

## **Using Analogy in Generalization and Conceptual Learning in CAL of Geometry**

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Various mathematical disciplines, especially algebra and arithmetic, offer possibilities of generalization of computative algorithms which leads from concrete numbers to expressions and formulas. Similarly, we can find generalization in geometry that conduces from concrete numbers to expressions in handling with length, angle, area, volume. When using step-by-step generalization, students can follow the way from individual objects to classes, to analyze common attributes, e.g. invariants by change of input. The same time they could perfect their meaning of created concept.

We keep a basic position of constructivism to the learning of mathematics where learning person actively creates ideas, conceptions and relationships. Analogy could be an appropriate mental operation in suitable tasks in school education because relative young children can understand analogy in comparison with other generalizing methods. Such instruction conduces to training of expressiveness, logic and from mathematical point of view to propaedeutics of concept of isomorphism.

Software of interactive geometry Cabri 3D and GeoGebra allow to simulate situation in which analogy between two dimensions or between algebraic expression of number structure and geometrical representation of this expression can be sought. Manipulation which is supported by this software allows to change position and shape of objects and to search for invariants or behaviour of corresponding algebraic or geometric objects.

In this article, some of concrete examples of training analogy using geometric software will be shown: searching analogical geometrical construction techniques for creating analogical figures in 2D and 3D, using analogy between 2D and 3D by creating basic conception about 4-dimensional objects, searching for analogy in relationships between concepts of arithmetic mean and its geometrical representation, co-called “addition of points” etc. The article also discusses situations where analogy fails and some observations from in-service teachers’ education.