

Problem-solving revisited
On school mathematics as a situated practice

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ABSTRACT

The general interest behind the present work is to contribute to an understanding of human cognition in context. More specifically, the empirical research reported focuses on how pupils define and deal with problem-solving in what for them is a regular school Situation. The relationships between problem-solving and contexts - concrete settings as well as abstract framings - are explored. Thus, cognition is studied within a sociocultural perspective and as embodied in communicative practices within institutional settings.

The empirical material reported has been collected in a series of naturalistic experimental and quasiexperimental investigations in which pupils in different grades of the comprehensive school have solved mathematics problems under varying conditions. The variations introduced have concerned such dimensions as (i) manipulations of the contextual embeddedness of problems in terms of headings provided, formulations of word problems, composition of tasks on work sheets, and the lessons during which identical tasks have been attended to, (ii) the tools and resources (computer, calendar) that have been available to pupils when solving problems, and, finally, (iii) whether students have been working alone or in groups.

The results demonstrate the fundamental, yet subtle, ways in which different contextualizations of problems result in variations in interpretation and the relative difficulties pupils have in dealing with them successfully. Problem-solving in the mathematics classroom is best understood as a simultaneous coordination of several levels of activity. There are intricate rules for how word problems are to be interpreted and what sorts of semiotic principles are relevant and can be relied on when coordinating what is said with an external reality and with mathematical notations and operations. Similarly, there are many levels of context in the institutionalized setting that offer structuring resources that provide suggestions for how to interpret tasks. It is also argued that mathematics teaching often results in a dilemma which is paradoxical in nature; in the attempts to utilize problem-solving as a vehicle for promoting competence that is decontextualized and abstract, mathematical reasoning itself becomes the dominant context for making sense of the tasks to be solved.

Key words: Problem-solving, Learning in school, Mathematics learning, Cognition and context, Situated learning.

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