

Einar Jahr
Hedmark College
Department of Teacher Education
N-2318 Hamar
NORWAY

Description of Doctoral Project

I have been working with teacher education in mathematics for 25 years. Through this work I have gained some experience and have made a number of reflections about the learning of mathematics.

My doctoral project will be based on my experiences and thoughts connected with my work as a teacher educator. This will cause me to choose a philosophic analysis of mathematical content and/or of the process of learning. In order to restrict myself to something accessible, but still relevant to all learning of mathematics, I will concentrate on the *formation of concepts*. The problem I will pose is therefore this:

How do human beings form mathematical concepts?

This problem leads straight to the core of the epistemology of mathematics. The most important sub-problem here is

- What is a mathematical concept?

To answer this, we must answer something even more fundamental:

- What is a concept?

Then we must consider the process of acquiring knowledge:

- How do human beings form concepts?

If we combine these points, we will be closer to answering the question I have posed..

In order to say what mathematical concepts are, one has to consider the philosophy of mathematics. As a result, one has to pose the didactical question:

- How does the teacher's philosophical view on mathematics influence the teaching?

Then I have to cope with the very difficult task of separating mathematical concepts from all other concepts. This is about finding criteria describing a clearly defined hierarchy of concepts. These criteria shall fit concepts that are so different as circle, addition and topological space. I am not sure what the result of this analysis will be, but a doctoral dissertation must find some new paths. I think part of this is definable, but I imagine some concepts must be considered as mathematical by cultural tradition.

Constructivism as a philosophy of learning holds a strong position today. Recently, it has been claimed that this philosophy has no didactical influence, because the theory does not incorporate guidelines for good teaching. I will thoroughly investigate the importance of discriminating between on the one hand the philosophy of how mathematics is learned and on the other hand methodological recommendations. At the same time I want to show how philosophical insight combined with didactical goals may influence teaching.

The real core in my project is *to use philosophy not only to understand, but as guidance for practice.*

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