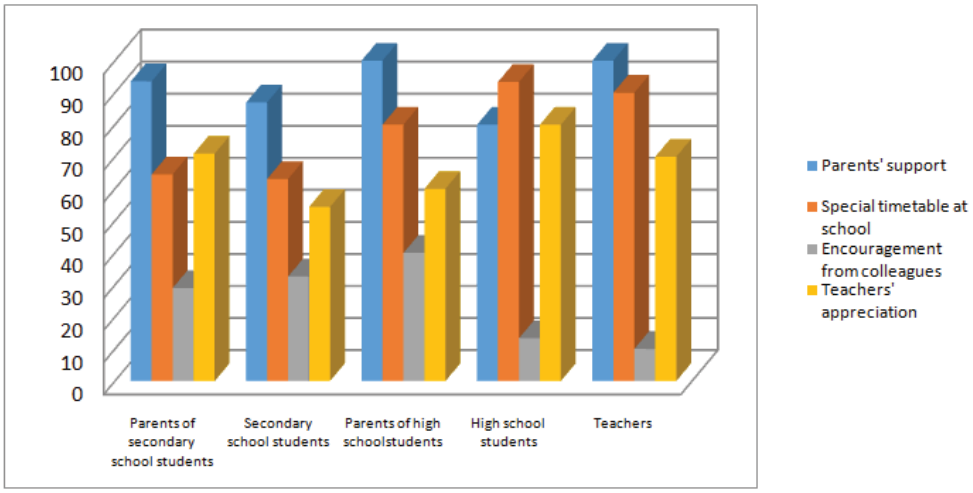

Fig. 2. Things that motivate students to achieve great performance

The analysis of the answers shows that parents' support is considered to be the most important fact which helps students to achieve good performance: 86,95% of secondary school students, 93,54% of parents and all teachers. Only high school students think that a better motivation to work more to obtain well performance at Mathematics is a special timetable at school (93,33% considered that). This timetable allows students to deepen those areas where they can excel. For all categories of participants, the least important fact which helps students to achieve performance is the encouragement from colleagues (32,6% secondary school students, 30% parents, 13,33% high school students and 10% teachers).

The answers of the Q4 item, given in Fig. 3, regarding the statement: Q4: "Which are, in your opinion, the main qualities of a student who wishes to achieve great performance in Mathematics?

a) Interest
b) Rigour
c) Logical thinking
d) Patience
e) Perseverance",

and their interpretation, offer other perspective on the profile of the olympic student in Mathematics and are presented in the following:

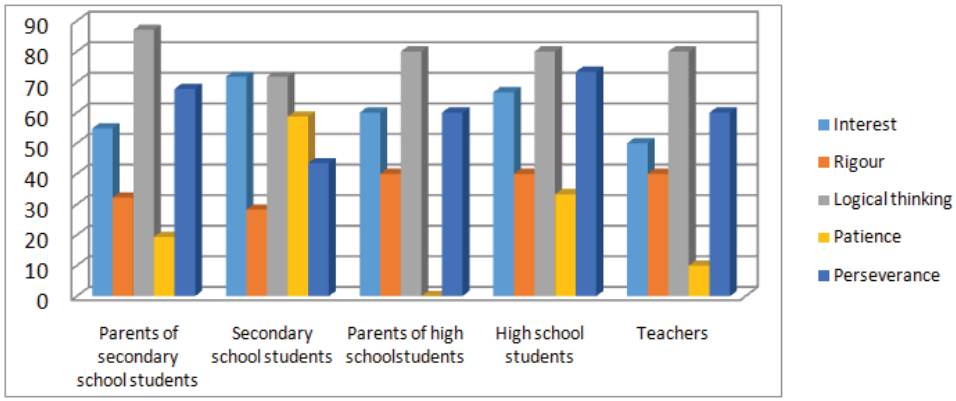

Fig. 3. The most important qualities of a student who achieves good performance

The results show that logical thinking is the main quality which all the interviewees have chosen (71,73% secondary school students, 87,09% parents of secondary school students, 80% high school students, their parents and teachers). The second quality necessary to achieve performance at mathematics has been considered by parents of secondary school students, by high school students, their parents and teachers, to be perseverance (67,74% parents of secondary school students, 73,33% high school students, 60% their parents and teachers), followed by interest. Another opinion has had secondary school students, which choose interest to be the second necessary quality (71,73%), followed by perseverance (43,47%). The patience is considered a necessary quality only by secondary school students (58,69%), this fact being justified by their age. Hard work at mathematics, more than 2 hours per day, demands patience from a 11-14 age child. Moreover, at this age, the success can delay and students need more patience to persevere to achieve performance.

4. Conclusions

The results presented focus on two mains provide answers to the purpose of the study. The factors that help achieve good performance in national and international Mathematics competitions are: sustained work (more than 14 hours per week), parents 'support and a special timetable at school.

As a second conclusion, the quantitative analysis also revealed the fact that all the students consider passion to be the main motivation to achieve great performance in Mathematics and the parents of the high school students feel that results of competitions are as important as passion.

This research revealed also that parents' support is considered to be the most important fact which helps students to achieve good performance by secondary school students, parents and all teachers. Only high school students think that a better motivation to work more to obtain well performance at Mathematics is a special timetable at school.

Our findings concerning the main qualities of a student who wishes to achieve great performance in mathematics show that logical thinking is the main quality which all the interviewees have chosen. The second quality necessary to achieve performance at mathematics has been considered by parents of secondary school students, by high school students, their parents and teachers, to be perseverance, while interest has been considered by secondary school students to be the second necessary quality.

One final observation puts emphasis on the fact that teachers have to look for passionate, hardworking and logical thinking students for obtaining performance in mathematics.

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