The teaching by the method of didactic games in primary school

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1 Introduction

In the writings of theorists and practitioners, the game is generally viewed as one of the basic forms of human activity that is associated with a person from early childhood and persists in his leisure activities throughout the life. If we combine the game with the learning goals that we want to achieve, we get a didactic game. The important opinion of using games in teaching can also be found in the works of J.A. Comenius.

In the following contribution, we deal with teaching through didactic game, namely "Colours Pairs" which aims to develop logical and combinatorial thinking of pupils. The lesson we had in the fifth grade of primary school in Vrable in June 2011. Our aim was to verify the interest of the didactic game "Colours Pairs" for children, accuracy and clarity of rules, the approximate time for game, the willingness of students (of the fifth grade) to play the game, the captivation of pupils, the activity of pupils.

2 Material and methods

Classroom Characteristics: In the classroom, there were 21 students (out of 25) of which 11 were boys. One of two integrated pupils was present, then the pupil who will repeat the grade and the pupil who is the current winner of the district round of Pytagoriada contest. An average mark of students from mathematics is 2.28.

The aim of teaching: The development of logical and combinatorial thinking of pupils. To know how to create a pair of elements from the given number of elements. To know how to decide whether it does depend on the order of elements, or it does not depend on the order of elements.

The equipment for lesson: Memory Cards - 30 pieces of colour squares (3 x 3 cm) - 5 pieces of six different colours (e.g. yellow, red, blue, green, violet), while on the other side (back), all the cards must be the same colour (for example, yellow) (Fig. 1).

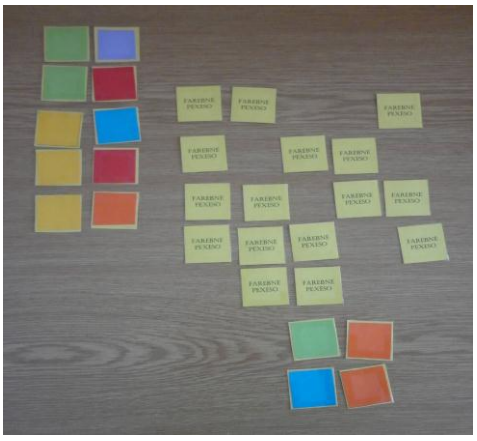

Fig.1 Used equipment for lesson

Game Rules

The game is played by two players. The cards become mixed and reversely put on the table in the shape of a rectangle (5 x 6). The player, who starts, turns any two cards. If he or his partner does not have this pair of colour cards, he takes this pair of cards and places it on the table in front of him,

otherwise, he leaves the card in a place turned with its back side up. Players will take turns after each move. The game ends when players run out of cards from the playing field. The winner is the one who has more pairs of cards.

3 Results and discussion

After explaining the rules, the pupils played a game in pairs. Subsequently, we resolved the following tasks with pupils.

Task 1: Logically organize all pairs of cards, which you have on the bench.

Solution: A possible arrangement is shown in Figure 2.

***Note**: Pupils had some difficulties with this task. We helped them with a symbolic inscription on the blackboard. After arrangement of the first column, they knew themselves how to organize remaining cards on the bench.*

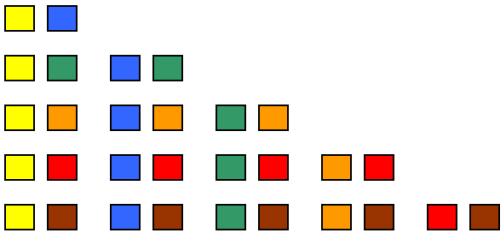

Fig.2 Arrange the cards on the bench

Task 2: How many pairs are there of all the cards?

Solution: 5 + 4 + 3 + 2 + 1 = 15

***Note**: It would be useful to point to a decreasing sequence of card pairs in each column.*

Task 3: If we made the pair of 5 different elements, how many pairs of cards would we get?

Solution: 4 + 3 + 2 + 1 = 10

***Note**: Here pupils guessed the results. When we clarified that the number of elements (colours) is decreased by one, pupils came out with the idea that the number of options must be lower. Even in spite of this, pupils guessed the results. Consequently, we suggested that they could choose any colour and they should give all the pairs of cards with that colour off the table. Here, the number of pairs was evident. Again, we presented a decreasing sequence.*

Task 4: If we shaped the pair of four different elements, how many game cards do we need to play?

Solution: 2 x (3 + 2 + 1) = 12

***Note**: The task is related to Task 3. Here, we expect that someone will automatically tell us the correct result, found by calculation. However, the majority of pupils began to manually remove the cards with other colour and count the number of options.*

Task 5: In the combinatorics, there is often a question whether it does depend or does not depend on the order (or patterns) of elements. Does it depend on the order of elements in the creation of pairs in the game “Colours Pairs”?

Solution: No, because the pair - yellow with red (YR) and red with yellow (RY) was the same option for us.

***Note**: For this task, we used the opportunity to get the answer of students by voting. Pupils who agreed that it does depend on the order of elements (or does not depend), raised their hand. Two pupils did not raise the hand at all. More hands were raised at the possibility that it does not depend on the order of elements, and so we once again clarified the conception. If it depended on the sequence of elements, it would mean that the YR and RY would be two options, two pairs of cards. If it*

did not depend on the sequence of elements, it would mean that the YR and RY would be the same opportunity. Here, all pupils agreed with the right answer.

Task 6: If we adjusted the rules of the game so that it would depend on the order of elements, how would the number of all pairs change?

Task 7: Choose the option where it depends on the order of elements. A: We will create a pair of students from your class who will be "on duty". B: We will create a pair of students from your class who will count the expression or word problem on the blackboard.

Task 8: Suggest an example where it will or will not depend on the order of elements in the formation of pairs.

Task 9: Suggest a similar game focused on combinatorics. Explain the rules and play it with your classmates.

Observations of the lesson

It is good if the teacher knows the pupils in the classroom, especially if it is a situation when he wants to focus on weaker pupils, what pupils react to the question, what pupils need to have the rules explained once again, whether pupils are really enthusiastic about the game, whether pupils' reactions are as natural as during each lesson. This deficiency can be removed by the presence of the teacher in the lesson, who knows the pupils, and is given the situations to notice during the lesson.

It is necessary to assure whether pupils really understand the rules by progressively observing each pair of pupils if they work according to the rules.

It is necessary to think about the time lag – the teacher needs to have prepared several variants of lesson.

When questioning pupils, they need to have and opportunity to confront their views (why it does depend on the order or why it does not)

Use a heuristic approach to solving tasks at the expense of time.

Questionnaire

At the end of the lesson, students completed an anonymous questionnaire. In the first four issues, pupils identified the answer at the five point scale (1 I strongly agree 2 I agree 3 I do not know 4 I disagree 5 I strongly disagree). The answers of pupils are in figure 3 (Fig.3).

1. I liked the lesson.

2. I learned something new.

3. We were doing interesting things at the lesson.

4. Mathematics is my favorite subject.

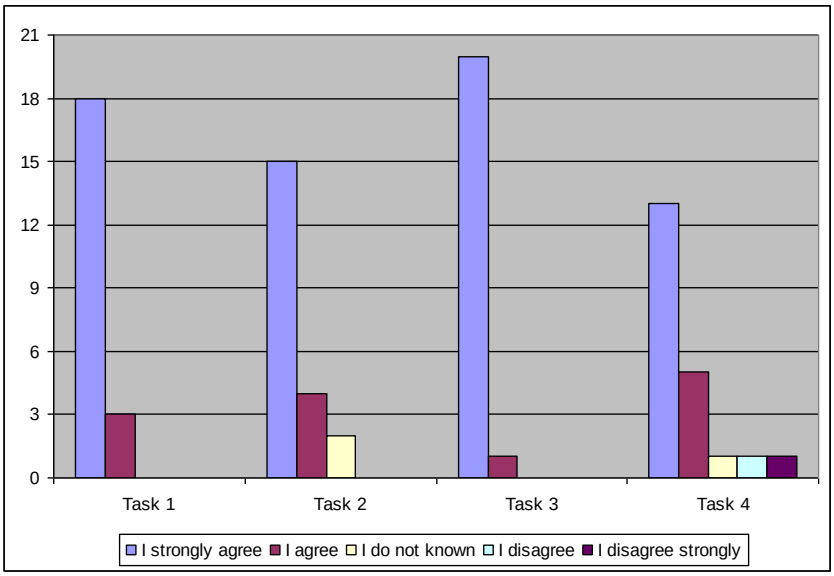

Fig.3 Answers of pupils on closed questions

Based on the responses of pupils, we infer that the lesson was enjoyed by pupils and it was interesting for them. Only 71.4% of pupils strongly agree that they learned something new. It is important to comment on the popularity of subject mathematics which scale average is 1.7, of which we can conclude that mathematics is favorite subject in this class.

Question number 5 was open: "Do you know any activity related to mathematics, which you like and enjoy?" (For example: solving word problems, counting the tasks in the workbook, math puzzles, math games, drawing ...).

Here, we were interested in how many pupils indicate games as a favorite activity. Up to 52.4% of pupils (three did not answer) said that math games are their favorite activity connected to mathematics. However, we perceive that their response was influenced by the lessons. But this result only supported our opinion that the pupils liked the lesson.

4 Conclusion

Students were active during the lesson; they cooperated helpfully and reacted to the questions. Their teacher, who was present at the lesson, assessed the behaviour and activity of pupils as better-than-average. We found three students in the class who were more passive, but they do not disturb others. Those pupils have the same behaviour during other mathematics lessons.

We can appraise that the game was attractive for pupils, considering their interest and activity during the lesson.

Most pupils understood the rules of the game immediately. However, it was necessary to explain the rules graphically. We found the pupils who need to assure even during the game that they understood the rules.

The projected time span of the game (15 minutes) was significantly prolonged. We recommend to spend the whole lesson (45 minutes) for this game and solving the problems.

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