

Abstract

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A phenomenographic excursion into first-grade children's arithmetic

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Arithmetic is one of the major areas of learning that children encounter in first grade. It is evident that learning to add and subtract does not come easy to all of them, and it has been observed that basic arithmetic may have a strong influence of children's self-definitions as learners, and their understanding of what learning is. It has also been suggested that when mathematics difficulties arise they stem from the child's adoption of an approach to addition and subtraction where problems are solved by unit-by-unit counting. When children do this there is a risk that they never come to experience numbers as whole-to-parts relations, which is the fruitful way of approaching basic arithmetic.

This dissertation examines on the one hand the scope of variation in first-grade children's ways of experiencing *learning* in the domain of arithmetic and on the other hand the scope of variation in their ways of experiencing *numbers* in the context of first-grade arithmetic. The material for this phenomenographic analysis was derived from a one-year study of three first-grade classes using some computer software developed for the purpose of enhancing the whole-to-parts aspects of numbers.

The main distinction in terms of the children's ways of experiencing number *learning* was between number learning as something that comes easy, as a gift (or not at all) and number learning as something that comes through work. In either case there was also a variation in whether, and to what extent, the learning self was seen to have an active role in number learning.

Three dimensions, each constituted by two contrasting poles, were discerned with reference to the children's ways of experiencing *numbers* in the context of learning. Numbers as experienced by these children varied in terms of their organisational integration of the poles of *structure* and *sequence*, they varied in terms of their presentational *nebulousness* or *definiteness*, and they varied in terms of whether they were oriented to as phenomena of *authority* or as *autonomous* phenomena. These three dimensions could also be viewed as an ontological, an epistemological and an ethical aspect of numbers, and part of the difficulty with number learning may stem from internal discrepancies in the available ways of experiencing numbers and number learning.