30 Grade-Eight Students:
Discourse switch and bilingual students solving text problems in mathematics

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In this paper, I investigate how discourse switch is influenced by agency as students orally solve a statistical problem. The linguistic and cultural backgrounds of bilingual students are often viewed as deficiencies that contribute to low performance in school. One example of a deficit explanation, in Sweden, is a student’s “lack of Swedishness”. I use the notion of agency to avoid deficiency explanations of bilingual students’ performance in school mathematics. In this problem solving episode, Swedish serves as the main language of instruction. Discourse switches from a dominant discourse of “Swedish only” to a discourse of recognising bilingualism, as the teacher translates into Arabic and explains in Arabic.

Introduction

This is a presentation from of a case study in a Swedish bilingual mathematics classroom context where Arabic and Swedish were used. The main title of the paper, “30 Grade-Eight Students”, is taken from the wording of a statistical problem posed to students in ninth grade. The expression created obstacles in student-to-student communication while the statistical problem was being solved. The solution to the disruption in communication activated discourse switch. I will return to this situation after providing background to, and describing the theoretical context of, the study. A main assumption in this paper is that broader social discourses affect the teaching and learning of mathematics in multilingual classrooms. A larger study, to which this paper is connected, was aimed at investigating how various discourses influenced practices in multilingual mathematics classrooms in Sweden. The objective of this paper is to investigate how discourse switch is affected by student and teacher agency in a particular group of students and their mathematics teacher in grade 9, as they orally solve a statistical problem in a national test1.

Sweden today is a multilingual rather than a monolingual society, and mathematics classrooms are increasingly ethnically diverse. In educational policies, steering documents and research studies, there is evidence of various aspects of

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1 No external examinations are given in Sweden. National tests are given to third-, fifth- and ninth-grade students each year. The test in ninth grade provides a basis for teachers to award grades. The test consists of more traditional as well as open tasks. Some tasks are holistic and others atomistic. An oral test is often given to ninth-grade students. The National Agency of Education is responsible for constructing the tests, which are corrected and evaluated by regular mathematics teacher. For more information about national tests in Sweden, see: http://www.prim.su.se/artiklar/pdf/Sw_test_ICME.pdf (Pettersson, 2004).
discrimination and exclusion. Language is a key issue, exemplifying a discriminatory practice where the focus on language constitutes a boundary between exclusion and inclusion. “Immigrant” students are considered to be a valuable resource as well as a problem. Sweden has a reputation for being generally successful with integration, a country infused with gender equality and human rights (Hällgren, Granstedt & Weiner, 2003). There are different approaches for how to deal with the issue of ethnic and language diversity in schools. One discourse applied is “Swedish only”; another discourse is recognising and encouraging bilingualism. The dominant discourse normalises “Swedish only” (Runfors, 2003). Politicians and teachers do not agree on how to deal with the issue, although there is implicit agreement about its importance.

Because of immigration, almost one fifth of the students in Swedish compulsory school speak a first language other than Swedish. Arabic is the most common mother tongue spoken after Swedish² (SOS, 2009/10). In some schools in suburban Stockholm, 98 percent of the students have a first language other than Swedish.

As a result of previous research in Sweden and elsewhere on second language learning and bilingual learners and mathematics (for example Adler, 2001; Moschkovich, 2002; Thomas & Collier, 2002), projects for bilingual teaching of mathematics were established in a number of segregated suburban schools outside the three main cities in Sweden. One project was carried out in the Stockholm area for 2½ years. In this paper I examine data from this project.

**Bilingual Students in Mathematics Classrooms**

Low performance in mathematics among bilingual students is often attributed to factors related to individual characteristics and the students’ cultural background (Khisty, 1995; Moschkovich, 2002; Barwell, 2009). “Such models concentrate on pinpointing and describing what students do not know” (Khisty, 1995). Deficit discourses position bilingual learners in “predefined identities which are used to determine or forecast their performance in school and higher education and predict obstacles on the way” (Stentoft, 2007, p. 1597).

In Sweden, the linguistic and cultural backgrounds of students are often viewed as deficiencies that contribute to their low performance. One example of a deficit explanation is the students’ “lack of Swedishness” (Runfors, 2003; Haglund, 2005). This situates them in classrooms as “immigrant” students, and classroom discourse normalises “Swedishness”. In Haglund’s (2005) study, students resisted this exclusionist and normalising discourse by affirming their identities as multilingual learners. Well-meaning discourses such as those involving “Swedishness” and “Swedish only” could be interpreted as being exclusionist in the sense of marginalising and may make minority students “not feel at home” in school.

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² Compulsory school is *grundskola* in Swedish. Arabic is spoken by almost 4% of the students in Swedish compulsory schools. They study Arabic as a subject two hours a week in school, along with their regular school subjects.
Setati (2005) claims that language is always political, on a macro level of policymaking but also on a micro level of classroom interaction. Which languages to use in a mathematics classroom and for what purpose reflect political contexts in a broader society. Setati investigated the language and discourse practices of teachers in a multilingual mathematics classroom where English and Setswana were used. At a micro level of classroom interaction, language was political, as power relations were present in the classroom. The mathematics teacher projected herself as a certain kind of person in a certain kind of activity. She practiced discourses in her position as a mathematics teacher in which English had to be emphasised. As an African woman, she honoured African languages.

Powell (2004) used the notion of agency and motivation to avoid deterministic theories and to resist deficiency explanations of African-American students’ failure in mathematics in the US. Powell’s research study of 24 sixth graders gave “evidence of the mathematical achievement of students of colour as a byproduct of their engagement of their agency” (p.10). Powell found that the students initiated investigations, reasoned and progressed in building a fundamental understanding of certain mathematical ideas. He notes that understanding agency “is particularly important since both failure and success can be located within the same set of social, economic, and school conditions that usually are described as only producing failure” (p. 6).

**Theoretical Context**

Institutional settings such as schools that include school-discursive practices are always infused with power relations (Foucault, 1993). From a socio-political point of view, discourses are part of mathematics education and power is exercised in and through social action. Power is a relational capacity of social actors to position themselves in shifting situations through the use of different resources (Valero, 2008).

In this paper I use *discourse* and *agency* as analytic tools to avoid deterministic deficiency explanations of bilingual students’ performance in the mathematics classroom, and to relate to broader social and political issues in Swedish society. I use the concept of *discourse* according to Foucault as a group of utterances which seem to be regulated in some way, and which seem to have coherence and a supremacy that can be related to broader social contexts. Agency is exercised in discursive practices. Sometimes agency is conscious; however sometimes people act as agents without being aware of the options (Cohen, 1994). This understanding of agency makes it possible to view students and teachers in mathematics classrooms as social actors in practices, in one way or another; agency can be active, but also passive and resistant.

By contextualising agency in discursive practices, students’ and teachers’ agency can be seen as having the potential to influence discourse switches in a mathematics classroom. On one hand, implicit institutional rules and structures are exercised
through discourses, and as a result discursive practices are produced that enable or disable bilingual students’ agency. On the other hand, students’ and teachers’ agency may have an effect on the discursive practices in the mathematics classroom.

Method

Ethnographic methods, mainly participant observation, have been used in my larger study. In that study, discourse categories were construed from an analysis of field notes, interviews, informal talk with teachers and students, and official documents in Sweden concerning mathematics education and bilingualism.

In this paper, the selected data come from a video recording and participant observation in April 2007. Four students perform mathematical problem-solving on a national test. Their teacher takes part in their performance by asking questions and pushing the students to communicate their findings, to her and to each other. The teacher also assesses the students’ performance. Usually the teacher and her students use both Swedish and Arabic in this mathematics classroom. As they communicate in the classroom, they also exercise agency. The communication in the recording was transcribed and then analysed. A discourse analysis determines the communication and actions taken as discursive practices. In terms of a broader social context, such as dominant discourses with respect to bilingualism and mathematics teaching, agency in discursive practices frames the analysis.

I will illustrate this with the episode already mentioned. The episode chosen represents situations in bilingual mathematics classrooms when Swedish functions as the language of authority and a discourse normalising “Swedish only” is applied.

Findings: Normalising Swedishness?

Four girls, Marian, Norma, Payman and Rama, are working on a problem with statistical material[^3] on a national test. The problem posed is aimed at assessing whether the students can analyse and interpret data in tables and diagrams, and to what extent the students can critically examine the advantages and disadvantages of different diagrams. The problem posed is about TV-watching habits:


30 grade-eight students at a school answered the question How many hours a week do you watch TV? You can see the results of this survey in the table. Different groups of students had the task of compiling and presenting the material clearly in the most suitable way. Group A:1 made the following diagram:

[^3]: The assignment is from the national test for grade nine, 2007, and the task is given as a problem to be solved together by several students. The aim is to have them discuss the problem and to communicate and argue for their individual solutions, and in the end come to a conclusion about the best way to solve the problem.
The teacher is to assess aspects of their mathematical reasoning: their understanding of the diagrams, their use of mathematical language, their argumentation and participation in the discussion.

The data from the table, in three columns with ten numbers\(^4\) in each, are assembled in different types of diagrams. The girls get one type of diagram each to study individually. The girls read the instructions and study the table and their type of diagram – bar chart, pie chart, histogram and a type of bubble chart – depicting three TV sets of different sizes. They study their charts in silence for a while and then start discussing with each other what type of diagrams they have. The teacher listens to them and also talks to them one by one, asking questions about the diagrams, and later addresses them as a group.

The teacher and the students use only Swedish. A discussion between the four girls proceeds. They seem to agree that the pie chart is quite easy to interpret but that it may not be the best representation of how many hours the “30 grade-eight students” watched TV; “a bar chart may be better”. Two of the girls are confused about the expression “30 åttondeklassare” [30 grade-eight students]\(^5\). “How many are there, really?” Rama points to the pie chart, saying she is trying to count how many groups or classes there are:

Rama: Men … det är 30 klasser … 38 klasser … trettio åttondeklassare? 
[But … there are 30 classes … 38 classes … 30 eighth-graders]

Marian: 30? Nej … 30 klasser! 
[30? No … 30 classes!]

Rama: 30? Nej … 30 åttondeklisser! 
[30? No … 30 grade-eight classes]

The girls stop talking and look at the question written on the paper. The three columns with numbers [the time in hours that each of the 30 students answered when asked how much TV they watched each week] do not seem to help them continue. Payman tries to help and reads out loud:

Payman: Hur många timmar i veckan tittar du på TV? 
[How many hours a week do you watch TV?]

30 åttondeklassare har fått frågan. 
[30 grade-eight students have been asked.]

Rama and Marian still look confused. They look at each other and at the teacher.

The teacher realises that none of the girls understands what the expression “30 åttondeklassare” [30 grade-eight students] signifies – 30 individual students in eighth grade – and she starts speaking Arabic. The students have understood the expression as though the problem was put to 30 different classes of grade-eight

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\(^4\) The time students spent watching TV ranges from no time at all to 23 hours a week.

\(^5\) In Swedish klass is a class or grade in school, klassare is the individual student, åtta is eight, and åttonde is eighth; åttondeklassare is grade-eight students, but when translated directly it would be “eighth graders”, very similar to åttondeklisser, which would be “eighth grades”. It is easier to confuse the expressions in Swedish than in English.
students or 38 classes, and the problem posed does not make much sense, looking at the table. The teacher then translates the Swedish writing and expresses the problem in Arabic. When the girls go on discussing, they use both Arabic and Swedish for a short while, just a few sentences, and then return to only Swedish. The rest of the test situation is in Swedish only. The girls continue to discuss the advantages and disadvantages of the different types of diagrams, now relating to the 30 individual students, to themselves and their own TV-watching habits.

After the test was done, I interviewed the teacher. She said that she did not really want to translate into Arabic because it was an important test: “And all students in Sweden do it in Swedish, and that is the language they have to use when they learn in the future, when they go on to the next school level [upper secondary]”.

Analysis

In the assessment situation, the teacher and the students, to begin with, used only Swedish. The students took the test very seriously, as did the teacher, and Swedish functioned as the language of authority. A discourse normalising “Swedish only” was at work.

The discussion between the girls went smoothly until Rama and Mariana became aware that they did not agree about the meaning of the expression “30 åttondeklassare” [30 grade-eight students]. Their non-comprehension interfered with their mathematical understanding of the problem, and they got stuck trying to grasp the meaning of the words. In their regular mathematics lessons, when Arabic was used alongside Swedish, this kind of confusion was rare.

Both the teacher and the students reflected an institutional value; Swedish is supposed to be the language of assessment in a discourse of authority. But when the teacher realised that the girls were confused, that their confusion was an obstacle for them and that they could not proceed to solve the problem, she abandoned the dominant discourse of “Swedish only”. She chose to speak the language the students use in regular mathematics lessons and in their daily life, Arabic, in a discourse that recognises bilingualism as a resource. In a discourse of solidarity, Arabic also worked as the language of solidarity and as the language of conceptualisation (compare with Setati, 2005).

In the test situation, the four students were strongly affected by the tension generated by the test. So was the teacher, who performed her identity as a Swedish mathematics teacher in the beginning. As a result of the students’ performance, she was later forced to perform her own identity as bilingual. She took active agency and recognised her students as bilingual. In this moment of recognition, the discourse switched from a dominant discourse of “only Swedish” to a discourse promoting bilingualism as a resource, and thus an opportunity for the students to continue performing mathematically.
This interaction exposes the complexity of the workings of power relations. On one hand, Swedish is the language of authority, as it is the “most important” language for further studies in Sweden. At the same time, the discourse of authority and “Swedish only” is challenged when the teacher took agency and translated into Arabic and explained in Arabic. The teacher’s main concern was that the students had to understand what the meaning of the problem was, to be able to discuss it. The teacher exercised a discourse of solidarity. Once the students grasped the meaning of “30 eighth-graders”, they could continue to discuss and solve the problem.

Discussion

This paper has investigated how agency influences discourse switches in a bilingual mathematics classroom, where Swedish serves as the language of authority. The brief episode described and analysed in this paper illustrates my finding, that discourse switches are affected by agency in the discursive practices of the classroom.

Apart from being a test situation, the circumstances described can also be interpreted as an opportunity for mathematical communication and students’ active agency. There is room for students’ active agency in student-student and teacher-student communication. Problem-solving that demands and values oral communication by bilingual students encourages students to learn mathematics because the significance of problems can be made explicit. One reflection is that when bilingual students solve mathematical word problems cooperatively and orally, they do not have to get stuck on vocabulary, because it is obvious if and when they get stuck. They are then able to switch to their mother tongue or get support from a bilingual teacher. When a discourse supporting bilingualism is applied, a discriminatory practice, where the focus is on language, cannot be used as a boundary between exclusion and inclusion.

From this case study, and my larger study, I find it important to relate the performance of bilingual students in school mathematics to factors other than deficiency and determinative explanations. Discourse and agency can thus be useful as analytic tools to avoid determinism and to resist the deficiency explanations usually applied in Swedish classrooms.

References


