UNDERSTANDING NUMBER MEANINGS AND REPRESENTATIONS OF DIRECTED NUMBERS*

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An initial study (Borba and Nunes, 2000) - using Vergnaud's (1982) theory of acquisition of mathematical concepts - showed that number meanings, conceptual invariants and symbolic representations affect reasoning about directed numbers. Controlling for number meanings and invariants, solving problems orally was significantly easier than having to make the representations of numbers explicit and operating on these explicit representations. Thus, performance in written assessments might lead to underestimating what children understand about directed numbers.

A second study investigated the possibility of teaching young children to represent directed numbers explicitly, enabling them to attain the same level of performance they showed orally. The participants were 80 children (mean age: 7y8m), pre-tested on problem solving using explicit representations of directed numbers. The children were matched for pre-test performance and then randomly assigned to four taught groups and one control group. The instruction the children received differed in number meaning (measure x relation) and form of explicit representation (writing x use of manipulatives). At post-test the taught groups performed significantly better than in the pre-test, but the control group did not. Children instructed on relations improved significantly more than the children instructed on measures. At post-test, the children transferred what they had learned in one form of explicit representation to other forms, and the representation used (writing or use of manipulatives) had no significant effect on performance.

Instruction was effective in teaching children to make explicit their implicit understanding of directed numbers. Instruction was more effective for the number meaning children had more difficulty in understanding. This suggests that instruction does not always have to start at the lowest level but rather that starting at an intermediate level children can build on their previous understanding of a concept.

REFERENCES

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