

Associations between first-graders' maths knowledge and their class-teachers' profiles of ability beliefs and outcome expectations

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Summary

Children's maths abilities and their development in general education is an important basic ability besides reading abilities. Research on school adaptation stresses the importance of maths pre-skills and children's ability to focus their attention for successful learning in the beginning of school. At the same time, the school climate in general and the teacher in particular have a similarly important role when it comes to the development of children's early maths skills – there are teachers whose students, although starting off with weaker pre-skills than others, make good progress, and there are teachers whose weaker students keep falling more and more behind (Duncan et al., 2007). One of the possible factors affecting different developmental trajectories might be teachers' beliefs and attitudes, as they are believed to influence teachers' views of the learning process (Chan, 2004). However, very little research has been carried out to test the associations between teachers' beliefs and specific teaching practices (however, see Aus et al., submitted; Shim et al., 2013) or the development of children's knowledge. Beliefs are difficult but not impossible to change and the best way to systematically influence teachers' beliefs is during teacher education (Cooney et al., 1998). We studied novice teachers who have only just begun working at schools in order to see what kinds of beliefs and attitudes young teachers hold in the beginning of their careers. The study focuses on the development of maths skills in first-grade students in association with the ability beliefs and outcome expectations of their class-teachers. The current study is a continuation of our previous work on associations between teachers' beliefs and their teaching practices. In this study we have used person-oriented methods to see what kinds of changes in students' maths skills

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take place during the first grade in classrooms of teachers with different belief profiles.

Our sample of teachers consisted of novice teachers with two profile types of ability beliefs and outcome expectations based on latent profile analysis (see Aus et al., submitted). One group consisted of teachers with relatively low entity and innatist ability beliefs, who at the same time believed that their activities as a teacher had an important role to play in student learning success (i.e. the so-called optimistic group). The other group consisted of teachers who were more inclined to believe that intellectual ability is a fixed and innatist trait, while also having little faith in the fact that their choice of teaching practices might be the reason for student learning results (i.e. the group with more reserved beliefs). The two groups did not differ in terms of incremental beliefs. We assume that in the classrooms of teachers with different belief-profiles, children's maths skills develop differently. More precisely, we suggest that for teachers with more positive beliefs we find more children whose skills improve or stay at the same relatively high level compared to others during the first school year. In classrooms of teachers with a more reserved belief-profile we expect to find more students whose skills do not improve. We base our hypotheses on experimental studies on the positive effects of changing students' ability beliefs (Blackwell et al., 2007; Mueller & Dweck, 1998). We assume that teachers' ability beliefs and outcome expectations have an effect on their teaching practices and classroom management decisions and through that also on students' study results (Leroy et al., 2007). We expect the teacher effect to be detectable in the first grades, as students at that time are mostly taught by one teacher.

The sample of students comprised 298 first-grade students from different regions in Estonia. Analysis of teachers' belief profiles was carried out on data from 118 novice teachers taking part in an induction year programme. The current study encompassed 15 of those teachers – all of the first-grade teachers who had answered the questionnaires about their ability beliefs and outcome expectations in the beginning of the school year. From the grades of the teachers included in the present study, 234 children took our maths skills test in the autumn and 211 children took the test in the spring. The effect of the teachers' belief profiles on the development of student maths skills was analysed based on data from 187 children who had taken the maths skills test on both occasions and whose teacher had answered the questions about their beliefs.

Five of the fifteen teachers in the current study belonged to the positive ability profile group and ten to the reserved belief profile group. We used

configural frequency analysis (CFA) to assess whether the children whose maths test results either improve, decline or stay the same in comparison to others are more likely to belong to classes of teachers with either one or the other belief-profile. First, we divided the children into three groups based on their maths test results from the autumn and from the spring. The groups were comprised of children with weak, average and strong maths skills. We then made sure that in autumn, i.e. at the beginning of the school year, children from all level groups were randomly represented in classes of teachers with different belief profiles.

Our hypotheses were partly confirmed. Classes of teachers with more reserved beliefs included more children, than would be expected by chance, who did not improve their weak maths skills compared to others during the school year, and also, fewer children than would be expected by chance, who improved their weak maths skills considerably compared to others. We also found fewer children than would be expected from classes of teachers with a positive belief profile, who declined considerably in their maths skills compared to others.

The fact that we found fewer children than would be expected from classes of teachers with positive beliefs, who declined considerably in their maths skills, allows us to suspect that those teachers have found ways to support the further development of children with good initial skills. The results concerning children in classes of teachers with reserved beliefs shows that for some reason children cannot improve their initial weak skills in classrooms where their teacher believes in fixed ability and has lower than average outcome expectations. Further studies are needed to clarify how teachers' beliefs express themselves in their attitudes toward children and the learning process, and also why the weakest students and their performance seem to be especially vulnerable. Our results refer to the need to raise awareness of beliefs of practicing teachers as well as the importance of the topic of ability beliefs in teacher education.

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