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The context of "pyramids" helps children discover negative and decimal numbers in a mathematics lesson

By a pyramid we mean a triangle (placed on the "tip") which should be filled in with numbers according to the rule: "add two adjacent numbers and write the result below". Some fields of the triangle are filled and pupils are asked to complete the empty ones. The context of pyramids was used in a research project investigating a pupil's ability to structure and restructure mathematical knowledge. Ten-year-old pupils who had not met negative and decimal numbers at school before were given pyramids in which these types of numbers were required as solutions. The children faced a cognitive conflict: their belief that we can only subtract a smaller number from a bigger one and that only natural numbers are needed is violated. The children's reactions to non-standard tasks were recorded and analysed. Some preliminary results are: (1) the context of pyramids could be used as a tool for introducing negative and/or decimal numbers while building on a pupil's informal knowledge; (2) children find this context very motivating, (3) the pupils in the experiment understood negative numbers as positive numbers in the operation of subtraction rather than as objects; (4) the rule "you subtract a smaller number from a bigger one" was very strong and pupils found it difficult to overcome; (5) no pupil was able to formulate the missing decimal number in words if he/she could not find its numerical representation; (6) pupils were reluctant to bring their everyday knowledge into the school context.

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