

Problems with successive addition of logical conditions

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1 Introduction

Mathematics is very important for the development of logical thinking of pupils. Some objects in the real life and also in mathematics can be characterized by some logical conditions. The problems with successive addition of logical conditions can help the pupils to oriented in the world of objects in the real life and in mathematics.

In such situations is preferable to use a constructivist type of teaching. For the constructivist type of teaching it is typical that the students are more active in the teaching process. They construct new instructions from their explorations. The aim of the constructivist method in this project was to find solutions for the problems. The teacher had a position of a presenter who presents and guides the discussion.

This project was carried out in a group of students, who will be teachers at primary schools. The project was realized from October 21 to November 1 2002 and took 4 teaching lessons. The group had 11 students all being in the last year of their studies at university.

The project aimed at goals in three fields:

- teaching: to show the students, that the problems with progressive addition of logical conditions is one of the forms of the constructivist type of teaching, which develops the ability of pupils to find the object satysfying the requireded conditions,

- ability: to discuss problems, to formulate own opinions, to learn to appreciate other students' solutions, to simulate the situations in the class with pupils

- experimental: to analyse the students' solutions from the qualitative viewpoint, to observe how the students can formulate their expectations from pupils.

The first three problems in the 1.-2. experimental lessons are given by teacher. Students solve the problem and discuss the other students' solutions.

One half of the students for the 3.-4. experimental lessons prepares problems dealing with objects located in the classroom and suitable for five years old children. The rest of students prepare problems suitable for ten years old pupils and dealing with natural numbers. We show in this article this two experimental lessons.

Every student gives his problem to other students and the students discuss ich their solutions and the solutions, which expect from the pupils. I 've observed with using field notes from the lessonss, how the students discuss the problems and what kind of emotional influence has this type of lesson on students. Field notes are the instrument of the qualitative research (see [4]).

2 Field notes

3.-4. experimental lessons

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The students prepare the following problems:

Problem Nr. 1 (Mária)

- a) Find some orange thing in the class.
- b) Find some small orange thing in the class.
- c) Find some small soft orange thing in the class.
- d) Find some thing in the class, which is similar to a small brick.

Problem Nr. 2 (Lucia V.)

- a) Find some small thing in the class.
- b) Find some small thing in the class, which must to be light.
- c) Find some small thing in the class, which is in the fore part of the class.
- d) Find some small thing in the class, which is in the fore part of the class and

which is white.

Problem Nr. 3 (Marianna)

- a) Find some thing in the fore part of the class.
- b) Find some small thing in the fore part of the class.
- c) Find some small thing in the fore part of the class, which is similar as a quader.
- d) Find some small thing in the fore part of the class, which is similar to quader

and which is used for the informations the director of the school.

Problem Nr. 4 (Miroslava K.)

- a) Draw some thing from your room.
- b) Draw some toy? from different things in your room.
- c) Draw some toy from hracka? things in your room, which is explicitely your.
- d) Draw more liked toy? from different things in your room, which is explicitely

your.

Problem Nr. 5 (Júlia)

- a) Find some things, which you use in the school.
- b) Find some things, which you use in the school and which you use for writing.
- c) Find some things, which you use in the school and which you use for writing.

These things have a part from wood.

- d) Find some things, which you use in the school and which you use for writing.

These things have a part from wood and their most part is red.

These five problems are for children of age 6. The students in the discuss spoke about that, how the children in the first grade can solve such problems.

Problem Nr. 1- The students think, that the pupils would speak about things, that they see in the class. Júlia: Sponge or case, Mária: Orange chalk , Jana: Eraser or desk, Irena: Orange pencil or mandarin, Lucia G.: Wall-gazette, Gabriela: Placard, Lucia V.: Door .

Julia explain, that this problem was oriented to the orange sponge in the class.

Problem Nr. 2 - This is a similar problem as Problem Nr. 1. Lucia V. explain, that this problem was oriented to white chalk, but other stidents said, that there is a possibility for other solutions, for example stage pocket (Angelika), switch (Jana). Marianna explain, that it is sometimes a problem for children, what is big and what is small.

Problem Nr. 3 - The students spoke about things, that the pupils would use in the parts of the problem. For example: a) blackboard, picture, symbol of the state b) chalk, sponge, blackboard c) stage pocket, switch, chalk, the school radio d) the school radio

Problem Nr. 4 - This problem is oriented to things, which the pupils have in their room. Advantage of this problem is in the possibility of emotional experience by the solving of this problem. The students spoke, that the children use in the answer the names of subjects, which they often use in their games and with which they have an

emotional connection. The students discuss, which things like boys and which like girls.

Problem Nr. 5 - In the first year the writing is a very important subject for the pupils and so the student choose this area of objects. Students think, that the pupil will use an objects with they write every day. So in the answers the children would oft for example pen, eraser, pencil and seldom chalk. Julia think, that in d) the pupils answer "red pencil" and seldom "red pastel", because they use the red pencil in the first year and the red pastel in the second year.

Problem Nr. 6 (Irena)

- a) Draw some figure of window.
- b) Draw some figure of window, which has not every side the same.
- c) Do from this figure two triangles.
- d) Do from figure in part b) four triangles.
- e) Which figur you can get, when you "open" these triangles?

Problem Nr. 7 (Lucia G.)

- a) Draw some circle.
- b) Draw some circle greater than first and mark it by "a".
- c) In the right overhead corner draw some great circle and mark it by ascender b.
- d) In the opposite corner draw three small circles.
- e) In the remaining corners draw great circles, one for each corner.

Problem Nr. 8 (Angelika)

- a) Write three consecutive numbers.
- b) Write three consecutive numbers. Their summ is greater than 10.
- c) Write three consecutive numbers. Each from them is less than 10 and their summ is 24.

Problem Nr. 9 (Jana)

- a) Write some natural number.
- b) Write some natural number greater than 50.
- c) Write some even natural number greater than 50.
- d) Write some even natural number greater than 50, which is divisibly by 5.

Problem Nr. 10 (Miroslava D.)

- a) Write some natural number with three digits.
- b) Write some natural number with three digits, which summ of digits is 9.
- c) Write some natural number with three digits, which summ of digits is 9. The first and the third digits are even.
- d) Write some natural number with three digits, which summ of digits is 9. The first and the third digits are even. The number is divisible by 2, 3 and 4.

The students explain, which form of solution they expect from pupils.

Problem Nr. 6

- I think, that in part a) the pupils will draw the windows, which they see from their class.(Miroslava K.).

- The pupils draw a rectangle in part b) (Jana).

- They draw a rectangle with one diagonal (part c), Miroslava D.).

- They draw a rectangle with two diagonals(part d), Gabriela.).

- I think, they can become a star in d) (Irena).

Problem Nr. 7 - Students discuss the place in paper, where the pupils draw the circles and the size of the circles.

- I think, that they draw the circle in the beginning of the paper, when they know, that it is beginnig of the work(Angelika).

- I think, they draw it in the middle (Gabriela).

- In my opinion, they draw a small circle(Marianna). Some pupils draw a great circle(Jana). I think, that in part b) the pupils draw the circle apart the first circle (Angelika). They can it draw around the first circle(Júlia).

Problem Nr. 8

- I think, that in part a) the pupils write 1, 2, 3, because this is the easiest(Miroslava D.).

- They write the numbers until 10 and in the part b) 11, 12, 13 (Angelika).

- In my opinion, they write 13, 14, 15 and so they mustn't calculate (Miroslava K.).

- I think in the part c) they calculate with estimation and can become 7, 8, 9 (Jana).

Problem Nr. 9 - The students mean, that in the part a) pupils write small numbers - 1 (Miroslava K.), 2 (Lucia V.). In the part b) and c) pupils write the numbers near 50 - 51 (Miroslava K.), 52 (Lucia V.). In the part d) pupils write the numbers until 100 - 55(Miroslava K.), 100 (Miroslava D.), 60 (Lucia V.).

Problem Nr. 10 - The students expect, that the numbers of pupils are special. Most numbers has consecutive digits (123, 234,...). a) 333 (Miroslava K.), 325 (Jana), 123 (Lucia V.) b) 333 (Miroslava K., Jana, Lucia V.) c) 252 (Miroslava K.) , 234 (Jana), 432 (Lucia V.) d) 252 (Miroslava K.) , 432 (Jana), 432 (Lucia V.)

3 Conclusions about the project

All students took part in the discussion about problems and formulated their opinions in the field, what they expect as a future teacher form pupils. They will see the problems from the viewpoint of the real life. Their explanation was mostly not exact, because they would formulate solutions from the viewpoint of pupils.

In my opinion two of problems prepared by students are very good for pupils. The first is Problem Nr. 4, because here it is possible to use emotion of pupils. Pupils like to speak about that, how you play in the free time. The second is Problem Nr. 11, because it is good for teaching the divisibility. Pupils can find intuitively the rule for divisibility by 2,3,4.

Generally I think that this project was very interesting and inspiring for me as well as for the students. I believe that in future I will use this constructivist teaching in my lessons. More informations about education mathematics at primary school is in [1], [2] and [3].

References

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