

Tool Use in an Innovative Learning Arrangement for Mathematics

Although technology is integrated in education, little is known about the relationship between the use of technological tools and cognitive development, and the way in which the teacher ‘orchestrates’ tool use. This issue is addressed for the case of mathematics education. The theoretical framework consists of domain specific theories, activity theory and the instrumental approach. In a design research methodology, an innovative instructional sequence using applets is developed and tested in grade 8.

To investigate the interplay between learning, teaching and the use of technological artefacts within a suitable learning ecology, the following *research questions* specify the more general research topic:

1. *How can applets be integrated in an instructional sequence for algebra, so that their use fosters the learning?*
2. *How can teachers orchestrate tool use in the classroom community?*

The first question concerns the individual learning. As a paradigm, the study focuses on the use of applets to develop the concept of function, and in particular on working with chains of operations. The concept of function is essential in algebra and calculus, but students have difficulties to make a shift from functions as local calculation processes to functions as global mathematical objects that signify unidirectional dependence relationships and can be submitted to operations of a higher order. The design of a specific instructional sequence for this topic serves as paradigm for more general knowledge on the influence of the use of technological artefacts on learning.

The second research question focuses on classroom practice and on the role of the teacher, which is identified as an important factor in the integration of technology.

The results of the study include a theoretically and empirically based local instruction theory on learning the function concept with technological artefacts, a framework for orchestration of tool use in mathematics teaching, and a more general elaboration of the theoretical framework for using computerized artefacts in education, which this study is a case of.

Involved in: research, curriculum development, IT

Supervisor **prof. dr. Koeno Gravemeijer**

Project leader **dr. Paul Drijvers**

Staff **Peter Boon, dr. Michiel Doorman, dr. Paul Drijvers**

Email **send mail**