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Teachers' probing questions in mathematical classrooms connected to their practice of encouraging students to explain their thinking

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Introduction

Asking questions is a common used teaching activity in mathematical classrooms and by arguing that there is a relationship between teaching and learning (Smith & Stein, 2011), the conclusion is that questions play an important role in teachers' practice in the mathematical classroom (Boaler & Brodie, 2004). Boaler and Brodie (2004) studied teachers' questions to find the nuances and differences of teachers' questions in mathematical classrooms. They found nine different types of questions (e.g. recall questions, questions supporting students in developing mathematical knowledge, questions which explore meanings and relationships, probing questions to get students to explain their thinking and questions generating discussions). The probing questions are considered critical in encouraging students to explain, clarify and reason. Connected to the probing questions, talk moves are considered useful for teachers in having a fruitful discussion with students (Smith & Stein, 2011; Kazemi & Hintz, 2014). The talk moves that can be seen in mathematical classrooms are for example revoicing, repeating and wait time (Kazemi & Hintz, 2014). Asking questions seems to be a teaching activity that teachers do not plan ahead of the lesson even though teachers make explicit that questions are important in the teaching (Boaler & Brodie, 2004). Asking probing questions also make students aware of their own responses and make students answer in the way they think the teacher expects an answer (Smith & Stein, 2011). Therefore, in this study I have chosen to focus on the specific questions where teachers are probing students to make their thinking explicit, e.g. "How did you think?", "How did you get your answer?"

The aim of the study is to categorize the different types of responses teachers give to students when students have answered teachers' probing questions. The prospective results will be analysed with the attempt to present different types of interaction patterns emerging from data, which are connected to teachers' responses and teachers' talk moves when students have made their thinking available and explicit through oral explanations. The results will be presented both qualitatively and quantitatively.

Theoretical framework and methodology

The data in this study consists of videotaped mathematics lessons from 16 teachers, one lesson from each teacher, with six to nine years old students. In the data analysis, all episodes where teachers ask probing questions (Boaler & Brodie, 2004) were first identified together with the lesson phase in which each probing question appeared. In these episodes teachers' talk moves (Kazemi & Hintz, 2014) were used to find categories of different interaction patterns among teachers' responses. The

interaction patterns are grown from the data and the patterns are used to explore the different ways teachers follow up students' answers after the probing question.

Findings

Preliminary findings from the 16 teachers indicate that probing questions are used in all phases of the mathematical lessons and that students' responses to the probing questions vary between different teachers. The probing questions are most common during the lesson phase whole class discussion and student work. In the preliminary results, I have found that teachers use revoicing in 50% of the interactions following probing questions. Revoicing seems to help students extend their thinking and the results show that when a student's first answer is short without an explicit thought and teachers follow up with revoicing, students often express a developed thought (see Example 1). In contrast, when a student first answers with an explicitly developed thought and the teacher uses the talk move revoicing the next answer from the student is often short (see Example 2).

Example 1: Short student answer and teacher revoicing – students express a developed thought

Teacher: Tell me, how do you think?

Student: I counted

Teacher: You counted

Student: I counted; first, I counted those [showing cards with number 6, 1] and then those [showing cards with numbers 3, 4, 2]

Example 2: Developed student answer and teacher revoicing - students stop deepening their answer

Teacher: Please, explain your pattern, how do you think?

Student: The pattern starts over here [pointing to the pearls] and we were thinking small large small large

Teacher: You did think small large small large

Student: Yes

The preliminary results also show that teachers who regularly use the talk move wait time have students answering the probing question with developed thoughts. However, the talk move wait time is not commonly used by the teachers in this study.

References

- Boaler, J., & Brodie, K. (2004). The importance, nature and impact of teacher questions. In D. E. McDougall & J. A. Ross (Eds.), *Proceedings of the twenty-sixth annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (Vol. 2, pp. 774–782). Toronto: OISE/UT.
- Kazemi, E., & Hintz, A. (2014). *Intentional talk: How to structure and lead productive mathematical discussions*. Portland, ME: Stenhouse Publishers.
- Smith, M., & Stein, M. K. (2011). *Five practices for orchestrating productive mathematical discourse*. Reston, VA: National Council of Teachers of Mathematics.

