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Using a Non-Traditional Activating Method in Mathematics Education

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Abstract

The contribution deals with the description and practical use of one non-traditional activating method from Germany. The name of this method is Silent mail. During the research in which we implemented this method in mathematics education to six-graders, we performed an indirect observation of a part of the class, with parental consent. This indirect observation was evaluated with the use of statistical implicative analysis. The contribution includes several samples of pupils´ works and their content analysis. The overall research implies that the activating method improves argumentative skills and constructivist thinking of pupils.

Keywords: Activating method, teaching mathematics, statistical implicative analysis.

Classification: D40

Introduction

The roots of mathematics education using teaching methods date back to the ancient Greece, when mathematicians of this period drew in the sand using sticks and illustrated their calculations using pebbles. At present, these methods would be obsolete and ineffective. Nowadays, there are different teaching methods, approaches and activities designed for an easy adoption, understanding and fixation of the curriculum by the pupils. One of the many countries that implements a great number of teaching methods used not only in mathematics is Germany. Individual teaching methods have been built in the teaching process in primary and secondary schools in Germany for several years. One of these methods is also Silent mail.

Activating Method Silent Mail

The name of the method comes from the German “Stille Post”. Pupils are divided into groups of five to seven. An elected pupil gets a paper with an impulse. He is the only one who can see it. The impulse can be in a form of a written text, thought, formula, word or a drawing. The pupil has to write or draw the first thing that comes into his mind after seeing the impulse. When finished, he folds the paper in a way that only his solution is visible and sends it to another pupil. This one will look at the solution of the previous one and this solution will become a new impulse for the second pupil, who has to put down his reaction, then fold the paper and pass it to another pupil. This process repeats until each pupil in the

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group writes or draws something. After the round is finished, they unfold the paper. In this way, pupils can see the initial impulse, the whole process and the final solution they reached. In case that each group got the same initial impulse, the groups can compare their solutions. The use of Silent post helps pupils to understand also the information they have learned a long time ago. The feeling of success can't subsequently lead also to the interest of pupils in mathematics, as primary school pupils often associate the teaching method and the subject being taught, mathematics. This interest will then motivate them to deal with mathematics also in their free time (www.studiensemina-koblenz.de; Barzel, Büchter, Leuder, 2011).

The Activating Method Used in Practice

The research was realized in school term 2013/2014 in class 6.B at primary school in Benková street in Nitra. There are 23 pupils I the class, but we obtained parental consent to video- record only from 10 pupils.

At the beginning of the lesson we explained the correct use of the teaching method and explained how the paper will move between pupils. The pupils in the last row got papers with the pre-prepared impulses. At first they were unsure what to do, but they quickly understood. As there were only three papers in the class with 23 pupils, the ones who were not writing began to disturb the class and talk. Therefore, we spontaneously decided that we would not wait until each paper gets to each pupil, but only waited until each paper reached the last pupil in the row and then began to analyze their work (Figure 1 to 3).

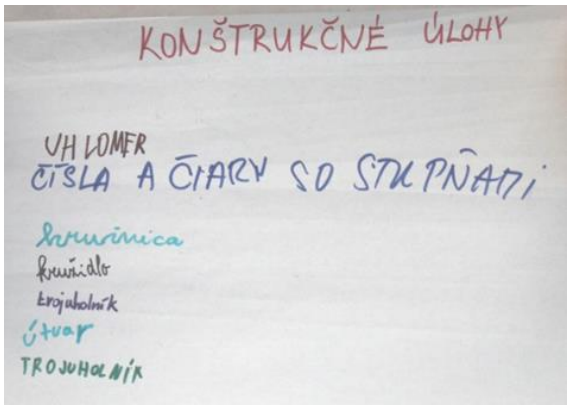
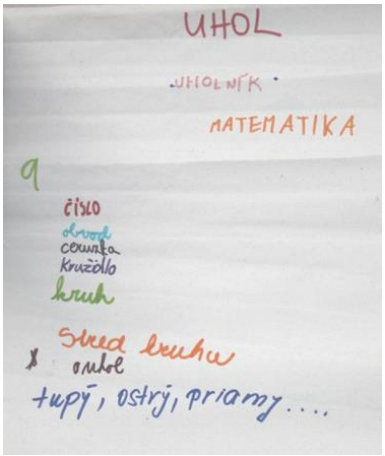


Figure 1: *Implementation of Silent post 1*



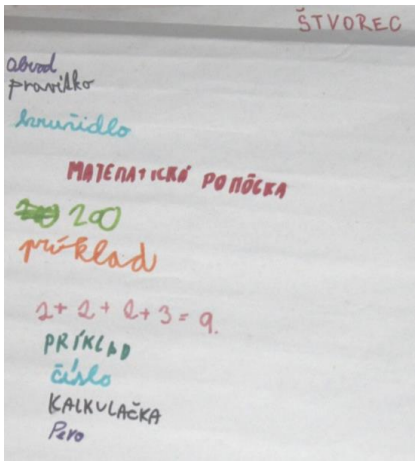


Figure 2: *Implementation of Silent post2*

Figure 3: *Implementation of Silent post3*

Also pupils who were not paying attention calmed down and started listening. After looking for associations between the first two terms also pupils entered the analysis. Individual pupils raised their hands and explained the associations between the lines.

The experiment was followed by the analysis of the video and we decided to use the statistical implication analysis developed by *Régis Gras* (2008) to evaluate the results. We selected the following didactic variables in terms of application of non-traditional methods in mathematics education:

T1 Pupil was solving the task;

T2 Pupil proceeded in solving the task according to the teacher's instruction;

T3 During solving the problem, pupil abided by the rules put out by the teacher;

T4 Pupil cooperated on the solution with classmates in the same group;

T5 Pupil discussed the solution with others in the group in a written form;

T6 Pupil required checking of a partial solution;

T7 Pupil was disciplined during the lesson;

T8 Pupil expressed dissatisfaction with the course and form of the activity;

T9 Pupil was active during the lesson;

T10 Pupil refused to participate in the task solving;

T11 Pupil dispassionately observed the happening around;

T12 Pupil engaged in the whole-class discussion about solutions.

The application of the Silent post led to the following implication rules:

$(\mathrm{t6} \rightarrow (\mathrm{t2} \leftrightarrow \mathrm{t12}))$ cohesion of 0,808;

$(\mathrm{t8} \rightarrow (\mathrm{t10} \rightarrow \mathrm{t5}))$ cohesion of 0,507;

$(\mathrm{t9} \rightarrow \mathrm{t3})$ cohesion of 0,355.

In the first implication tree (Fig.4) we can see that a part of the pupils abided by the rules put out by the teacher, discussed the solution in an oral form with the whole class, but needed a check of accuracy of their reaction. The second implication tree represents a group of pupils who discussed the solution with their classmates in a written form, but declined to participate in the task solving, while they expressed dissatisfaction with the course and form of the activity. The third implication tree represents pupils who were active and respected the teacher's rules.

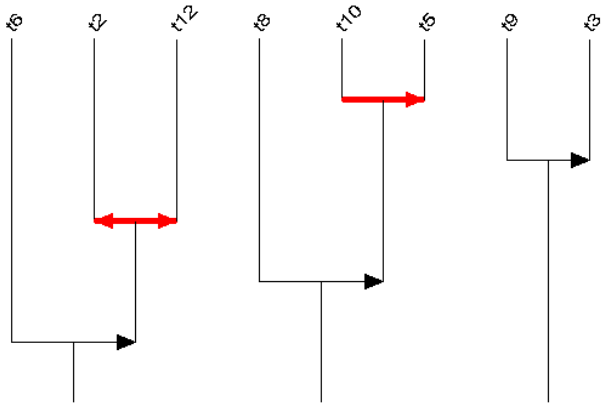


***Figure 4**: Implication tree*

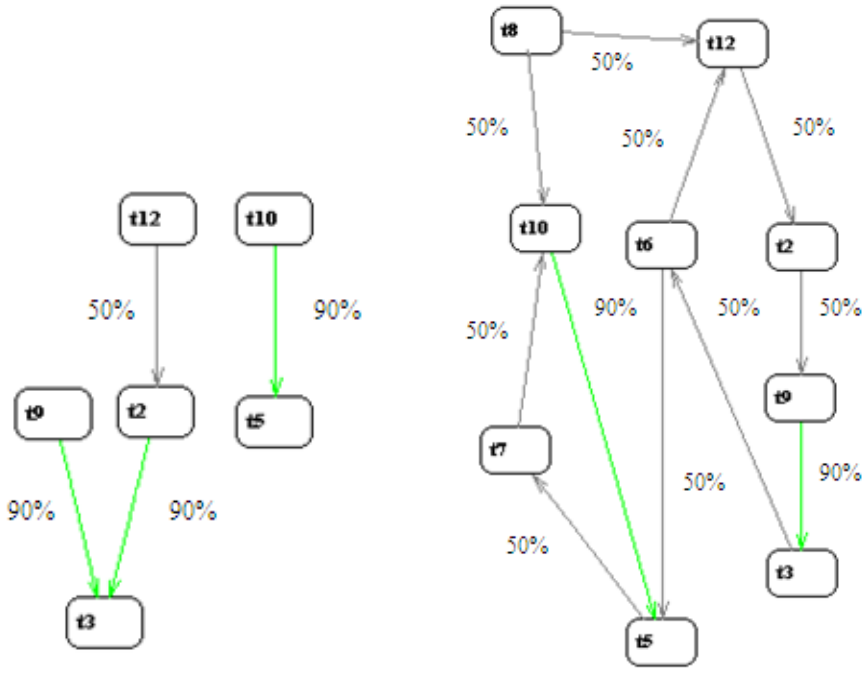


***Figure 5**: a) Implication graph with high set values; b) Implication graph with low set values*

The implication graph (Fig.5) is more complicated. We set high limits and created two graphs: a graph with vertices T12 (Pupil engaged in the whole-class discussion about solutions), T9 (Pupil was active during the lesson), T3 (During solving the problem, pupil abided by the rules put out by the teacher), T2 (Pupil proceeded in solving the task according to the teacher's instruction) and a graph with vertices T10 (Pupil refused to participate in the task solving), T5 (Pupil discussed the solution with others in the group in a written form). After lowering of the limit values we obtained one comprehensive graph with nine vertices, where the vertex T9 (Pupil was active during the lesson) popped out between vertices T2 and T3. There also originated an edge between vertices representing didactic variables T2 and T9. We can notice the association between the didactic variable T8 (Pupil expressed dissatisfaction with the course and form of the activity), T12, T10 and T5. One group of pupils expressed their dissatisfaction with the course and form of the activity. This group subsequently divided into two. One part of the dissatisfied pupils declined the participation

in task solving, but discussed the solution with their classmates in a written form. The second part of the dissatisfied pupils engaged in the whole-class discussion. This implies that though some pupils expressed dissatisfaction and maybe even refused to participate in the task solving, they still discussed the solution either with classmates or with the whole class.

Conclusion

Teaching methods are an active element of the teaching process; therefore it is important how we understand the term teaching methods. According to *H. Meyer*, "teaching methods are forms and approaches in which and through which teacher and pupils acquire the surrounding natural and social reality in institutional conditions" (Meyer, 2005, p.45).

The activating method Silent mail is an unconventional method that supports constructivist thinking of pupils and their argumentative skills. Therefore we think that its implementation in the teaching process of mathematics in primary and secondary schools could positively influence the mathematics education in Slovakia.

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