

Geometric Figures in Concept Maps in Primary Education

Valéria Švecová^{a*} – Gabriela Pavlovičová^a

^a *Department of mathematics, Faculty of Natural Sciences, Constantine the Philosopher University in Nitra,
Tr. A. Hlinku 1, SK - 949 74 Nitra*

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Abstract

The aim of the school learning is to acquire and remember the most knowledge and information possible and thus to enlarge own notion system. The process of remembering and acquiring could be facilitated by rewriting key words from the text to a larger piece of paper and connecting the key words into a space structure according to their relation and coherence. In such a way the concept map will arise and may serve a suitable device. Applying the concept mapping as well as other metacognitive methods into the school program would be of double important role. Firstly, such methods may help the future teachers to bring their own teaching approaches nearer to a more logical and senceful way of teaching. They will look for how to elaborate the teaching material and how to make it more clear and understandable. That means they will emphasize the role of key words and key principles as well as their mutual relations and coherences. Secondly, they will do it in a way which will form the learner's contact understanding of the given theme. In this article we were interested in concept mapping at the primary level of education.

Keywords: Primary school, concept maps, square, rectangle.

Classification: C30

Introduction

A teaching process at the primary school level should be a well thought-out, detailed and logical unit in which we achieve certain educational goals. Pupils examine geometric figures as units and they differentiate between them according to their shapes. Then comes an analysis of these geometric figures and the result of this analysis is to set apart their characteristics according to which we differentiate and describe these figures. Based on these characteristics we create correct images and concepts (Šedivý, Križalkovič, 1990).

Concept maps at the primary level of education

In our research, we focused on creating concept maps on the subject SQUARE / RECTANGLE. The concept maps were creating by 4th grade primary school pupils.

Regarding to guidelines ISCED 1 a pupil has to have following knowledge and skills:

- square and rectangle draw in a square grid;
- term and mark vertices of square and rectangle;
- identify properties of square and rectangle and characterize them.

*Corresponding author: vsvecova@ukf.sk
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According to Petrasová (2008) a concept map is a graphic presentation of a pupil's knowledge structure from a particular subject where knots = points represent concepts and flow lines = arcs/lines stand for relations between the concepts. When designing a concept map a certain scheme – diagram is created. It is a method of studying, finding and testing the knowledge of individual pupils.

Tony Buzan (2003,p. 4) defines concept (thought) maps as following:

1. „A simple way of getting the information into the brain and out again.”
2. „A new way of studying and revising which is fast and works well.”
3. „A way of making notes that is not boring.”
4. „The best way to come up with new ideas and to plan projects.”

A concept (thought) map is comprised of words, colours, lines and pictures. It can be created very easily and it can help us:

- remember better and make clearer notes;
- get better marks;
- come up with ingenious ideas;
- save time and use it for a different purpose;
- sort out our thoughts, interests and the whole life (Buzan, 2003)

If a teacher gives his students the task of creating a concept map based on the currently taught topics, he can easily and quickly get very important information from the structures of the students' concept maps. He can find out whether the students understand the logical side of the topic, whether they have a sufficient overview of the topic or are drowning in the information the meaning of which is unclear to them. A teacher can quickly find out if a student can really reflect on what he has learnt or whether he is just parroting some memorized phrases and the individual observations are mutually isolated. (Vasková, 2006)

The research group was created by the pupils from Year 4 at the Pavol Marceľ primary school in Bratislava. 20 students took part in the research, 9 of them were boys and 11 were girls. When creating concept maps on the topics of a square, rectangle we chose unstructured concept mapping because we told the pupils only the key word (a triangle). The students' task was to find other concepts which they could connect with the triangle (Janík, 2005).

THE PROCESS OF RESEARCH

The research took place in two consequent lessons. The procedure was following:

1. The first phase of the execution of the research was to prepare some exemplary concept maps.
2. Then there was finding out to what extent the pupils knew concept maps and what their experience with them was. We found out that the pupils were familiar with the concept maps as their teacher included them in the process of teaching not only

Math but other subjects as well. Therefore we concluded the concept maps would be on a very high level.

3. The preparation for working with the concept maps (the motivational part of the lesson) was based on sorting out similar shapes into groups according to their identical or alike characteristics. We prepared some cut out pictures of various objects which resembled specific geometric figures (e.g. road signs, a globe, a duvet, a tent...). Then the pupils one by one approached the objects and put a random picture into the relevant group. Thanks to this part of the lesson the pupils were appropriately motivated for the other part of the research which followed shortly.
4. Afterwards followed some shared work of the whole class. We used the exemplary concept map on the topic of *a circle*. We started with drawing a circle on the board together with the word „circle“. Then together with the pupils we looked for objects that were of a similar shape. We wrote the correct objects on the board. Then we divided all the objects similar to a circle into various categories – a circle (a pizza, a cake, a placemat...), a ball (the Earth, an orange, a christmas ball...). Slowly we moved from the circle objects to the characteristics that all these objects had in common. The pupils needed a strong guidance from our side to correctly describe and define all the basic characteristics of a circle. The objects that were three-dimensional – a globe (the sun, planets, an onion, a ball ...) the students also included in this concept map of a circle. We presume that the students of this age do not quite differentiate between a drawn picture of a flat and a three-dimensional object and therefore they included the three-dimensional objects in the category of the circle objects because they viewed them as circles.
5. After working together as a class, we proceeded to working in groups of 4 pupils. We divided the class into 6 groups consisting of 2 boys and 2 girls. Each group got a task to create a concept map similar to the one we created earlier. 3 groups were to come up with a concept map for a rectangle and 3 groups for a square. During the group work we guided the pupils so that they understood and created the best possible maps. The group work did not cause any problems as this kind of activity was widely used with their teacher. After finishing the group stage we called out a representative from one of the groups with the *square* concept map to present the objects and characteristics included in their concept map. We wrote the correct ones on the board. Then the pupils from the other *square* concept map groups filled in their ideas. Even the pupils from the remaining groups participated in the discussion.

So we created one concept map on the concept *SQUARE* (fig.1) (for better visibility, we redraw it).

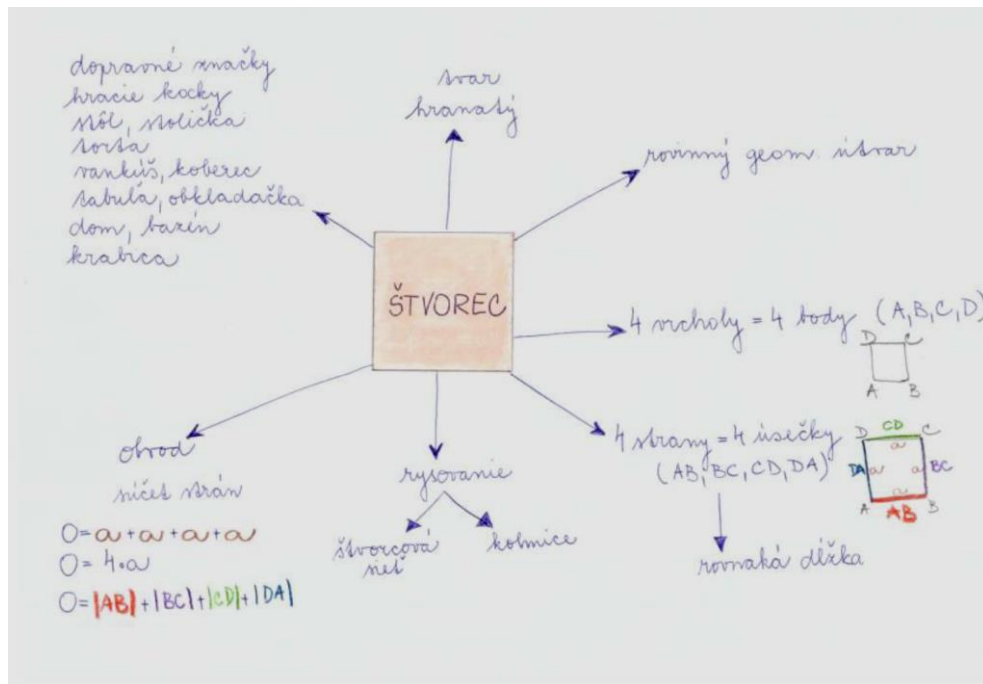


Figure 1: Concept map on the concept the SQUARE

The concept map includes the notions:

- plane shape
- 4 points = 4 vertices (A,B,C,D)
- 4 sides = 4 segments (AB,BC,CD,DA) - are 4 sides are equal
- angled form
- drawing: square grid, perpendiculars
- perimeter/ the sum of the sides
- objects similar to a square (road signs, carpet, ...)

We followed the same procedure with the *rectangle* concept map groups. Again the pupils from the other groups joined in with their ideas of objects and characteristics.

The common concept map of the class to concept *the RECTANGLE* is shown in figure 2.

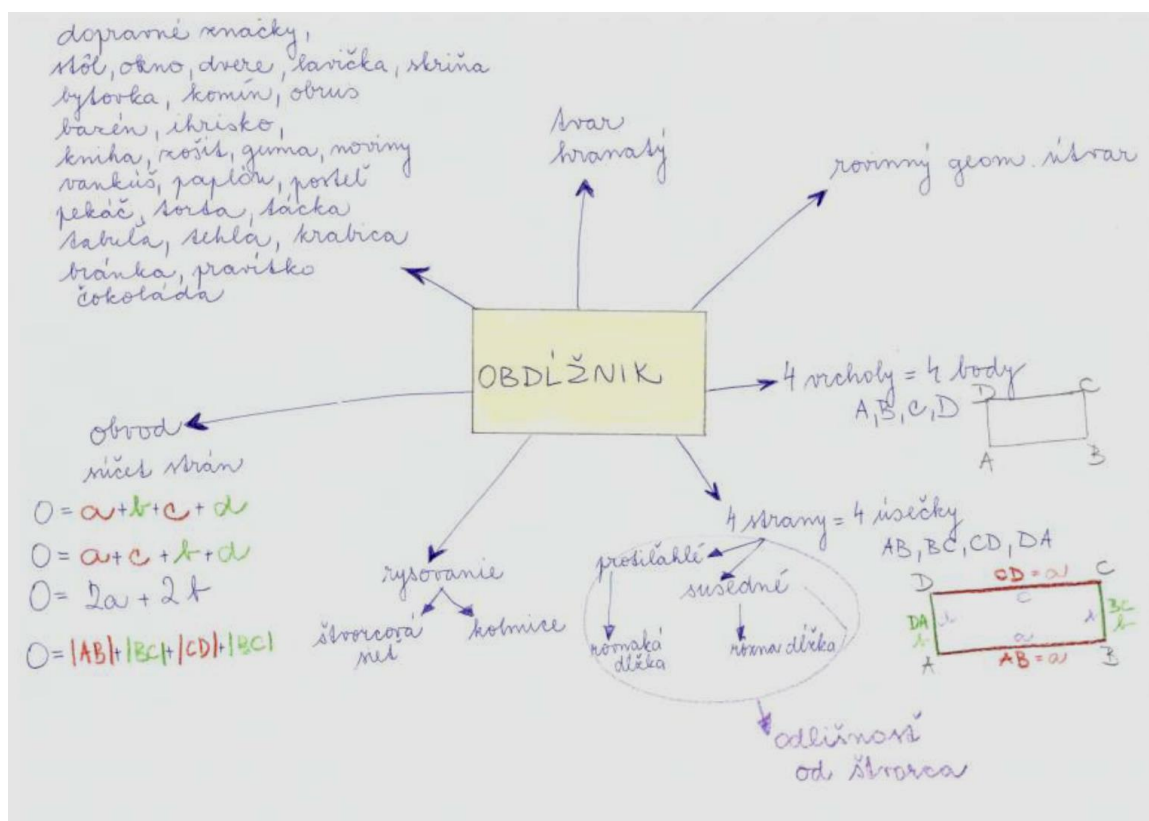


Figure 2: Concept map on the concept the RECTANGLE

The concept map includes the notions:

- plane shape;
- 4 points = 4 vertices (A,B,C,D);
- 4 sides = 4 segments (AB,BC,CD,DA) - Opposite sides are parallel and congruent – difference of square;
- angled form;
- drawing: square grid, perpendiculars;
- perimeter/ the sum of the sides;
- objects similar to a square (road signs, tablecloth, ...)

At the end of this phase we showed the pupils the exemplary concept maps so that they themselves could see to what extent they managed to agree on the various objects and characteristics that we presumed they should know and include.

In this way, the pupils have created a tool to consolidate knowledge of the square and rectangle, and at the same time better understand the differences between the two geometric figures.

Conclusion

Concept maps organize knowledge very clearly into a comprehensive structure. Each of thematic curriculum is necessary summarize and the concept maps are suitable tool. They enable students to see all the newly acquired information. Concept maps could be prepared by the teacher himself, but much more effective they are when being prepared by pupils or students themselves only.

References

- BALKOVÁ, M. 2015. Pojmové mapy v matematike na primárnom stupni. Diplomová práca.
- BUZAN, T. 2003. Mind maps for kids. London : Thorsons, 2003. 120 p. ISBN 0007151330.
- JANÍK, T. 2005. Znalost jako klíčová kategorie učitelského vzdělávání. Brno : Paido, 2005. 171 s. ISBN 80-7315-080-8.
- PETRASOVÁ, A. 2003. Využitie stratégie EUR ako prostriedku eliminácie funkčnej negramotnosti rómskych žiakov. Prešov : Metodicko-pedagogické centrum, 2003. 96 s. ISBN 80-8045-307-1.
- ŠEDIVÝ, O. – KRIŽALKOVIČ, K. 1990. *Didaktika matematiky pre štúdium učiteľstva 1. stupňa ZŠ*. Bratislava : Slovenské pedagogické nakladateľstvo, 1990. 272 s. ISBN 80-08-00378-2.
- VASKOVÁ, V. 2006. Pojmové mapy v príprave budúcich učiteľov. In: VII. vedecká konferencie doktorandov a mladých vedeckých pracovníkov : zborník z medzinárodnej konferencie, Nitra : FPV UKF, 2006. s.666-670. - ISBN 80-8050-960-3.