

Investigating how learners use representations in understanding fractions – a semiotic perspective in a modelling classroom

In contrast with how maths is usually taught, my study focused on introducing Grade Five learners to fractions by using real-world problems and supporting them as they developed their own ways of solving problems. I applied a mathematical modelling approach in teaching learners to consider underlying mathematics, develop a model of a problem and solve this instead of simply applying a process by using a rule. Mathematical modelling requires learners to think about what they know in the real world, providing an opportunity to relate maths to known things while developing their thinking and communication skills.

Four Grade Five learners took part in the study and all of the interactions were video recorded. They answered some questions about fractions in one-on-one interviews, before and after a four-week teaching experiment. During the experiment they worked in small groups and made sense of the mathematics and representations while solving and discussing three modelling activities.

Mathematical concepts have to be represented by pictures, symbols or words. How learners use and process these representations indicates what they understand: how and what they think. I considered the learners' internal processing and external use of representations in an interactive classroom through a sensory processing approach and semiotics, which is the study of representations that considers the meaning associated with representations in three ways: semantics, syntax and pragmatics. Approaching mathematics teaching and learning so it is not removed from everyday life will enable grade five learners to use representations of maths in all three ways.

I analysed the outcome of the one-on-one interviews and the results showed that the learners understood fractions better. I then described the teacher and learners' use of representations during the modelling activities which showed that considering how learners use representations can help a teacher to identify learners' barriers to understanding and provide signposts in helping them overcome these. This study highlights the usefulness of a semiotic perspective in a mathematics classroom.

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