

# ABSTRACTION IN THE LEARNING OF MATHEMATICS BY FIFTH-GRADERS IN RUSSIA

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In this communication the problems of abstraction in the learning of mathematics at 5<sup>th</sup> grade of lower secondary school are considered. In particular, we investigated the process of abstracting during the introduction of the following concepts: natural numbers, ordinary fractions, a segment, direct line, a ray, scales and coordinates.

Nemov (2000) wrote in his "General foundations of psychology": "One can abstract not only properties, but also operations, in particular ways of problem solving. Their use and transfer to other conditions are possible only when the chosen way of a solution is realized and interpreted regardless to a concrete problem". In a school course of mathematics the means of abstraction is more often applied at forming mathematical skills rather than mathematical concepts. In 5<sup>th</sup> grade, during the introduction of variables and at the beginning of work with the formulas, the pupils pass to the second, higher level of abstraction, when the abstraction from concrete numerical data happens. Note that in a text-book-companion of Shevrin et al. (1989) for the study of each arithmetical operation basic types of corresponding word problems are selected and the patterns of solving such tasks are presented as schemes.

The next important step in the raise of a level of abstraction of mathematical objects is a symbolic representation of properties of addition and subtraction. The introduction of a symbolic representation influences also the method of presenting a subject matter. If properties of addition and subtraction studied before the acquaintance with a symbolic representation have been introduced by a concrete and inductive method, the properties of multiplication and division of natural numbers, which are studied later, are being introduced by an abstract and deductive method.

Note that the operation of rounding off and fulfilling mathematical operations with the rounded values of numbers by its external form and structure is very close to the operation of abstraction. Rounding a number off, we distract from digits insignificant for us which we throw off, we work only with remaining, "essential" digits.

Important for the further study of mathematics are skills connected with measurement of magnitudes. In 5<sup>th</sup> grade the measurement of the length of a segment and the degree measurement of an angle is fulfilled. Abstraction is again present here during the development of skills of use of measuring gears.

## References:

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