

## ATTENTION OF TEACHERS TO PUPILS INTERESTED IN MATHEMATICS IN THE 4<sup>TH</sup> CLASS AT ELEMENTARY SCHOOL

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**Abstract.** This paper presents some results achieved with carefulness for pupils with larger interest in mathematics in the 4<sup>th</sup> class at elementary school. We gave attention to two subjects – teacher and his (her) pupils. We mention the first one in this paper. We have found out certain reserves at work with these pupils including gifted pupils, mainly at out of educational time. Research shows needs to improve the quality of preparation for pupils interested more in mathematics. It is also connected with preparation of next teachers at universities.

### 1. Introduction

Educational process of pupils more interested in mathematics should be in attention of their teachers. Special attention to this fact is expressed in Conception of educational process development and in National programme of education in the Slovak Republic [1]. There are more reasons for it, like a determination gifted pupils, organisation of several mathematical competitions or mathematical hobby groups, and so on. A part of our research was focused on contemporary state of carefulness for pupils more interested in mathematics. We have found out ways that teachers used in their work with these pupils by questionnaire.

### 2. Basic categories of research

**Aims of research** were focused mainly on finding out

- how a teacher can determine his (her) pupils more interested in mathematics and gifted pupils in mathematics,

- what is a teacher carefulness for his (her) pupils during lessons,
- what is a teacher carefulness for his (her) pupils at out of educational time,
- what materials were used by a teacher at work with pupils.

We used empiric method questionnaire for finding out information. It contained 30 items. Answer part was combined, it had closed, half-closed and open questions. The questionnaire was anonymous.

**Research sample:** We asked 110 schools on Central Slovak territory in 2001. Schools were chosen by chance in order to be substituted schools in district towns and their surrounding, town and village schools.

### 3. Some achieved results

#### **Basic information:**

There were 71.82% of returned questionnaires. 135 teachers from 79 schools answered. 82.22% teachers were competent to teach, others studied at universities. Their average practice was 17 years. So we can say, that majority of these teachers were experienced and so they should be able to work with pupils with interest in mathematics.

There were few-classed and selective-classed schools among schools. So we focused our attention to them, too. It could show larger solicitude of a teacher about his (her) pupils there. We expected more pupils with larger interest in mathematics, because the pupils were chosen according mathematical exam, too. We expected that a teacher had more opportunities to work individually with pupils more interested in mathematics in few-classed schools. But finally there were not larger differences between these and classical classes.

#### **Determination of pupils more interested in mathematics and gifted pupils in mathematics:**

The teachers taught 3 219 pupils and they marked 34.61% of pupils as pupils more interested in mathematics and 12.33% as gifted pupils. It has showed that approximately one third of pupils were interested in mathematics. Information about gifted pupils is three times higher than psychological researches inform us.

*This finding out shows us that many teachers have not sufficiency knowledge and experience with determination of gifted pupils. Literature [3, p. 17] gives information that there are 2–4% gifted pupils in population (not only in mathematics). Only 18.52% of the respondents are in area determined by experts. Almost one half of respondents asserted that they had had 11–20% gifted pupils in the class.*

**Teacher carefulness of his (her) pupils during lessons:**

We asked the respondents if mathematical subject matter in curriculum has developed abilities of pupils more interested in mathematics. 54.82% of them said proportionately, only 5.93% thought that it has developed very much. Almost one third of the teachers (31.11%) thought that it has developed abilities little or not. 8.14% of the teachers were not able to judge this situation.

*This finding out corresponds with results of another question, because the teachers very often used basic textbooks literature while they set homework to pupils more interested in mathematics (57.78%). The teachers, who were not satisfied how basic subject matter develops mathematical abilities of pupils with larger interest in mathematics, gave priority to other literature sources and own creation of problems. So to use only basic textbook literature is not sufficient.*

51.11% of the respondents gave attention to pupils more interested in mathematics at least two times a week on mathematical lessons. Only exceptionally, mainly before competitions 40.74% of the teachers did that. Others (8.15%) did not give any attention.

*We are glad, that approximately one half of the teachers do not forget about pupils, with larger interest in mathematics and work with them more or less regularly during the school year. Many teachers gave attention to these pupils irregularly and we can say that happening but once. We mean preparation before competitions during perhaps two weeks, because mathematical competitions Mathematical kangaroo, Pytagoriáda, Mathematical Olympiad are not running through all school year. Only Mathematical correspondent seminar and Minimix are whole year competitions, but the teachers mediate them only to pupils and do not secure special preparation for them, because organisation of these competitions is not connected with school organs. We would welcome if exceptional attention will be more regularly.*

Individual problems were always given to pupils more interested in mathematics by 6.67% of the teachers on lessons and very often by 50.37% of them. It is more than answers in previous paragraph. Occasionally it is 39.26% of the teachers and 3.70% of them did not give any problems.

*We think that regular attention of the teachers should be larger. Giving individual problems very often does not correspond with giving often attention to pupils more interested in mathematics.*

Carefulness lessens at giving individual homework, only 14.82% of the teachers set it (30.00% per week, 45.00% twice per week, 25.00% three times per week). This form was occasionally used by 51.11% of the teachers and was not used by 34.07% of the ones.

*This way was regularly used by small number of the teachers. Almost one third of them did not give any attention to it at all. But gifted pupils should be given individual homework and majority of the teachers said that they had have 11–20% of them at class. Choice and number of problems is very important, so that a teacher does not lower an interest in subject. According interval of giving homework we can judge that given problems were mostly algorithmic or half-algorithmic. Probably there were less non-standard problems, which texts are more pretentious to understanding a need to apply various solving strategies.*

Individual homework connected with determined subject-matter only was given by 39.33% of the teachers. Problems not only connected with this subject matter were given by 60.67% of the teachers.

*We can say that though there were not many teachers who set individual homework (14.82%), majority of them (according us) endeavoured to look up also other types of problems, to asset other solving ways, other topics in boundaries of mathematical knowledge and skills of pupil in the 4<sup>th</sup> class at elementary school.*

We have known that 13.34% of the teachers had to help always or very often at individual problems, 63.70% of them only sometimes and seldom or not 22.96%.

*Here we could think of pretension of problems which were chosen by the teachers. So we can expect that they probably assessed inaccurately individual mathematical abilities of the pupils if they always had to help the pupils. Not only gifted pupils in mathematics were among pupils more interested in mathematics. It is question, if pupil, who does not experience success during independent solving of problem, does not loose motivation and interest. Spare if it is concerned homework a pupil should be able to solve it independently or with small advice of teacher. On the other hand gifted pupils need such problems in order to be able as more as to develop their own creative abilities, logical and critical thinking.*

#### **Used materials:**

All teachers used textbooks written by Bero and Pytlová on lessons. 34.07% of them answered that there were sufficiency of suitable problems in this literature, other 52.59% of them thought that not and 13.33% did not know to judge this situation.

*The textbooks copy subject-matter according curriculum. According view of the teachers (54.82%) subject-matter has developed abilities of pupils more interested in mathematics proportionately in one of the question, so then it would be sufficiency of suitable problems in textbooks for these pupils. But only approximately one third of the teachers agreed with it. Here answers of*

*respondents did not correspond entirely. More than one tenth of the teachers who were not able to judge aptness of problems for pupils with interest in subject had probably smaller skills with classification of problems.*

The teachers, who were short of suitable problems in textbooks, answered what they had missed the most at work with pupils more interested in mathematics. They marked puzzles, games, crosswords (54.90%), untraditional tasks (52.10%), problems (47.90%), divergent problems (33.80%), creative problems (25.40%), combination problems (19.70%), experimental problems (7.04%), problems from practice (1.41%).

*We can agree with the teachers who want more non-standard problems.*

#### **Teacher carefulness of his (her) pupils at out of educational time:**

Mathematical hobby groups were organised by only 8.15% of the teachers.

*So we see that mathematical hobby group has not own stability place at elementary school and the teachers did not add a big importance to this form of preparation of pupils. But it is sufficient space for purposeful and continuous preparation of pupils at out of educational time.*

Other respondents who did not organise mathematical hobby group asserted causes, mainly shortage of time (27.40%), financial valuation (23.40%), unconcern of the teachers (17.70%), unconcern of the pupils (6.06%), other reasons (35.50%) like organising other hobby group, organising mathematical hobby group by another teacher at school, shortage of materials, shortage of free time of the pupils, short-dated work at school and so on.

*We see that there are various causes of non-existence of mathematical hobby groups at elementary school, some are objective, some less. In case of contemporaneous economical situation it can be comprehensible of unconcern of the teachers about work at hobby group and effort to use time another way than to prepare, organise and realise hobby group. Work is focused on to secure higher economical incomes. Shortage of time may be connected with fulfilment of organisation and administrative tasks. It concerns of one half asked respondents. But we see shortage of experience with organising of hobby group at elementary school, willingness to try and begin something new and perhaps non-precise ideas about contents, too. Although only small group of the teachers saw causes in shortage of suitable literature. We think, that this number is really higher. Evidently the teachers had no reason to find and judge necessary literature for work at schools where hobby groups were not organised.*

All teachers who organised mathematical hobby groups did it regularly once per week (63.63%), once per two weeks (27.27%) or once a month (9.10%).

*Although there were not many teachers working at hobby groups we are glad that they worked regularly and majority of them every week. We regard it as the best interval time. It is assumption to preserve pupils' interest.*

The teacher working at hobby group was the most lacking of methodical materials (63.63%), set of funny tasks (54.55%), set of problems for mathematical hobby groups (45.45%), set of problems from thematic spheres (27.27%), competition problems (9.09%). Any help was not needed by 18.18% teachers.

*We think that the teacher who works in hobby group can better evaluate necessary form of help and judge abundance of suitable suggestions and materials. The teachers who did not work at hobby groups did not see bigger obstacles in shortage of literature. Methodical materials and directions could help to improve work of teachers who have already certain experience with organising of mathematical hobby groups. Almost two thirds of the teachers were interested in it. The teachers demanded specific set of problems, which can help them more purposefully.*

The teachers used as a source of differentiated problems for pupils on lessons or at mathematical hobby groups textbooks (57.78%), own creation of problems (34.07%), journal Komenský (8.88%), and other sources (49.63%). Just among them there were the most of problems from mathematical competitions (28.36%) and various tests for the first form in a grammar school (25.37%). Children journals were used less, likewise others for example Teachers' newspapers, older textbooks and so on. Approximately one half of the teachers focused on textbook literature. Only textbooks were used by 47.44% of them.

*We think that it is not sufficient for development of mathematical abilities of pupils more interested in mathematics and gifted pupils. These pupils need to gain experience with larger variants of problems, their texts, solution strategies, degrees of pretension and creation. We are glad that the teachers aimed at creating own problems, too. 11.54% of them used only own problems. A creation of problems, mainly for more pretentious solver, is not simple affair for experienced author, too. It is necessary to think about many factors. So the teachers could not relay only on this source.*

Both sources, textbooks and own creation combined 19.23% of the teachers.

*We would recommend to combine as more sources as they can because there are stimulating thinks, motives and problems in every of them. There are various sources for gathering of suitable problems for pupils more interested in mathematics and gifted pupils at bookshops at present. But methodical materials (how to work with problems) are missing. Spare purchase of literature is mostly influenced by teachers' own financial possibilities.*

Pupils took part mostly in traditional long-lasting mathematical competitions at elementary schools (Pytagoriáda 35.04% in 4<sup>th</sup> class). Mostly each teacher joined pupils to one competition at least. The highest participation was in Pytagoriada. It rises with higher grade. We explain it by character

of problems in this competition, too. They are simpler than in Mathematical Olympiad. 74.07% of the teachers joined their pupils (16.37%) to Mathematical Olympiad. 14.82% of the teachers did not joined their pupils to competitions at all. We were surprised that 11.11% of them had not known about this activity of pupils. Mathematical correspondence seminar was solved by 9.79% of the pupils, Mathematical kangaroo by 15.94% of them.

*We think that if preparation of pupils is not indifferent to teacher in any area, he or she should know their interests and have a survey what form to satisfy interests. He (she) should be attentive to representation of class in various competitions. We are glad that the majority of the teachers gave chance to pupils to take part in Pytagoriada and Mathematical Olympiad. Teachers who did not know about competitions probably had no or only little knowledge about their organisation and course.*

Finally we can say that there are some reserves at work of teacher with the pupils more interested in mathematics. It concerns above all suitable information and knowledge about gifted pupils in mathematics at elementary school, wider information about various mathematical competitions for 8-10 years old pupils, information about methodical work in mathematical hobby group, suitable sets of non-standard problems of various severity, teacher belief in important mathematical hobby group at elementary school.

### Summary:

We recommend according achieved our findings out:

- to elaborate information materials for teachers in order to be able to improve a determination of pupils with larger interest in mathematics and gifted pupils in mathematics, Musil [2, p. 136] states, that accuracy of estimate was already raised about average 40% after short initiation of teachers to psychological principles and methods for determination of talent. It is important to give teachers an opportunity of training it by psychologists;
- to elaborate information materials about organisation and course of mathematical competitions at elementary school;
- to create methodical materials for work at mathematical hobby groups;
- to work out a suitable set of non-standard problems with various intentions and various degrees of creation for work in mathematical hobby group;
- to convince teachers about importance of mathematical hobby group also at elementary school and recommend establishment it.

**References**

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