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## **Lesson and learning study - the opportunity to successful communicate the content in algebra**

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Students build a powerful understanding of mathematics when they are involved in communication that challenges them to explore and justify their own mathematical idea.

There are extensive concerns pertaining to the idea that students do not develop sufficient communication in algebra and in mathematics more generally. This problem is at least partially related to their algebraic thinking. Although teaching should give students the opportunity to develop their ability to communicate, there are limited research insights as to why some types of communications work better than others, and how and why instruction influences such communication. The focus, in this article, is not on general aspects of communication, but instead on those aspects of the object of learning that the teachers focused on and what aspects the students discerned through the mathematical communication (with a focus on algebra). To do this, a new approach to communication, which has been developed in recent years, is used as a starting point, namely variation theory (Marton & Booth, 1997; Marton, 2015). Variation theory provides a framework that should make it possible to discern and describe differences in how aspects of the algebra content are communicated, because it has an explicit focus on the object of learning and discernment of its aspects. For discernment to occur, students must experience variation. Experiencing variation in certain aspects require opening up dimensions of variation in these aspects.

In this study, an effort was made to examine what aspects of the object of learning the teachers focused on and what aspects the students discerned through the mathematical communication. For this particular focus, two case studies were chosen for analysis, namely two videotaped algebra lessons. In own lesson it is used lesson study and in the second it is used learning study. The aim of both lessons was to give the students the opportunity to discover the need for using variables as a consequence of expressing generalizations. The analysis of the opportunity to communicate was grounded in variation theory. Differences between focused aspects and discerned aspects of the object of learning are described. The results show that the communication that occurred in the two classrooms the students made distinctions in understanding the object of learning. These distinctions were grounded in the collectively performed patterned activity in which students and teacher made their thinking public. The process of making thinking public was characterized by an aspect that was critical for one or more students (A) is focused on by the action of the teacher or other students (B) so that A discerned the aspects focused on by B. Coordination between the aspects focused on by the teacher and discerned by the students provides students with the opportunity to successful communicate the content in algebra. In addition, the structure of the lesson influences the opportunity to communicate aspects of the content. In both lessons the activity used to introduce variables in algebra had the potential to provide the opportunity to communicate algebra in the classroom. However, the way in which some aspects were focused gave the students different opportunities to discern the use of variables in algebra.

## **References**

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