

# ASSESSING STUDENTS' BELIEFS ABOUT MATHEMATICS AS A DISCIPLINE

Maria Kirstine Oestergaard

Aarhus University & University College Copenhagen

Changing students' beliefs is a complicated matter, and so is assessing any potential changes in students' beliefs. If we wish for students to become critical and reflective thinkers, their beliefs need to be evidentially held (Green, 1971), which means that they must be formed through experience and reflection upon these experiences. However, when it comes to students' beliefs about mathematics as a discipline, experiences are not easily obtained. This dimension of the belief system includes beliefs about the role of mathematics in the world, the nature, application, history, philosophy and aesthetics of mathematics, and thus exceeds mathematics as a school subject (Jankvist, 2015). According to the Danish competency framework (Niss & Højgaard, 2019), which is widely implemented in Danish mathematics education, mathematical competence consists of two main pillars: eight action-oriented competencies and three forms of overview and judgment. The latter concern 1) the actual application of mathematics, 2) the historical development of mathematics, and 3) the nature of mathematics as a subject area. These three forms of overview and judgment are based on both knowledge and beliefs about mathematics as a discipline. Thus, they constitute an applicable framework for assessing such beliefs, as shown in this study addressing the following research question:

- What characterizes middle school students' beliefs about mathematics as a discipline?

As part of a longitudinal intervention study of middle school students' beliefs about mathematics as a discipline, three 6th grade classes (a total of 70 students) completed a 20-item questionnaire designed to outline their baseline beliefs. Subsequently, three students with diverse views about and attitudes towards mathematics were selected for further interviews. The data from the questionnaires and the interviews of the three students have been analysed using the three forms of mathematical overview and judgment as coding categories as well as Green's notion of evidentially and non-evidentially held beliefs. The analysis shows that even though the three students differ a lot in their mathematical abilities, level of motivation, attitude towards mathematics and learning behaviour, all of them are struggling with the questions concerning mathematics as a discipline. Their answers are often hesitant, uncertain, shallow or incoherent. All three students mainly associates mathematics with numbers and calculations, and – apart from grocery shopping – they all seem to have difficulties providing examples of the use of mathematics in everyday life.

These results indicate that the students' beliefs about mathematics as a discipline are, if not non-existent, then limited or unstable, and thereby peripheral (Green, 1971). Combined with the lack of examples by the students, this fact points toward non-evidentially held beliefs. One of the aims in the longitudinal project is to provide the students with opportunities to develop evidentially held beliefs by presenting concrete examples, both of the application and the historical development of mathematics as well as mathematical methods and discussions. Followed by room for reflection, these experiences can potentially lead to central and influential beliefs about mathematics as a discipline.

## References

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