International Journal of Applied Mathematics

Volume 30 No. 3 2017, 253-258
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
doi: http://dx.doi.org/10.12732/ijam.v30i3.4

ANOTHER WAY OF TEACHING MATHEMATICS TO GIPSY STUDENTS

Ileana Máté

The Lower-Secondary School of Diosig
Livezilor Str., No 53
com. Diosig, jud. Bihor, P. Code 417 235, ROMANIA

Abstract: Mathematics as a school subject is a very abstract one, often difficult to understand for the students. This statement is even more true for the gypsy students. In the lower-secondary education, it would be worth solving word problems by using arithmetical methods first, then solving such problems first by using arithmetical methods, and then using algebraic methods as well. By doing this, a connection can be created between word problems and equations, and, thus making the teaching-learning process more efficient. In my research, I try to prove this fact.

AMS Subject Classification: 97C70, 97H20, 97H30
Key Words: didactics of mathematics, text-based problems, algebra teaching, equations

1. Introduction

During my 22 years of career as a teacher of mathematics I have tried to use different teaching methods so as to make it easier for my students to learn and understand the subject matter of mathematics. As time went by, I have noticed that those teaching methods in which the students were actually actively involved in the teaching process seem to be more efficient (see [4]). This statement is even more true in the case of gipsy students. On the basis of an international study we can assert that the gipsy students have lower school results then their fellow colleagues of the same age (see [8]).

Received: April 10, 2017

Social reasons which lead to the unfavourable learning conditions for young gipsy students: their parents' low level of education, family instability, the size of the family, the minoritary ethnical condition (see [6]). Mathematics classes for gipsy students should be colorful, with a lot of problems that would need their attention and their creativity as well. There should be an acceptable, allowing atmosphere in the classroom in which mistakes are not considered sins but reasons of the activities to correct the errors. Students should not be forced to work but their activity should be the result of the fact that they are interested in what they are doing (see [7]).

Word Problems: According to Csíkos (see [3]), the mathematical word problems comprise all such problems whose formulations are written down in the form of a text, and their solving needs the use of a certain area of Mathematics.

Representations: According to Bruner, each piece of knowledge can be represented in three different ways: the material representation, the visual representation and the symbolic representation.(see [2]) The new mathematical concepts should be presented on three levels: concrete, visual and abstract. As for the memory, it is better to have three different memory traces for the same concept. In this case, the chance for remembrance will be much higher (see [1]).

2. Description of the Research

I have been teaching mathematics for 7 years in Diosig, a big village in Romania. In our village, 23 percents of the population is of gipsy ethnicity and the percent of gipsy students in the school is even bigger. For the gipsy students and for their parents to be at school means that they actually have to go to school every day. Gipsy students do not want to study at home, they do not want to do their homework, but what is worse is that their parents do not even care about this situation. Unfortunately this fact reflects in the their results at school (see [5]).

During January - March 2017, I have realized an experiment with the students from the 7^{th} grade. There are 19 students in the classroom, all of gipsy ethnicity. The experiment lasted for 30 hours of mathematics during which I have tried to find an efficient teaching method for the text problems solvable through different arithmetical and algebraical methods. At the beginning of the experiment the students have solved an initial test. The test contained different simple text problems. For example: *If a garden has the form of a rectangle, and its width is of 8 m and its length is of 12 m, then how many meters of barbed wire are enough to surround the garden?*

After correcting the tests I have noticed that the students have got great shortcomings in understanding the problems, that they have not managed to do the multiplications, that they have serious shortcomings in imagining the problems. They have beautifully drawn the rectangle, they have written on one width of the rectangle the number 8 and on one length of the rectangle the number 12 but unfortunately they only added the numbers they had written down, so they only added 12 plus 8. After talking to them they have explained me that if the numbers representing the width and the length of the rectangle are not written on both sides then they considered that they do not have to add them twice. When they finally understood the problem they had no shortcomings in adding and in subtraction even if they did some of the calculi using their fingers.

During the first 6 hours we have reviewed the basic operations: addition, subtraction, multiplication and division. At each hour I have formulated simple text problems whose solutions were actually one or two operations. For example: *In the garden of my grandmother there are 12 apple trees. The number of plum trees is twice as big. How many plum trees are in the garden?*

First of all the students had to read the text, then they had to read the text again in order to understand the problem and only after that they could search for methods to solve it.

The students worked in teams of 3 or 5 pupils. This way they had more courage to solve the problems. I walked around all the teams, supervising them and helping them with ideas but I did not solve the problems myself. During the next 6 hours we have learned the basis of the algebraic calculus. During the first hour the students played 3 games. The students got the written rules of the three games, and I made sure they understood what each game was about and how it should be played correctly. They played rummy, cards and they played with dice. In each game they gathered points and in the end they had to make some calculi with the points they had already gathered. For example, one task was: *multiply your points by 2 and add 15 to the sum you obtain. The winner would be the one with the greatest scores.*

This is how I introduced the variable and the replacement of the variable with a certain value. All the students have been actively participatory to the lesson, they were extremely involved in the activity without me telling them that they have to participate and to show interest in the lesson. They have learned addition and subtraction of variables through games, as well.

During the next 6 hours I have showed them three methods of arithmetical solving of the problems: the representation method, the reverse conclusion's method and the scales method. At this point it all became interesting because

the students did not want to work in teams as the work rhythm of each student was different for each member of the team.

We have created pairs to solve the problems. All the students were pleased with this decision. After they have learned the arithmetical methods we passed on to the algebraic method but in such a way so that it was not seen as a compulsory thing to do but it came as a natural thing needed by the students.

I have formulated two problems. One of the problems was: *Mother, father and their daughter Mary are 78 years old all together. Mother is 12 times older than Mary and father is 13 times older than Mary. How old is each member of the family?* At the beginning they have represented the age of Mary through a segment. When they were about to represent the age of the mother they asked if it would not be easier to simplify the writing and after they had represented the age of the father through 13 congruent segments they started to come up with ideas: *let us not draw so much, let us multiply by 12 or by 13.* So, after having arithmetically solved the problem we have algebraically solved it too, the first time the variable was a segment and then, instead of the segment they suggested using the letter **m**, from the name Mary.

During the next hours we have learned the method of the algebraic solving of the problems. I have used a school scales with two handles where the equality of a problem meant that the scales were in balance. We have solved problems like:*A scales with two handles is in balance. On one side of the scales there are four balls and on the other side there are two balls of the same kind and a weight of 50 grams. How much does a ball weight?* We have solved such problems by taking the same things from each side of the scales so that the latter stayed in balance all the time. The students understood the scales method very easily and this time they all wanted to work individually, not in pairs. Each of them wanted to try this method alone.

During the last four hours we had a serious revision of what we had studied so far, solving text problems through different arithmetical and algebraic methods.

At the end of the experiment the students had a final written test in which they had to solve 13 problems and for whose solving they had 100 minutes. Not all the students have solved all the problems correctly but each student has worked at least 50 minutes, they have tried their best and none of them said (as gipsy students usually say) *that s/he was not going to write the test because s/he can not solve the problems.* During the final test - as well as during the experiment - I allowed the students to ask me for help if they needed it. I did not solve the problems for them but I helped them to see the answer with the help of some questions, or I suggested them a certain method to solve the

problem if I saw that their answers were bad or if I saw they did not solve a problem correctly.

3. Conclusions

The biggest problem of the gipsy students is that they do not care about learning so they do not want to make any effort to learn anything. The importance and the novelty of this method consists in the following: I paid attention to the activity of each student in particular, the students have learned certain algebraic notions through games (which otherwise would have been very abstract for these students), the students have been very active during all the classes. In the text problems I have used statements known by the students from their every day life, I have tried that everything that we did during the experiment be visible and if possible even palpable. I have done the problem representations not only through mathematical signs but through objects, as well.

Further, it would be better for us as the teachers to know and understand the gipsy students better so that we could offer them personalized methods of teaching, to attract them to learning. In this way the teachers should have possibilities to participate and attend improvement courses and they should also have the possibility to work with smaller groups of gipsy students.

References

[1] A. Ambrus, Teaching mathematical problem-solving with the brain in mind, In: *Center for Educational Policy Studies Journal*, **4**, No 2, Ljubljana (2014), 111.

[2] J.S. Bruner, *Towards a Theory of Instruction*, Harvard University Press (1966), 44-45.

[3] Cs. Csíkos, The difficulties of comprehending mathematical word problems in 10-11-year-old, In: *Magyar Pedagógia*, **103**, No 1 (2003), 35-55.

[4] I. Máté, Matematikatanítás változatosan, In: *Matlap-Ifjúsági Matematikai Lapok*, **XIII**, No 5 Kolozsvár (2009), 188-192.

[5] I. Mate, The mathematical proficiency tests, In: *Knowledge and Sustainable Economic Development*, Nagyvárad (2012), 659-670.

[6] J. Rajnai, Lehet másképp?, In: *Új pedagógiai szemle* **62**, No 11-12, Budapest (2012), 54-75.

[7] N. Szabó-Thalmeiner, Factors determining mathematical effectivenessa, In: *PedActa*, Kolozsvár, **I**, No 1-2 (2011), 1-9.

[8] A. Wilkin, C. Derrington, R. White, K. Martin, B. Foster, K. Kinder, and S. Rutt, *Improving the outcomes for Gypsy, Roma and Traveller pupils: Final report*, Department for Education, UK (2010), 114-115.