LANGUAGE (NON) DIFFERENTIATION? INTERVIEWS WITH BILINGUAL LEARNERS OF MATHEMATICS

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In this report I discuss on the idea of language (non) differentiation in the learning and teaching of mathematics with bilingual students. I claim that the language experience of bilingual students is similar to that of monolingual students in terms of improving the use of a “unitary language system” that serves for interaction and communication in their learning of mathematics. My thesis is that educational policies and practices based on criteria of language differentiation are more centered on “objective” distinctions among languages and speakers, and less on how this differentiation is (not) experienced by students. I illustrate my arguments with data from interviews with bilingual Latin American students in Barcelona, Catalonia-Spain.

Introduction

Do bilingual students identify their two languages when thinking mathematics or do they rather see them like a “unitary language system” (Bakhtin, 1986)? Is the identification of the two languages something that mainly comes from views of researchers / teachers / politicians that presuppose their existence separately and in relation to different purposes? I claim that the language experience of bilingual students is similar to that of monolingual students in that they use a language system that serves for interaction and communication. In the first case, students may use constructions from different lexicons and grammars but, even so, this is still coherent with the experience of using a unitary language system and functioning as if there was just language behind everyday activities. My argument is that educational policies and practices based on criteria of language differentiation are more centered on “objective” distinctions among languages and speakers, and less on the idea of how this differentiation is (not) experienced by students in their learning of mathematics.

I illustrate my discussion with data from interviews with bilingual students in the urban area of Barcelona, Catalonia-Spain. Although I know that evidence from these interviews is not sufficient to conclude about the experience of a language system resulting from mixing different lexicons and grammars, this is a first step toward questioning some of the teachers, researchers and politicians’ educational discourses and decisions based on strict distinctions among languages and speakers. The experience of a language system is difficult to interpret because different students are differently exposed to their languages. Moreover, there are issues of influence coming from the social and political contexts of interaction and learning, as well as the understanding itself of the act of mixing languages and its implications. It is therefore necessary to reinforce my analysis with works on
multilingual students flexibly using their languages while learning mathematics (see, for example, Clarkson, 2007; Moschkovich, 2007; Setati, 2005; Setati, Molefe & Langa, 2008; together with the works compiled by Barwell, 2009).

In what follows I introduce three situations from individual task-based interviews with three bilingual Spanish-dominant students (see Planas & Civil, 2010, for details of the four-task questionnaire and the interview). For each task, they were required to fill in blank boxes with the languages that they had used. In this report, I take the three students that marked Catalan in all boxes. Although two of them had problems with one of the tasks, they all succeeded in answering mathematical questions that were cognitively demanding. Some of the students’ perceptions emerging from these interviews are central to my understanding of language (non) differentiation in the teaching and learning of mathematics. The institutional context of the data below is given by Catalan being the language of learning and teaching – LoLT– in Catalonia.

Examples of findings

It has been documented that people simultaneously learning two languages go through stages when they do not differentiate between their two languages, and tend to mix elements from them in the same utterance (García, 2008). Some dominant explanations to this phenomenon are based on discourses of deficit (i.e., insufficient language proficiency), rather than functionality (i.e., practical language use). Far from “purist” and “deficit” positions, I take the term “language (non) differentiation” to express questions as to how practices of language (non) mixing may be representing agentive behaviors on the part of bilingual learners in politically complex settings. At present, my results from interviews indicate that bilingual students, with a clear dominance in one of the languages, do “code”-mix in the resolution of mathematical tasks. However, they are very cautious when referring to their practices of language mixing.

“But everything is in Catalan”

My data shows Latin American bilingual students that have integrated, or are in the process of integrating, their two languages, Spanish and Catalan. They say not to switch languages when doing mathematics, although they do. This is clear in part of the interview in Spanish with Isidora, a Spanish-dominant bilingual student born in Venezuela with a middle proficiency in Catalan who says she used Catalan exclusively in the resolution of the mathematical tasks. The student chose Spanish for the interview, and wrote her resolution mixing Catalan and Spanish. Extract 1 indicates the moment when I look at her notebook and comment on the word “circle” that she has written in Spanish, circulo, next to several of her drawings:
Extract 1

Núria: Dices que solo has usado catalán. / You say you have only used Catalan.


Núria: Vale. ¿Me explicas el problema? / Okay. Can you explain the problem to me?

Isidora: He visto que el cuadrado es más grande. / I see that the square is larger.

Núria: Has escrito círculo. ¿Lo has pensado en castellano? / You’ve written círculo [circle]. Did you think it in Spanish?

Isidora: Pero todo es catalán. / But everything is in Catalan.

Núria: (...) ¿Qué pasa con “el perímetro del cercle”? / What about the “perímetro del cercle” [literally reading a Catalan-Spanish sentence in the notebook which means “the perimeter of the circle”]? Isidora: Es más pequeño / It’s smaller (…).

Isidora uses a Spanish word, círculo, in her writing, combines Catalan and Spanish in various sentences, and at the same time maintains that “everything is in Catalan.” She knows the meaning for cercle, the Catalan word for círculo: when I use cercle in the interview (reproducing a similar mixing to that which she did in her writing), she responds with a mathematical answer that shows understanding. Thus it cannot be concluded that Isidora practices of language mixing (e.g., “perímetro” and “círculo” in Spanish, and “cercle” in Catalan) result from insufficient knowledge of mathematical vocabulary in the LoLT. It might be concluded instead that she keeps a Spanish term next to her drawings because she does not feel the need to make a translation, and because the fact of círculo and cercle belonging to two different lexicons does not really make sense to her during the resolution of that particular task.

What is meant then by “everything is in Catalan” in the context of the interview with me? Why does Isidora refer to Catalan only to report her languages while doing mathematics during the resolution of the tasks in the questionnaire? She arrived in Barcelona a year ago, her home language is Spanish and her choice for the interview is Spanish too, but she says she only used Catalan. In a recent work (Planas, 2011), I argue that subject positions need to be situated in broader political contexts than those merely related to particular interactions with particular individuals. It is not only about Isidora and Núria interacting; they are in a classroom at the school immediately after a lesson in which the teacher’s instruction has been entirely in Catalan, and two weeks after the promotion of some students (not Isidora) from the parallel system of special classes to that of regular classes on the main basis of advances in the knowledge of the LoLT (see, Planas & Civil, 2010, for details on special and regular classes in the Catalonian school system). All these factors may be at the root of certain subject positions. Furthermore, what is
especially remarkable here is that actions of “language non-differentiation” provide grounding for flexible behaviors that point to agency. Although Isidora may feel forced to adjust to monolingual norms in her conversation with me, she is agentive enough to put the focus on the mathematics during the resolution of the tasks.

“Half-Catalan, half-math”

In the interview with Julio, also from Venezuela, he marked Catalan in all blank boxes but at a certain point in the conversation he said he used two languages, Catalan and mathematics. Like Isidora, Julio is an immigrant student whose home language is Spanish and who attends special classes with other immigrant students to gain better knowledge of Catalan. He chose Spanish for the interview, wrote his resolution mixing Catalan and Spanish (e.g., “els pisos [Catalan] de la tienda [Spanish]”), and did not refer to language-mixing except for the joint use of “half-Catalan, half-math”, as he himself put it:

Extract 2

Núria: ¿Has pensado todo en castellano? / Did you think everything in Spanish?
Julio: ¿Sobre los problemas? / About the problems?
Núria: Sí, los del cuestionario. / Yes, those in the questionnaire.
Julio: En catalán y con mates. / In Catalan and with math.
Núria: ¿Más catalán que castellano? / More Catalan than Spanish?
Julio: Mitad catalán, mitad mates. / Half-Catalan, half-math.
Núria: Aquí dice els pisos de la tienda… / Here [sheet of the questionnaire] it says els pisos de la tienda [the floors of the store]…
Julio: Lee más. Uso mates para sumar y restar cuando se sube y se baja. / Read a bit more. I use math to add and subtract when you go up and down.

In Extract 2, when I mention the use of Catalan and Spanish, the student refers to a different mixing coming from the use of Catalan and mathematics (e.g., “I use math to add and subtract”). When I insist on the use of Spanish (which is a controversial way of conducting the interview that would also need analysis), Julio seems far from understanding my interest in these language issues. Similarly to the case with Isidora and despite some of my questions during the interview, Julio does not put emphasis on the distinction between his two languages. This case is, however, different in that it points to the experience of learning Catalan together with the additional complexity of learning the language of mathematics. Why Julio does not mention Spanish to report his languages in the resolution of the tasks? Again, subject positions need to be situated in the broader political context of Catalan schools in which Spanish is not the LoLT. Furthermore, the idea of “half-Catalan, half-math” introduces into discussion the complex distinction between “languages” and “codes.”
Julio reacts to some of my questions by bringing up “codes” instead of “ordinary” languages. How can we interpret the mixing of Catalan, Spanish and mathematics in terms of the student’s learning? On the one hand, the distinction that Julio makes between (his) Catalan (a mixing of Catalan and Spanish that conforms an “understandable” language) and the language of mathematics indicates advanced processes of mathematization that are part of what needs to be reinforced through the learning of mathematics. On the other hand, the lack of explicit distinction between Catalan and Spanish in the student’s writing and talking points to a focus on mathematics instead of language. During the interview, Julio shows agency by challenging my focus on language issues (e.g., “Here it says *els pisos de la tienda*”) and introducing appropriate references to mathematization. His positioning appears related to identities that give priority to the learning of mathematics. It has the effect of centering the interview on difficulties arising from the interpretation of open-ended tasks, and decisions regarding how to check resolutions.

“Not very much Spanish in fact!”

Andrea, a student from Colombia, marked Catalan in all blank boxes but pointed to occasional practices of mixing Spanish and Catalan in her resolution of one of the mathematical tasks of the questionnaire. During the interview with her, I introduced comments regarding mixing languages when thinking and writing to make the student reflect on the use of her two languages. Like in the cases with Isidora and Julio, Andrea did not expand much on my questions on language issues. In her case, she was rather more interested in “justifying” her use of Spanish with those tasks that were mathematically more difficult, as rated by her.

Extract 3

Núria: ¿Has pensado y escrito todo en catalán? / Did you think and write everything in Catalan?

Andrea: Lo he leído en catalán y he traducido pocas palabras al castellano. / I read it in Catalan, and translated a few words into Spanish.

Núria: Medio medio…? / Fifty fifty…?

Andrea: El problema cuatro, en castellano, pero solo el cuatro. / Problem four, in Spanish, but only problem four.

Núria: Sí, ya veo. En la hoja está sobre todo explicado en castellano. / Yes, I can see. On the sheet, it is mainly explained in Spanish.

Andrea: Es más difícil que los otros. / It is more difficult than the others.

Núria: Así, medio medio…? / So, fifty fifty…?

Andrea: En realidad, ¡poco castellano! / Not very much Spanish in fact!

Extract 3 brings up discussion on what is under practices of mixing languages. In the case of Andrea, we find both Catalan and Spanish in her writing, but more Spanish in situations in which the mathematics is experienced as being more
difficult (it is significant however that problem 4 in the questionnaire is highly language-demanding in that it has a long and dense wording of more than five lines). Her behavior is consistent with the idea of students using their languages as a tool in their learning of mathematics. Andrea seems to take advantage of her two languages for pragmatic reasons: keeping Catalan only –or mostly Catalan– would be detrimental to her thinking and would challenge her understanding of certain tasks. Nevertheless, if considering the contrast between the use of Spanish in the notebook and her “not very much Spanish in fact!”, we see that “language (non) differentiation” plays a relevant role. From this contrast, we get information about which language is dominant in how Andrea perceives her context of learning and teaching mathematics.

In this report I attempt to interpret language (non) differentiation in terms of both political and subject positions in the process of learning and teaching mathematics. Subject positions by Isidora, Julio and Andrea are relative to political contexts and expectations, many of them coming from the structure of the interview as well as my own subject positions. During the planning of the interview, I assumed students would fill in the blank boxes and provide information about what had “really” happened in their language use. However, as they started with matching a language to the first task in the questionnaire, they did the same for all other tasks, and this information did not fit into what I could find later. They adopted agentive behaviors in that they did not expand on some of my questions on language issues but, instead, paid much attention to the mathematics and even reoriented the initial focus of the interview. I see their agency consisting in the ability to represent language use in relation to individual opportunities of mathematical learning, as they attempt to produce identities that are more complex than those politically ascribed to them.

Considerations for the teaching of mathematics

My data illustrates bilingual students who show agency in their mixing of languages to assist their learning of mathematics. One practical conclusion that arises is the need to teach not only mathematics either in Catalan or Spanish, but also to recommend and teach flexible uses of the students’ languages. Flexible uses of languages do not guarantee better conditions for mathematical learning but are expected to help keep and promote engagement. The need for proficiency in the LoLT comes together with the need for flexible uses of languages in the classroom. Instead, restrictive interpretations of language use may dramatically constrain possibilities of participation and learning. Students may take up weaker participant positions if they perceive that they will be submitted to negative evaluations of their language use. The experience of asymmetries in terms of language “expertise” may prevent them from participating. On the other hand, perceptions of languages as “collaborative” and not “competitive” may increase productive speaking in multilingual contexts.

From the perspective of the monolingual teacher, it is difficult to construct learning and teaching environments that support language-mixing and help overcome
language barriers in the mathematics classroom. Fortunately this is not the case in Catalan classrooms with Latin American students because all Catalan teachers are bilingual Catalan and Spanish. This is one small part of the situation, not only in Catalonia (where many Moroccan, Pakistani and Indian students have teachers who cannot speak and understand their languages) but also in many other places with highly multilingual classrooms and less highly multilingual teachers struggling to meet the language and educational needs of their students. Similarly to what Chitera (2011) argues, an important message is not to see students with “limited language skills” but to search for teacher education programs that foster teaching and learning strategies for flexible uses of languages in multilingual mathematics classrooms.

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