

Student-Initiated Communication with the Teacher: Field, Mode and Tenor

Mikaela Rohdin

Luleå tekniska universitet

This paper reports from one part of a study of upper-secondary mathematics classrooms in Sweden. In Sweden, individual work on textbook exercises constitutes a large part of upper-secondary mathematics education. During such work, the teacher is available to students as a resource to use in their work. In this part of the study, the focus is on how students in such textbook-based mathematics lessons make use of the available resources. In this paper, student-initiated communication with the teacher is discussed, in order to build on and extend a previous analysis of how the students make use of the teacher.

Introduction

The study within which this paper is written is part of an international research project, *The emergence of disparity in mathematics performance*, the aim of which is to analyse how student background is linked to success in school mathematics [1], [2]. This paper is part of an attempt to identify how differences in communication repertoire are linked to access to valued parts of the curriculum. Building on the analysis presented in Rohdin (2012), this paper focuses on student-initiated communication with the teacher during independent work.

Background

The overall research project draws on Bernstein's (2000) categories *visible and invisible pedagogies*, and the related concept pairs *classification and framing* and *recognition and realization rules*. In the Swedish context, the notion of framing turned out to be particularly interesting. The classrooms we have observed in the Swedish part of the study, including the one discussed in this paper, have had weak framing over pace, but stronger framing over sequencing. This is because the lessons are very much based on the textbooks, and follow the order of the books. In terms of pace, students are given a sheet of paper on which is written which chapters, pages or exercises they are meant to work with at a given time. They are, however, given the responsibility to choose which exercises to do and which to skip. The teacher in the class described in this paper explicitly tells the students not to spend time doing what they already know how to, and to move on to what they do not know. The teacher does not directly check whether the

students have done (or skipped) the sections they are supposed to. Teacher-framing is (apparently) weak, and therefore it becomes very much up to the individual student how and even whether to learn. This applies in particular to initiating or not initiating communication with the teacher (see below).

Bourne (2003), in an analysis of language classrooms with weak and strong framing, respectively, claims that when much is left to the students' choices, "evaluation replaces instruction, and certain children are not given access to the academic discourses on which, Bernstein argues, the development of scientific concepts ultimately depends" (p. 498). This seems to be of particular relevance to the Swedish mathematics classrooms where framing is apparently weak and students are faced with many choices (cf. Jablonka, Johansson & Rohdin, 2010).

Student-initiated communication with the teacher

Context

In line with the aims of the overall project, the classes studied were beginning their first year at upper secondary school (Swedish *gymnasium*). This was because it was important to catch what happened during the first few weeks, when the students were still new to each other, the teacher and the school. The class discussed in this paper was a small one (less than 15 students), with a mix of social backgrounds and nationalities among the students, and there were more girls than boys. Most of the students were entirely new to each other when the school year started. Some had met before but did not know each other well. The teacher had not met the students before.

The first nine lessons of the school year were video-recorded. Two cameras were used when possible, following the teacher and the students, respectively. During these first nine lessons of the school year, the lesson structure is fairly typical of Swedish mathematics classrooms at the upper secondary level, as described by for example Skolinspektionen (2010), in that much of the time is spent on individual and independent textbook-work. It is important to remember, however, that what is described here is what happened during these first nine lessons of the school year. Thus, it is not necessarily representative of the rest of the year. For further details on the data, see Rohdin (2012).

Communication patterns and perceived ability—discrepancies

In Rohdin (2012), an analysis of the communication patterns in the classroom was presented, and the communication patterns were discussed in connection with the students' reasons for picking some students as the best at mathematics. An incongruity was pointed out, namely that students said they thought a student was good at mathematics because he or she seldom asked the teacher a question, while the communication-pattern analysis showed that the students most frequently picked out as good at mathematics did in fact ask the teacher

questions, and often comparatively frequently. In order to look more closely at this discrepancy, the videos and transcripts of the instances of student-initiated communication between student and teacher were analysed.

Instances of student-initiated communication with the teacher

The concept scheme of *field*, *tenor* and *mode* (Halliday & Hasan, 1989) was used as a methodological tool for focusing the analysis of these communication instances. According to Halliday and Hasan, these concern *what a text is about*, *who the participants are* (including *their status*) and *what part the language is playing in the interaction*, respectively (1989, p. 24). Thus they cover many of the ways these communication instances could differ from each other. The field, tenor and mode together define particular *registers*, “the semantic configurations that are typically associated with particular social contexts” (Halliday & Hasan, 1989, p. 43), which, according to Halliday and Hasan reflect the nature of the activity in which language plays an essential part. The analysis in this paper is similar to that presented by Atweh, Bleicher & Cooper (1998), although their analysis focused on the whole-class communication of two different teachers working with two different classes.

The analysis presented in this paper uses data from lessons 2 and 9, focusing on communication instances in lesson 9. Lesson 2 is the first “real” lesson in the sequence (lesson 1 dealt with handing out books and calculators, and going through the goals and grading criteria of the course), and lesson 9 is the last lesson in the sequence. The language used in the classroom is English, which is not the native language of any of the participants involved (students and teacher). In the analysis, therefore, use has been made of the knowledge of the participants’ native languages, and of how the participants use English during the lessons. This is particularly so in the case of the participants’ use of the pronoun “you”. In all three extracts presented (see below), the word “you” is used frequently. This should be understood as referring to the second person singular (Swedish or German “du”), rather than as an impersonal pronoun (Swedish or German “man”, English “one”). This can be seen by looking more closely at the context in which the word occurs.

Table 1 shows the number of occasions and the number of minutes of student-initiated communication with the teacher of each student during lessons 2 and 9. The student picked most frequently as being good at mathematics were students A, D and E. Table 1 shows that they do not seem to initiate communication with the teacher any less than other students, and in the case of student D the opposite is the case. In lesson 2, three students (B, D and I) initiate communication with the teacher. In lesson 9, the number of instances has increased, as has the number of students involved: all students present except student H initiate communication with the teacher at least once during the lesson. There are notable differences in the amount of time the teacher spends with each

student during such student-initiated communication, ranging from a total of a few seconds to over 17 minutes.

Student	Occasions in lesson 2	Minutes in lesson 2	Occasions in lesson 9	Minutes in lesson 9
A	0	0	3	3½
B	3	1½-2	absent	absent
C	0	0	absent	absent
D	3	1½-2	6	17½
E	0	0	2	8
F	0	0	1	<½
G	0	0	2	4
H	0	0	0	0
I	2	1	1	<½
J	absent	absent	1	1

Table 1. Number of occasions and number of minutes of student-initiated communication with the teacher during lessons 2 and 9.

By lesson 9, most students had started initiating communication with the teacher, as table 1 shows. Three students (at different times during the lesson) ask for help with the same exercise. The transcript extracts from these three occasions are presented below, and the extracts are discussed separately in terms of field, tenor and mode, and then compared. The three extracts are presented in the order in which they occurred during the lesson. The extracts have been chosen because the topic, the time and the place all remain broadly the same across these three instances of student-initiated communication with the teacher. From the third extract, the wording of the exercise can be identified: “Find the range of each function when the domain is $\{-1, 0, 6\}$.” The function discussed in all three extracts is $t = 5 + r$.

The extracts are presented in their entirety, from the start, when the student catches the teacher’s attention, to the end, when the teacher leaves the student. The starting and ending times of the episodes in the lesson are given in brackets. The unit of analysis is the conversation, not the teacher’s utterances on their own or the student’s utterances on their own.

Student A (19:04-20:17)

Student A: [says teacher’s name]

Teacher: Mm.

Student A: [inaudible]

Teacher: Yes.

Student A: choose a number or?

- Teacher: Mm. The domain is the same as the x-values,
 Student A: [inaudible]
 Teacher: and in this case we have r, so this means that substitute the values for r and calculate for t. So the first value you get for your range that would be five minus one, that is four.
 Student A: Mm.
 Teacher: And then you take the second one and substitute that value in,
 Student A: Mm. [inaudible] so that's
 Teacher: so that will give you, yes, so you will have four, five
 Student A: [inaudible]
 Teacher: and [pause] the third one is six.
 Student A: So it should be
 Teacher: So that will give you five plus six [pause] eleven.
 Student A: Mm.
 Teacher: So your range would be the set of those three numbers.
 Student A: Okay. [pause] Okay. [inaudible]
 Teacher: Mm. But the domain that is always the set of the independent variables,
 Student A: Mm.
 Teacher: and the range the function values.

After getting the teacher's attention, student A starts by asking whether one way of doing the exercise is correct, or whether there is another way. The teacher does not answer explicitly, but instead starts explaining the task, which could be taken as meaning that the suggestion made by student A was incorrect.

The teacher does not mention the numbers in the domain, only what the word "domain" means. The teacher explicitly gives the definition of "domain" and "range". *En passant*, the teacher implicitly comments on the "non-standard" choice of variables (r and t instead of x and y)—"and in this case we have r". At the end there is a summing-up, "the domain is always the set of the independent variables, and the range [is always the set of] the function values", suggesting that this is the important point of the exercise. The teacher uses the words "domain", "range", "set", "substitute", "x-values", "calculate" and "function values". The tone of voice and the pace of the utterances give an impression of brisk, businesslike interaction. There is no waiting-time for the student to "catch up". The student interjects, usually interrupting the teacher's utterance. The teacher also interrupts the student. There is an instance of "you" with an active verb, but mostly the "you" is a passive part of the process, not an agent. Things happen, and the "you" observes it happening. There is one case of "we", and it is a passive "we"—"in this case we have r". The image created is that of an objective mathematics, independent of what the student or the teacher does.

There is an impression that the details are not so important and can be rushed over, while the overall structure is emphasised. There is some space for the student to do or say something, and the student occasionally tries to create more space by (mostly unsuccessfully) interrupting the teacher. The mode of the exchange appears to be a dialogue, but on closer inspection it turns out that the student's contributions do not in fact have any impact. Thus it is more like a monologue, although the student attempts to make it a dialogue. The main input from the student is the original question, although the teacher's response does not directly relate to it. Apart from this, the teacher's part of the conversation forms a coherent whole on its own.

Student J (20:21-21:23)

Student J: [says teacher's name]

Teacher: Mm.

Student J: [points at an exercise in the textbook]

Teacher: Yes. You know the domain, the values are minus one zero six, so that means the range would be the values for t so we take the first one minus one and substitute that one into the function. You will have five minus one that will be four.

Student J: Mm.

Teacher: So that's the first value and then take the next one that's zero. Five plus zero that's five. Six five plus six eleven, so this will be the range,

Student J: Okay.

Teacher: the corresponding function values.

Student J: Okay.

Teacher: You see it could have been written like y equals five plus x also, the choice of letter doesn't matter, you can choose whatever letter you want.

Student J: Mm.

After getting the teacher's attention, student J says nothing at all, but points at the exercise in the book. The teacher says what the domain is by saying what the numbers are, not by giving a definition of "domain". There is an implicit definition of "range". There is no explicit "summing-up": once the answer has been reached the explanation is over. The teacher uses the words "domain", "range", "substitute", "function" and "corresponding function values". The teacher's utterances usually start with "you" and an active verb. The part corresponding to the explicit imperative with student G (see below) becomes a collaborative enterprise—"so we take the first one". This could also be a case of what is called "Krankenschwester-wir" ("nurse-we") in German (cf. Sachweh, 2006), that is a "we" that can mean "you" or "I", but not "we" [3], perhaps to

create a caring, nurturing atmosphere. In this case “we” in practice means “I”, since the teacher is the one doing the taking and the student does not visibly or audibly participate. This contrasts with the “we” in the first extract, where it can indeed be the case that “we [both] have r”. The teacher at the end explicitly points out that “the choice of letter doesn’t matter”. The teacher explains this statement and expands, and once again there is a “you” taking an active part in the process—“you can choose whatever letter you want”. There is a suggestion that this is the important part of the exercise. The image created is that of an operational mathematics, dependent on the student or the teacher doing something with it. On the other hand, there is no space for the student to actually do something, since the teacher does all the work. In this case, it is even clearer that the communication is a monologue, with a designated listener. The listener shows involvement by saying “mm” or “okay” at appropriate places, but no further contributions occur. The teacher’s utterances form a coherent whole on their own, without the student’s utterances.

Student G (32:38-34:29)

- Student G: [says the teacher’s name] I need help.
- Teacher: Find the range of each function when the domain is minus one zero and six. So that would tell you this is the independent variables.
- Student G: Okay.
- Teacher: And your function is t equals five plus r so finding the range means that you should substitute each value and calculate what’s the value of t because your t -values would then be the range.
- Student G: Okay. [inaudible]
- Teacher: So take the first one to start with and that’s minus one.
- Student G: Mm. [pause] Is it t equals
- Teacher: Yes five [pause] minus one you will have the first value
- Student G: Is it plus minus one or just minus one?
- Teacher: You can just write minus because
- Student G: Yeah.
- Teacher: plus minus will be just minus.
- Student G: Mm.
- Teacher: So that will be four. [pause] And then you take your second value. [pause] And then the third.
- Student G: Yeah okay.
- Teacher: And then you can write the range with braces like this, so your values would be then?
- Student G: Four five and eleven.

Teacher: Exactly. [pause] Neat. Nice.

Student G: Okay.

Teacher: And you notice also that the choice of letter doesn't matter.

Student G: Yeah.

After getting the teacher's attention, student G says "I need help", but does not elaborate on what kind of help, or with what. The teacher first reads the text of the exercise aloud, and then "translates" the text for the student. "Domain" and "range", while not explicitly defined, are explained. The teacher explains what solving the exercise would amount to doing, and then proceeds to do that. The teacher uses the words "independent variables", "function", "range", "substitute", "calculate" and "t-values". There are quite a few instances of "you" with an active verb and a couple of instances where the "you" is a passive part of the process. There is one explicit imperative—"so take the first one to start with", and a few implicit ones—"and then you can write the range with braces". This is a reference to "the set" mentioned in the conversation with student A, but without the explicit use of the word "set". There is one explicit question—"so your values would be then?"—which becomes the "summing-up" part, checking that the student realises what the answer is. The teacher at the end again points out that "the choice of letter doesn't matter", but in contrast to the conversation with student J, the teacher does not comment further on this. The image of mathematics created is ambivalent between objective and operational. Here, there is more space for the student to do something, and the student's doing is recognised and praised at the end of the exchange—"Neat. Nice." It is partly a monologue, but with some of the parts supplied by the listener, in the sense that the student is filling in the details the teacher is expecting and leaving space for. There are exceptions, when the student makes a suggestion or asks a question that makes the teacher deviate from the intended direction for a while. This extract therefore has more dialogical features than the previous two. Without the student's utterances, the communication does not form a coherent whole.

Comparison

The three students initiate the communication in very different ways. The very first initiation is the same in all three instances—the students all use the teacher's name in order to get attention. After that, however, there are differences. Student A starts by asking a question about the exercise, student J quietly points at the exercise in the book and student G asks for (unspecified) help. After these initiations, most of the speaking is done by the teacher.

In the first extract, the teacher rephrases the exercise and then performs the steps to get to the answer, and finally rephrases the answer in the original terms. In the second extract, the teacher talks the student through how to get the required numbers. In the third extract, the teacher first tells the student how to go

about answering the exercise, and then talks the student through the process, leaving space for the student to perform the calculations.

The students' initial behaviour is reflected throughout the conversation. Student A asks whether s/he has the right idea of how to go about doing the exercise, thus demonstrating a certain amount of competence and independence. During the conversation, the student tries to re-establish this competence, by occasionally interrupting the teacher with indications that s/he has understood before the teacher has finished explaining, and independence, by interrupting the teacher with contributions. Student J points at the book without saying anything at all, demonstrating helplessness. During the conversation, the student contributes indications that s/he is listening and accepting what the teacher says. This can be seen by the fact that the instances of "mm" and "okay" occur at places where the teacher leaves a space for them, expecting them. Student G asks for unspecific help, not offering any indication of having an idea of what to do, but indicating a certain amount of initiative. During the conversation, the student offers confirmation of listening/accepting at appropriate places, and also contributes a (partial) suggestion and a question.

There are also differences in the teacher's tone of voice and pace of speaking. These features are of course not possible to show in the transcripts, but add to the impression of the situation. With students J and G, the teacher's voice is softer and slower, and with student A the teacher's voice is sharper and quicker, and also darker. The conversation between the teacher and student A thus comes across as more formal, brief and "businesslike", something which is reinforced by the more formal language used. The focus is on the general features of the exercise rather than on the specific numbers or letters used. The conversations between the teacher and student J and to some extent student G come across as more nurturing and encouraging. In the conversation between the teacher and student J the focus is on what is specific to the exercise. In the conversation between the teacher and student G, the focus is on getting the student to be able to arrive at the required answer.

Conclusion

The analysis in Rohdin (2012) indicated a need to examine more closely the occurrences of student-initiated communication with the teacher, in order to explain the discrepancy between students' reasons for considering particular students to be good at mathematics, and the findings of the communication-pattern analysis. An analysis of a selection of such occurrences shows that, although in this classroom all are engaged in the same social activity, there are variations of the teacher-student school mathematics register. There is more or less focus on technicality (field), the emergent role relationships differ slightly (tenor), and there are subtle differences in the mode, with some more didactical

or expository and others less. In some of these cases the student is constituted as competent and independent, and in others as helpless and dependent. If such differences are induced by the students' initial openings of the conversations, they would depend not only on the teacher's different approaches, but also on the different students' different approaches. These interact with and reinforce each other during the conversations, and across time this could provide one mechanism through which students get access to different kinds of mathematics. The students' ways of communicating with the teacher, their different registers, therefore seem to influence their access to valued kinds of mathematics.

Notes

1. The Swedish part of the project is funded by Vetenskapsrådet.
2. For further details and a thematic literature review on the project see <http://www.acadiau.ca/~cknippin/sd/index.html>.
3. An example of the "Krankenschwester-wir" would be "How are we feeling today?"

References

- Atweh, B., Bleicher, R. E., & Cooper, T. J. (1998). The Construction of the Social Context of Mathematics Classrooms: A Sociolinguistic Analysis. *Journal for Research in Mathematics Education*, 29(1), 63-82.
- Bernstein, B. (2000). *Pedagogy, symbolic control and identity. Theory, research and critique. Revised edition*. Oxford, UK: Rowman & Littlefield.
- Bourne, J. (2003). Vertical discourse: the role of the teacher in the transmission and acquisition of decontextualised language. *European Educational Research Journal*, 2(4), 496-520.
- Halliday, M. A. K. & Hasan, R. (1989). *Language, context and text: aspects of language in a social-semiotic perspective*. Oxford, UK: Oxford University Press.
- Jablonka, E., Johansson, M., & Rohdin, M. (2010). Achievement as a matter of choice? In C. Bergsten, E. Jablonka, & T. Wedege, (Eds.), *Mathematics and Mathematics Education: Cultural and Social Dimensions. Proceedings of MADIF 7, The Seventh Mathematics Education Research Seminar, 26-27 January, 2010* (pp. 113-123). Linköping: Svensk Förening för MatematikDidaktisk Forskning.
- Rohdin, M. (2012). Making use of the available resources: Communication strategies and perceived mathematical ability. In G. Gunnarsdóttir, et al. (Eds.), *Proceedings of the 11th Nordic Conference on Mathematics Education*. Reykjavík: University of Iceland Press.
- Sachweh, S. (2006). "Noch ein Löffelchen" – *Effektive Kommunikation in der Altenpflege. 2nd revised and extended edition*. Bern: Verlag Hans Huber.
- Skolinspektionen (2010). *Undervisningen i matematik i gymnasieskolan (2010:13)*. Stockholm: Skolinspektionen.