Mathematical conversations in a trilingual classroom

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1. The study

- Particular context:

  Master thesis work –Màster de Recerca en Didàctica de les Matemàtiques i les Ciències, UAB.

- General context:

  21st International Committee on Mathematical Instruction –ICMI Study, 'Mathematics education and language diversity' (Setati i Santos-Domite, 2009).

2. Key notions

- Mathematical practice (Godino & Batanero, 1998)
- Language and Code switching (Moschkovich, 2005)
- Talk forms (Mercer, 2004)
- Communicative approaches (Scott, Mortimer & Aguiar, 2006)

2.1 Mathematical practice

"We consider mathematical practice any action or manifestation (linguistic or otherwise) carried out by somebody to solve mathematical problems, to communicate the solution to other people, so as to validate and generalize that solution to other contexts and problems (Godino & Batanero, 1998, p. 182)".

2.2 Language and code switching

"Code switching has been used in sociolinguistics to the practice of using more than one language in the course of a single communicative episode. I distinguish between the terms 'code switching' and 'language switching' because these two terms refer to different situations. Research from a psycholinguistic perspective has used the term 'language switching' to refer to an individual cognitive phenomenon different from code switching. I use the term 'language switching' to refer to the use of two languages during solitary and/or mental arithmetic computation (Moschkovich, 2005, p. 125)".

2.3 Talk forms

"My colleagues and I described children's talk as being more or less like three archetypical forms: Disputational talk (which is characterised by disagreement and individualised decision making (…)), Cumulative talk (in which speakers build positively but uncritically and what the others have said (…)) and Exploratory talk (in which partners engage critically but constructively each other's ideas (…)) (Mercer, 2004, p. 146)".

2.4 Communicative approaches

"The communicative approach focuses on questions such as whether or not a teacher interacts with students (…) and whether the students' ideas are taken into account as the lesson proceed. (…) We have identified four fundamental classes of communicative approach, which are defined by characterizing the talk between teacher and students along each of two dimensions, *dialogic –authoritative* and *interactive –noninteractive* (Scott, Mortimer & Aguiar, 2006, p. 609)".

3. Research question and goals

How is code-switching used when teaching and learning mathematics in a trilingual mathematics classroom?

- Goal 1. To identify talk forms in the classroom discourse, and code-switching in the cases of exploratory talk.
- Goal 2. To identify communicative approaches in the classroom discourse, and code-switching in the cases of interactive/dialogic approach.

4. Classroom context

- 27 students, aged 12 and 13, IES La Roca, La Roca del Vallès, 2006-2007 school year.
- CLIL -Content and Language Integrated Learning- Methodology.
- Dominoes game with mathematical contents (resolution of equivalences between angles).
- Small groups of three and four students.

5. Method

- Qualitative and interpretive paradigm.
- Video and audio tape data.
- Ethnographic field notes.
- Written comments on videos.
- Transcripts of audio and subtranscripts.
- Construction of tables with data.
- Construction of narratives.

6. Findings (exploratory talk)

Torns	*P*	*Transcripció*	*TP*	*CL*
124	A1	Yes! This is forty-five, no? And, and plus this is a hundred eighty, no?		Yes! This is forty-five, no? And, and plus this is a hundred eighty, no?
125	PM	Ehhh, three multiplied by forty-five is one hundred and thirty-five, ok? And the supplementary angle of forty-five...		Ehhh, three multiplied by forty-five is one hundred and thirty-five, ok? And the supplementary angle of forty-five ...
126	A1	Less.		Less.
127	PM	To do one hundred and eighty...	E	To do one hundred and eighty..
128	A1	Yes, ja, ja ho sé això.		Yes, ja, ja ho sé això.
129	PM	Yes. And the answer is?		Yes. And the answer is?
130	A1	Is cent...		Is cent...
131	PM	No, no, no.		No, no, no.
132	A1	Yes, mira, three per four... cent trenta-cinc plus...		Yes, mira, three per four... cent trenta-cinc plus...

Table 1. Example of exploratory talk

6. Findings (exploratory talk)

- The exploratory form often appears when the teacher interacts with the students, and also, but less frequently, when students interact themselves.
- In the interaction with the teacher and with students, the exploratory form occurs both in the organization of the task and the development of the mathematical practices.
- Code-switching appears as a reaction to misunderstandings, lack of technical vocabulary, and difficulties in communication.

6. Findings (interactive/dialogic)

Torns	*P*	*Transcripció*	*TP*	*CL*
324	A24	Això com es fa, A21?	D-I	Això com es fa, A21?
325	A21	A veure. You are stressing.	D-I	A veure. You are stressing.
326	A24	A21, com es fa això?	D-I	A21, com es fa això?
329	A21	Three multiplication.	D-I	Three multiplication.
330	A23	No, no.	D-I	No, no.
331	A21	For... One hundred and eigthy.	D-I	For... One hundred and eigthy.
332	A23	And dividation.	D-I	And dividation.
333	A21	And dividation of four.	D-I	And dividation of four.
334	A23	No, no, one hundred and eigthy and multiplication three.	D-I	No, no, one hundred and eigthy and multiplication three.
335	A21	Three dividation for four dividation for four dividation for four.	D-I	Three dividation for four dividation for four dividation for four.
336	A24	Thank you.	D-I	Thank you.
337	A21	Quant?	D-I	Quant?
338	A24	XXX.	D-I	XXX.
339	A21	Goita quin resultat...	D-I	Goita quin resultat...

Table 2. Example of interactive/dialogic approach

6. Findings (interactive/dialogic)

- The interactive/dialogic approach often appears when the teacher interacts with the students, and also when students interact themselves.
- In the interaction with the teacher and with students, the interactive/dialogic approach occurs both in the organization of the task and the development of the mathematical practices.
- Code-switching appears as a reaction to difficulties in the development of the mathematical task, as a sort of resource for collaborative support between students.
- Code-mixing, instead of code-switching, appears when students make the effort to keep talking English.

7. Final remarks

- We need to further examine the role of code-switching in the teacher's discourse and her language openness in the interaction with students.
- Beyond the current focus on code-switching, we consider the possibility of moving towards a more sociodiscursive approach where the use of three languages can be merely interpreted as a way of "speaking".
- Our study in only one classroom, suggests that a better understanding of the relationships between language and mathematical practices is necessary.

8. References

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