

The Impact of ICT on Representations in Primary School Mathematics

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Mathematical ideas or concepts can be represented in many different ways by students in the primary school classroom. ICT offers new possibilities of representing, displaying, transforming and reviewing these mathematical ideas as well as new ways for teachers to collect and store digital records of students' mathematical work. With this change it should be interesting to investigate the impact of ICT on students' use of different semiotic resources and the way teachers react to these representations. This short presentation acts as a starting point for a planned study aimed at investigating this question.

A forthcoming study

Mathematical ideas or concepts can be represented in many different ways by students in the primary school classroom. Representations and signs play an essential role in mathematics and working with representations may be seen as the essence of mathematics (Hoffman, 2006). Since it is impossible to grasp and experience a mathematical object or the objectivity of mathematics humans need signs and representations. Semiotic theories can be used in the study of signs, communication, meaning-making and representation of concepts and ideas through different modes and this is often referred to as *multimodality* or the study of *multimodal discourse* (Sáenz-Ludlow & Presmeg, 2006). O'Halloran (2005) argues that there are few comprehensive theoretical and practical approaches in this field and as a consequence the meta-language needed for a theory and practice of multimodal discourse analysis is still at a preliminary stage. Given that the field of research is relatively new and still developing this is to be expected but can still create problems. One of the problems involve the terms *mode* and *semiotic*. While Kress and Van Leeuwen (2001) define *mode* as the semiotic resource that allow simultaneous realization of discourses and types of interaction O'Halloran (2005) uses the term *mode* to refer to the channel through which semiotic activity takes place. This channel can be auditory, visual or tactile. O'Halloran, who unlike Kress and Van Leeuwen studies mathematics, views semiotic resources as functional sign systems with unique grammatical systems through which they are organised and for mathematics these semiotic resources include *language*, *visual images* and *mathematical symbolism*. Thus mathematics can be seen as a multisemiotic discipline. Since meaning-making in

mathematics can occur with any semiotic resource all the different resources used by learners have to be taken into account in the practices of assessment in mathematics. In assessing students' mathematical literacy teachers use a number of more or less explicit assessment acts. In day-to-day classroom work teachers continuously assess students, formally and informally, in different types of interactions where the semiotic resources can change with every situation. Teachers recognise these different representations in different ways, where some ways of communicating mathematical ideas or concepts are encouraged whilst others may be discouraged.

In classrooms around the world ICT offers new possibilities of representing, displaying, transforming and reviewing mathematical ideas as well as new ways for teachers to collect and store digital records of students' mathematical work. As signs of learning can be shown by learners in a number of ways using different semiotic resources an important question arises; what counts as evidence of learning?

The study proposed here sets out to investigate the following questions:

- What semiotic resources are used by students in the mathematics classroom?
- In what different ways do ICT influence students' use of multiple forms of representations of mathematical ideas and concepts?
- How can teachers' recognition of these representations, as signs of learning, be understood?
- What are the implications of ICT concerning assessment in the mathematics classroom?

The data collection of the study includes teacher interviews with stimulated recall, classroom observation, video analysis and analysis of student work. The study also sets out to equip one or more classes with laptops and/or tablet pc:s during two years. In these classes ethnographic fieldwork will fuse with action research as there will be collaboration between the teachers in the classrooms and the researcher.

References

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