Communicative projects about mathematical reasoning

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Keywords: Mathematical reasoning, dialogism, classroom practice.

Background

Mathematical reasoning as concept in education research comes in various shapes and is used with different purposes (Jeannotte & Kieran, 2017). Regardless of definition, mathematical reasoning is included in many curricula as part of being mathematically competent. Now, in Norway, after the curriculum renewal in 2020, (Norwegian Directorate for Education and Training, 2020), mathematical reasoning is linked to students' capability of using mathematical language, of engaging in posing and answering questions and of using mathematical concepts in different situations. The responsibility for creating opportunities for students to develop an understanding of and ability to carry out mathematical reasoning lies with the teacher. However, creating and maintaining a discourse that promotes the development of these competencies, seems to be challenging for teachers (Højgaard et al., 2010).

As part of my PhD work, the study presented here focuses on the interactions in the classrooms of newly graduated teachers when communicating mathematical reasoning. The study contributes to the understanding of what participation in mathematical reasoning activities looks like as well as aspects of how learning experiences influence each other over different timescales. The research questions are: What kind of communicative projects are established in the classroom when the new teacher and students are communicating mathematical reasoning? How do these projects evolve over time?

Theoretical framework

For this research I have chosen a dialogical approach. Dialogical aspects of students becoming active members of the mathematical discourse in the classroom have been addressed in several research studies. For example, studies have shown how participating in conversations about mathematics promotes students' understanding of mathematical concepts or a development of formal mathematical language (Barwell, 2016; Schleppegrell, 2007). Following Linell, dialogism is a theory of sense-making where "action, communication and cognition are thoroughly relational (or inter-relational) and interactional in nature" (Linell, 2009, p. 14). This relational aspect of communication puts focus on both sense-making as a situated joint construction and on communicative acts as sequentially ordered. In the negotiation of meaning there is a flow of initiatives and responses forming a dialogical interdependent relation between single acts and more overarching activities. Similarly, activities form larger units of communication, "communicative projects", interrelated to other goals or doings in, and across situations. This interdependence connects acts in the present to dialogical contributions prior in time and to future contributions (Lemke, 2000). Analysis of what happens in communicative projects, how they are organized or on what timescale they are carried out can be a way to understand a locally produced discourse (Linell, 2009). The dialogical principles of sequentiality, joint construction and act-activity interdependence also imply that contexts and discourses are constantly shifting, interdependent with what others do, have done and potentially could be doing in the future.

Methodology

The study focuses on communicative projects about mathematical reasoning and how they evolve over time. To identify communicative projects, I will do observations of a sequence of 10-12 consecutive lessons. This enables analysis of interactions both within a lesson and between lessons (Lemke, 2000). The observations will be done in three to four classrooms at upper secondary level using video recording. Also, the teachers of those classes will be interviewed. The teachers will have up to three years of experience teaching mathematics since graduating from teacher education. Video recordings and interviews enable analysis of how communicative projects evolve. Capturing actions such as gestures, the use of physical objects or use of words can connect different timescales. Interviews will give information about how the teacher planned and adjusted activities. Both methods can be used for finding shifts in organizational aspects (Linell, 2009) such as the use of time and space in the classroom or the function of reasoning activities. I will use the mathematical reasoning framework presented by Jeannotte and Kieran (2017) for identifying topic activities on mathematical reasoning. Although there are challenges in finding communicative projects and connecting interactions to a relevant timescale, the dialogical approach makes it possible to discuss how teachers handle shifting learning opportunities connected to mathematical reasoning. For the poster I hope to have some initial data and I want to discuss using dialogism as theoretical framework for the analysis.

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