

## Visualising connections

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*The poster presents an idea of how Bernstein's theory about horizontal and vertical discourses can be used with variation theory. In the long run, the goal is to develop mathematics education in Malmö taken teachers and students into account as well as to create a research based teacher development program. The starting point is that pedagogy need to be visible, meaning that the connection between what happens in the classroom and how mathematical knowledge is evaluated and graded is visible to the students. The purpose of the poster is to get feedback on the ideas and get ideas of how this issue can be dealt with.*

*Keywords: vocational education, variation theory, visible pedagogy, action research.*

### **BACKGROUND**

In order to close the achievement gap when it comes to mathematics there is a need to make the pedagogy visible (Dahl, 2014). Visible pedagogy, drawing on Bernstein (2000), means that the connection between what happens in the classroom and what is evaluated and graded must be clear to the students.

Mathematics education in upper secondary school in Sweden follows a national curriculum, launched in 2011 (Skolverket, 2011). Mathematics in this curriculum is divided into “core content” (what each course should cover) and “knowledge requirements” (what should be graded). Core content is for instance geometry and algebra while knowledge requirements are expressed as different competencies, for instance problem solving and conceptual understanding.

Furthermore, upper secondary school in Sweden is divided in different programs, some preparing for further education and some preparing for a specific vocation, such as building and construction or nursing and caring. It is well known in Sweden that vocational programs attract students who come from lower socio-economic backgrounds and who is at risk of become low achievers in mathematics (Broady & Börjesson, 2005). For these different kinds of programs there are different mathematics courses with some similarities but also some crucial differences. For the vocational programs (but not for the other programs) it is stated under “core content” that most of the mathematics should cover relevant mathematics for the “subjects typical of a programme” (Skolverket, 2012 p. 4). But, there is nothing about this in the “knowledge requirements”. Because of the structure, there is a risk that the pedagogy becomes invisible to the students attending a vocational program.

A way to deal with this risk, is to use a material for supporting evaluation and grading for the vocational programmes that is constructed by Skolverket (Swedish national agency for education). These are under construction and the idea is that it should be

optional for teachers to use them. Therefore we do not know to what extent they will be used or how this will affect the visibility of the pedagogy.

Another way to deal with this issue is to connect the mathematics education for the vocational programmes more tightly to the subjects typical of a program. In an ongoing project in Malmö, the third largest city in Sweden, this is just the case. In this project, teachers in mathematics and teachers in building and construction work together and teach mathematics and construction simultaneously in the workshop.

These two ways of dealing with the risk of invisibility, deal with two different aspects of the issue: the first one is about the connection between the “core content” and the “knowledge requirements”, while the second way deals with connection that students need to be able to make between the different aspects of mathematics, the “pure” mathematics in knowledge requirements and the “applied” mathematics in the core content for vocational programs.

In previous research (Dahl, 2014) Bernstein’s division into horizontal and vertical discourse (Bernstein, 2000) were used in order to analyse the mathematics curriculum and the national tests in Sweden. In order to bring this research into the classroom, textbooks and teacher-made-tests will be analysed by as well as planning lessons with the teachers and classroom observations. In these analyses we will use both Bernstein’s division into horizontal and vertical discourse, as well as variation theory (Marton, 2014). The aim is not to combine the two, rather to use different tools to unfold the students’ opportunities to learn. It has been argued that teachers need an explanatory framework that can shed light on how their actions in the classroom affect student learning and help them to discover the features that make a difference to student learning in the classroom (Wernberg, 2009) It is crucial that it is the students’ opportunities to experience the connection that needs to be in focus.

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