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ORIGINAL ARTICLE

Language-as-resource and language-as-political: tensions in the bilingual mathematics classroom

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Abstract In this article we reflect on the learning of mathematics in bilingual settings from a social and a political perspective. In particular we highlight two concepts that are key to our work: language-as-resource and language-as-political. To do so, we draw on classroom data from students of Mexican origin in Tucson, USA, and students from Latin America in Barcelona, Spain. The language policies in our contexts share a message of privileging the language of instruction (English or Catalan) over other languages. Our analysis of the two sets of data points to differences in the mathematical participation of students on the basis of which language they use. We develop the argument that, even if languages other than Catalan and English are accepted and certain pedagogies may be close to a language-as-resource approach, the use of the students' languages is politically mediated in such a way that its pedagogical value (as a medium of communication and learning) is not always taken into account in the bilingual mathematics classroom.

Keywords Students' learning · Mathematics classroom · Bilingualism · Language-as-resource · Language-as-political · Tensions

Introduction

This article addresses the mathematical learning and the experiences of students in classrooms in which the official language of instruction is not their home language. We draw on data from two research studies in two contexts: Barcelona, Spain and Tucson, USA. Our focus is on students from Latin America attending school in Barcelona, and

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students of Mexican origin attending school in Tucson. We attempt to show that even in two different realities, there are students experiencing similar tensions. In Tucson the language of schooling is English and in Barcelona it is Catalan. Although the language policies in the two contexts may not be the same, they share a message of privileging the language of instruction (English or Catalan) over other languages. Hence we share a concern on the social and cognitive impact of policies that mark one language as more powerful than another, particularly when those implicated are from non-dominant language groups.

In Arizona (Tucson), Proposition 203, which severely restricts bilingual education in the State, was passed in 2000. Stritikus and Garcia (2005) say "the normative assumptions underlying Proposition 203 position the language and culture of students who are diverse in a subordinate and inferior role to English" (p. 734). Furthermore, in 2006, the Arizona state legislature passed a new law that essentially segregated English language learners for 4 h everyday to focus on the learning of the English language. Gándara and Orfield (2012) give a historical overview of the negative educational impact for Latino students who were segregated by language in Arizona and raise serious concerns about the 4-h law not only for English Language Learners (ELLs) in Arizona, but in other states in the U.S. that might consider a similar law:

> Unfortunately, it is hard to imagine that those who are intent on depriving immigrants and their children of educational benefits would not use a decision that allowed Arizona to continue segregating its EL [English Learner] students into Mexican Rooms and denying them access to the core curriculum to bolster efforts to pass laws in other states that seek to reduce or eliminate the educational opportunities offered to EL students…. The stakes for these issues continuously increase because the U.S. population is becoming ever more diverse and the most rapidly growing sector, Latinos, attend the schools most segregated by language, race and poverty. (pp. 17–18)

In Catalonia (Spain), Catalan is the only official language of instruction at all levels of the education system. Students whose home language is not Catalan and are recent immigrants learn this language at school in the so-called "special classes." These "special classes" segregate recent immigrants, usually for 1 year, from the students who are proficient in Catalan. Mar-Molinero (2000) interprets language as a key feature of national and personal identity in the Catalonian context. As Strubell (2006) claims, this is related to the fact that Franco's dictatorship (1939–1975) attempted the suppression of Catalan identity by prohibiting the public use of Catalan and only allowing Spanish in schools. After Franco, the local autonomous government developed the current educational policy with Catalan as the only language of instruction since 1985. In short, language policies that are directed to immigrant students (as is the case in both contexts) are ideologically charged and it is imperative that researchers address the educational implications of such policies.

Language-as-resource and language-as-political

Similarly to Adler (2001) and Jorgensen (2010), our theoretical position integrates the social and the political to explore the learning of mathematics in multilingual settings.

In this section we outline some of the main ideas from the literature that have influenced our research. In particular we highlight two metaphors that are key to our work, language-as-resource and language-as-political. We view language-as-resource as a potential for thinking and doing, and more particularly for learning and teaching mathematics, and language-as-political as a potential for transformation through processes that place certain languages and their speakers at a distinct disadvantage. These metaphors are grounded on the classical work by Ruiz (1984), in which he describes two competing orientations in language planning—"language-as-problem" and "language-as-right"—and proposes a third one—"language-as-resource" (p. 17). In describing the potential of language-as-resource in the U.S. context, Ruiz writes:

> It can have a direct impact on enhancing the language status of subordinate languages; it can help to ease tensions between majority and minority communities; it can serve as a more consistent way of viewing the role of non-English languages in U.S. society. (p. 25)

Although the writing by Ruiz (1984) is almost 30 years old, his call is still valid today, "for now, however, perhaps the best approach would be to encourage the compilation of a strong literature with an emphasis on language as a resource" (p. 28). This article intends to address this call.

Moschkovich (2002, 2007) argues for a sociocultural perspective that moves away from what bilingual learners cannot do and, "instead focuses on describing the resources bilingual students use to communicate mathematically" (Moschkovich 2007, p. 90). In our work we look at the challenges and affordances of multiple languages in the classroom (although in our contexts we are focusing on two languages at a given time) in a political context that privileges one language in the classroom. In Tucson we focus on the richness of students' mathematical thinking and their level of engagement with the task when using their home language. In Barcelona we focus on the learning opportunities created by using the students' home language. As we have written elsewhere, the situation is more complex than just letting students use Spanish either in Tucson (Civil 2011) or Barcelona (Planas 2007), but complexity may be addressed through classroom practices in which the students' languages successfully become a vehicle in the construction of mathematical knowledge (for examples of such successful teaching practices see Khisty and Chval 2002; Norén 2011; Musanti et al. 2009).

Clarkson (2009a, b) and Jorgensen (2010) in Australia, Gorgorió and Planas (2001) in Catalonia, and Turner and Celedón-Pattichis (2011) in the United States, among others, have also addressed the idea of language-as-resource in relation to students' participation in the multi/bi-lingual mathematics classroom. These authors have examined specific teacher and student actions that seem to support the learning of mathematics through the flexible use of the students' dominant languages along with the language of instruction. Major arguments in favour of multi/bi-lingual education have been grounded on the learning benefits that all students may get from having the opportunity to use the language that they know best in the development and communication of their mathematical thinking. Here the language is viewed under instrumental (language-as-instrument), communicative (language-for-communication), and critical (language-as-

right) approaches that frame the learning. The instrumental and the communicative approaches are particularly reported in Gorgorió and Planas (2001) as a way to conceptualize the notion of language-as-resource.

In our work, the metaphor of language-as-resource is complementary to that of language-as-political. We search for the discourses on the status and roles of languages other than Catalan (in Barcelona) and English (in Tucson) that may have an influence on how language is used as a resource in the learning and teaching of mathematics. In fact, we claim that certain discourses are oriented by the idea of language-as-problem, and do not draw on potential strengths coming from the use of the students' languages in the learning. It is our assumption that any fuller development of language-as-resource in schools requires a higher understanding of why it is that bilingual education and immigration in Catalonia and Arizona have been problematised in many ways for the last decade and have very little institutional support at present. Mainstream discourses on bilingual education and immigration become a serious obstacle to the implementation of language-as-resource pedagogies. This is not unique to the geographical contexts we discuss in this article (see Civil 2012). For example, Alrø et al. (2009) write about the anti-immigration sentiment in Denmark:

> Nowadays the overall public discourse of mistrust and sometimes hatred against 'those that are not like us' permeate many spheres of social life, among others schools and classrooms. In the educational arena 'immigrants' are constructed as problematic, and multilingualism as an obstacle that needs to be overcome. (p. 13)

Setati (2005) argues for a sociopolitical perspective to consider how:

> language is always political not only at the macro level of policy making but also at the micro level of classroom interactions… Decisions about which language to use, how to use it, and for what purpose are both pedagogic and political. (pp. 450–451)

Chitera (2011) and Setati (2008) document views of African students in African countries in which English, the colonial language, is the language of instruction. Many speakers of African languages do not find it necessary to study their home languages at school. They consider English more useful for "getting on in the world" (Barwell 2012), and for the learning of mathematics, and as a result they experience the use of the language of instruction as the appropriate option. These valorisations of languages cannot be separated from dominant discourses on which language is expected to provide easier access to academic and social promotion.

In the context of the English-only movement in the United States, Enyedy et al. (2008) examine data from bilingual Latina/o mathematical learners using two languages in classrooms where English is the language of instruction, Spanish is not a high-status second language, and discourses on deficiency on the part of these students are common. Also in the United States, Gutstein (2003) reports monolingual classroom practices that denigrate Spanish and those who are associated with this language. He shows subtle micro aggressions (Solórzano 1998) that serve to maintain privilege among groups of students on the basis of their language. In Catalonia, where Catalan is used as a tool for establishing the idea of "national language," Planas (2011) reports on discriminatory practices and policies that unequivocally make it clear that Catalan is the language to be

used in the learning and teaching of mathematics. Mainstream discourses point to Catalan as being "worth" more than Spanish, and much more than other languages, such as Arabic, Panjabi, Urdu, and Tagalog (in schools with highly multilingual classrooms that are composed of immigrants from several parts of the world), to the extent that advancing in the school system is achievable only through the use of Catalan.

In this article we integrate the sociocultural (Clarkson 2009a, b; Moschkovich 2002, 2007) and the sociopolitical (Adler 2001; Jorgensen 2010; Setati 2008) approach to examine some of the tensions in the mathematical participation of students who are not proficient in the language of instruction and who may experience both language-as-resource and language-as-political in the context of their classrooms.

Research methods

As indicated earlier, we draw on research studies that took place in Barcelona and Tucson. Both contexts have schools with students who are in the process of becoming bilingual (Spanish and English with Mexican children in Tucson; Spanish and Catalan with Latin American children in Barcelona). The teachers in the classes may use the two languages in a flexible way despite the regulations in Arizona and Catalonia that claim the official status for only one of the languages (English in Tucson; Catalan in Barcelona). In the Tucson case, the teacher's first language was Spanish and she was an English learner herself; in the Barcelona case, the teacher's first language was Catalan but she was fluent in Spanish. In both cases they mostly taught in the language of instruction. For the Tucson case we focus on a 7th grade classroom (12-year-olds) with only eight students, all classified as English-language learners. Seven students were recent immigrants, with most of them having arrived to the U.S. within the previous 2 years. Marta worked with the teacher and the students for the whole academic year, with the data collection being from February to May 2008. Marta and the teacher worked together to implement an emphasis on students working in small groups and explaining their thinking. This was a change from the typical classroom norms up to then, as we moved towards more emphasis on students' participation in mathematical discourse. For the Barcelona case, our data come from a classroom with 22 12-year-olds, 7 of whom are of Latin American origin and have Spanish as their first language. Núria worked with the teacher for the whole year as part of a teacher study group and the classroom data was collected in the fall of 2008. In most lessons, Núria was an observer, and on some occasions she played the role of teacher or that of assistant to the regular teacher in the class. Like in the case of Tucson, and following the goals of the teacher study group, the teacher took responsibility for the long-term task of establishing new classroom norms based on group work and class talk.

The data we discuss in this article come from transcripts of videotaped lessons in the two contexts. In our respective geographical contexts, the direct observation of the lessons facilitated the selection of episodes that were potentially rich from the perspective of changes in the mathematical participation. That is, we searched for moments in the lessons in which one or more of the students whose primary language is not that of the instruction experienced a change in the mathematical participation. This change could be an increase in mathematical participation, by which a student

engaged in mathematical explanation and/or through his/her intervention provoked the participation of other students. The change could also be an interruption in participation where students' interventions happened to be considerably reduced. Our choice of these episodes fits the goal to understand the mathematical participation of students whose dominant language is not the language of instruction, and particularly to explore the role of the two languages in such participation as well as the differences in levels of participation among students. Ultimately we want to understand how the changes in participation may have an influence on the mathematical learning of all students. We draw on the principles of critical approaches to ethnographic research (Gee 2004; Gutiérrez 2007), which include attending to issues of power by encouraging mathematical participation under the assumption that all students have valuable knowledge and experiences to contribute to a mathematics discussion.

For this article we jointly analysed the episodes that we had each selected separately from our two bodies of data. For data analysis we searched common qualitative themes, following the grounded theory tradition (Strauss and Corbin 1997) and a variant of the constant comparative method (Glaser and Strauss 1967). We first worked through the data by inferring evidences of tensions between language-as-resource and language-as-political from particular episodes of mathematical participation in Tucson (for this purpose Marta selected 10 episodes) and in Barcelona (Núria selected 10 episodes). At a second stage of the analysis, we grouped specific episodes (from the total of 20) that we considered as paradigmatic of two major types of sometimes overlapping tensions: those in which there was a clear use of the students' language as a resource, and those in which the political role of language was explicit. Our interpretive and critical approach to the analysis of data (Bloome et al. 2005) prevents us from proposing generalisations in relation to what can be said about classroom practices and students' mathematical participation in bilingual settings. However, the fact that we found similarities in two different political and geographical contexts is worth noting, as we think of other contexts worldwide with similar language policies.

In the next section we present two of the themes that best exemplify the tensions between language-as-resource and language-as-political. In our analysis we have attempted to capture such tensions and make them visible through the identification of language practices that are critical to the students' mathematical participation.

The use of language-as-resource

We have reported elsewhere on some findings in the Tucson case, in which students in the ELL classroom engage in rich mathematical discussions in Spanish (Civil 2009, 2011, 2012; Civil and Planas 2012). When using their home language in their mathematical explanations to the whole group, the students' overall demeanour is more relaxed. They use the spoken language (and nonverbal language such as smiles and gestures) to interact with the other students in the audience, who in turn engage in the mathematical discussions. These discussions are lively and reflect informal interaction styles with the use of humour and nicknames, while at the same time presenting mathematical arguments. In contrast, when students try to use only

English, their presentation style is stilted and non-engaging (they do not look at the audience, speak softly, and do not appear to be comfortable). We wonder: Which setting (English vs. Spanish, in the Tucson context) provides a better opportunity to learn mathematics?

In the excerpt below, Larissa explains a probability game to a group of students who has just walked into the classroom and has not seen the game before. Recall that all students as well as the teacher were Spanish-dominant speakers. They tended to use English to communicate to the whole class, but used Spanish in their small groups. Larissa had been analysing the game with her partner Carlos, and one of the issues they had encountered when reading the problem in English was the term "product." They were not quite sure how to say it in Spanish (it is actually very similar: "producto"). It is one of those terms that are examples of academic language with a specific meaning in mathematics. When Larissa explains the game to the group, she first reads it in English. She barely looks at the audience and mostly looks at the sheet in her hands and reads from it:

> Larissa We played a game that's called the multiplication game and the rules are that, two players that are A and B, take turns rolling two number cubes, and when, the, if the product of the numbers rolled is an odd, is an odd number, player A wins a point, and if the product of the numbers rolled is even, player B wins a point.

She then asks, "Do we say it in Spanish?" and when she switches to Spanish, the sheet becomes a reference for her, that is, she looks at it from time to time, but she is translating on the spot and, in fact, does not use the word "producto" (which they had just learned) but instead talks about multiplication and provides a clearer explanation than the English version by itself. In her interpretation in Spanish, Larissa personalizes the game with the use of the "you" pronoun (see below): "cuando tiras dos dados, ese número lo vas a…" [*when you roll two dice, you are going to…*]. This is a more inviting style tan the impersonal and more formal English written version that she had just read.

> Larissa Es un juego que se llama *multiplication game*; entonces, dos jugadores, que son el A y el B, toman turnos tirando dados. Entonces, cuando tiras dos dados, ese número lo vas a multiplicar por el otro número del otro dado, y si el número es impar, el *player* A gana un punto; si el número es par, multiplicándolo, el *player* B tiene un punto. [*It's a game called multiplication game; so, two players, which are A and B, take turns rolling dice. So, when you roll two dice, you are going to multiply that number by the number on the other dice, and if the number is odd, player A gets a point; if the number is even, multiplying it, player B has a point*.]

In another lesson from the same seventh-grade classroom, a mathematical problem was posed to decide which option was best for a class party; one option involved going to a pizza place and movie for $10/person; the second option was going to a water park and hot dogs for $100 to reserve the pool and $5/person; and the third option was going to a skating ring and ice cream for $200 to rent the skating ring and $2/person. Students first worked in their groups and then presented their conclusions to the whole class. Ernesto and Simón worked together on this problem and, when presenting, Ernesto did most of the talking, although Simón had a higher degree of

fluency in English. Ernesto was considered the strongest student in mathematics and his peers often deferred to him for explanations. Ernesto does most of the explanation in English, and although somewhat halted in his expression, he handles the teacher's questions quite well. Simón contributes to the presentation by writing on the board the algebraic expressions for the three settings (pizza, water park, and skating ring), and by interjecting one or two words in English adding to what Ernesto is saying. When the two students are done with their presentation, Marta asks them, "For how many people is the price of the skate the same as the pizza?" Ernesto looks at his notes and finds 25 as the answer. When Marta asks them to convince her, Ernesto starts writing the algebraic expressions again (they had erased them) with the goal of substituting the value of 25 for each and see that they are the same. They did not have this on their notes, so they had to work it out from scratch on the board. At that point they switch to Spanish and while they are writing on the board, they are talking through the steps in Spanish. They end up with $10 \times 25 = 250$ for the pizza option and $200 + 2(25) = 250$ for the skating ring option, at which point Ernesto asks Marta if she is convinced:

1	Ernesto	¿Se convence? [*Are you convinced?*]
2	Marta	Okay, now how did you know that it was 25?
3	Ernesto	25? Because you, um, because, I just as… um, ¿cómo se dice? [*How do you say?*] I see my table and because I had, 10 plus… pues. Miré la tabla, com—tenía, tenía de diez en diez. [*... well, I looked at the table, sin—I had, I had by tens.*] Miré la tabla. Tenía de 10 en 10 en 35, entre 30 y 40 era, era 340. Entonces, entre 20 y tre—30. Era… entre 20 y 30. Entre 20 y 30, eran 250 pues, en la Pizza Pi era fácil saber que eran 250. [*I looked at the table. I had 10 and 10 at 35, between 30 and 40 it was, it was 340. So, between 20 and thi—30. It was... between 20 and 30. Between 20 and 30, it was 250, well, in the Pizza Pi it was easy to see it was 250.*] Y luego porque en el skate night era de dos y tenía 240 en 20, cada cinco personas eran 10 dólares. [*And then because in the skate night it was from two and I had 240 at 20, every five people was 10 dollars.*]
4	Marta	Okay
5	Ernesto	¿Se entiende? [*Is it clear?*]
6	Marta	Sí, lo entendí. [*Yes, I understood.*] So you didn't have that value, you didn't have the 25 on the table.
7	Ernesto	No.
8	Marta	You have 20 and the 30, and then you, you saw how the thing was going. What about solving the equation? Solving for, solving for n. Doing the algebraic solving of the equation.
9	Ernesto	¿Cómo? [*What?*]
10	Marta	Que resuelvan la ecuación. Como hiciste ahora que estabas mirando ese pa—el papel. [*Solving the equation. Like you did just now that you were looking at this pa—the paper.*]
11	Ernesto	Uh huh.
12	Marta	Que resuelvas P igual a S. [*That you, you solve P equals S.*] (On the board they had P=10 n and S=200+2n)

In this episode, Ernesto tries to explain in English how he used the table to see that 25 was the value for which the pizza price and the skating price would be the same, but he is having a hard time explaining that he had organised the table going by tens, and switches to Spanish to explain his reasoning [3]. Marta is trying to push them to

set the two expressions equal to each other and solve the equation $10n = 200 + 2n$ to find the point where the two lines cross [8, 10]. She had worked with Ernesto and Simón earlier on the similar process for the skating and the water park, setting those two expressions equal to each other. When Ernesto asks, "¿Cómo? [*What?*]" [9], we do not know if he does not understand the question due to the language or the mathematics (or maybe both). Marta immediately translates into Spanish and elaborates further [12], hence helping Ernesto understand what he is being asked to do.

13	Ernesto	P igual a—oh sí. Oh sí. [P equals ah—oh yes. Oh yes.] … Quiere que le haga así como, de esto igual a esto—[*You want me to do it like this like, this is equal to this*—]
14	Marta	Exactamente. Que resuelvas, para ver si sale lo mismo, tendría que salirte 25, ¿no? ¿Se supone? [*Exactly. That you solve, to see if you get the same, it would have to come out 25, right? Supposedly?*]
15	Ernesto	10 por 25. [*10 times 25.*]
16	Marta	No, no, pero no así porque no sabes cuál es la solución. [*No, no, but not like that because you don't know what the solution is.*]
17	Ernesto	Oh.
18	Marta	Si ya pones que es 25, ya lo sabes. Tienes que usar las ecuaciones que está escribiendo Simón. [*If you put that it is 25, you already know it. You have to use the equations that Simón is writing.*]
19	Ernesto	10 por n. [*10 times n.*]
20	Marta	Exactamente. [*Exactly.*]
21	Ernesto	Igual… A 200 más dos n [*Equals… 200 plus two n.*]
22	Marta	Okay.
23	Ernesto	So, aquí creo que se resta. [*So, here I think that you subtract.*]

It seems that Ernesto had understood what Marta was asking him to do, but as he starts writing, Marta realizes that what he was going to do was to substitute 25 in each expression again, rather than solve for n [16]. After this gets clarified, Ernesto successfully solves the equation [19, 21, 23]. All this exchange is in Spanish and none of the participants get back to English. What we claim is that by using his home language, Ernesto expands his mathematical participation. One question that arises is whether Ernesto would use Spanish the same way in the mainstream mathematics classroom with English dominant students. The year following the study reported here, Marta visited the algebra classes of some of these students (including Ernesto and Larisa) on a few occasions and she noted that the students who had been in the ELL classroom the year before were not very vocal during the whole-class discussions. This is not to say that these students were not engaged with the mathematics. In fact, both Ernesto and Larisa were doing quite well. They just did not seem to contribute as much to the English-only discussions in class. Certainly more research is needed to understand the students' participation in different contexts. In the next section we look at a mainstream mathematics classroom with Catalan as the language of instruction. We claim that the findings in Barcelona can help us understand the experiences of Spanish-dominant students in Tucson who enter mainstream classrooms after having been for about 1 year in lessons with only ELLs. Similarly, the findings in Tucson can help us understand the experiences of Latin American students in Barcelona while they are in lessons with only Catalan language learners in the "special classroom."

The role of language-as-political

In the section with data from Tucson we have addressed questions concerning the mathematical participation of Mexican students in a classroom comprised of only English-language learners. What we have argued to this point is that students in Tucson have agency to use their home language as a resource in their learning of mathematics, while at the same time experiencing the political dimension of language when, for instance, they switch to English to report their mathematical thinking.

The data from Barcelona points to changes in the Latin American students' mathematical participation depending on whether their work takes place in Spanish monolingual small groups or with the whole class with Catalan being the language of instruction. These students use their home language as a resource for learning mathematics in the linguistically homogeneous small group, where the teacher promotes speaking Spanish by the mere fact of encouraging students to work in same-language groups. However, when the conversation moves to the whole group no special consideration is given to enhance the use of any particular language other than Catalan. To illustrate the move from the emphasis on language-as-resource to language-as-political, we take the case of Pedro, a 12-year-old boy who was born in Bolivia, and, at the time of the research, had been in the Catalonian school system for almost 4 years and had a good knowledge of Catalan. On his arrival, he had been enrolled in a classroom of only Catalan-language learners, within a mainstream primary school, for 1 year. This was also the case of Luis, Nicolás, and Daily, the other three Latin American students in his group. We select Pedro due to his low participation in whole-class talk and his preference, as reported in an interview with him, for working with peers with his same home language.

We first comment on an episode that took place in Spanish except for one word in Catalan (C), during the time devoted to the resolution of a task that asks to find how many types of triangles can be obtained by combining angle (acute, right, obtuse) and side conditions (equilateral, isosceles, scalene). The episode starts when Nicolás asks whether it is possible to have a type of triangle whose "opposite sides" are the same. Pedro initially reacts by explaining that you cannot have opposite sides in a triangle, though he later expresses doubt (see [7] in the excerpt below). He is challenged by the mathematical use of "opposite," and puts this term in relation to different mathematical objects ("the opposite side of an angle," "opposite points in a circle," "opposite sides in a quadrilateral"). He tries to help overcome a confusion that is similar to the example described in Adler (2001), with the use of "adjacent" and "opposite" in a multilingual classroom. The students decide that they should ask the teacher and, while waiting for her, Pedro draws various polygons and looks for opposite sides in polygons with an even number of sides. It is a problem that is not related to the initial task but whose formulation shows Pedro's mathematical ability as he comes up with conjectures to define what the opposite side is, given one side, by searching for symmetries. When he goes back to the task by drawing a representation of the isosceles right triangle, the focus on "the"

language appears (for an extended version of the transcript below, see Planas 2012a, pp. 51–52):

1	Pedro	¿Cómo se dice en catalán? [*What do you call this in Catalan?*]
2	Luis	¿Qué? ¿Opuestos? [*What? Opposite?*]
3	Pedro	¿Cómo dices isósceles en catalán? [*What do you call isosceles in Catalan?*]
4	Luis	¿Isósceles? ¿No es igual? Se escribe i-s-o-s-c-e-l-s. [*Isosceles? It's not the same? It's written i-s-o-s-c-e-l-s.*]
5	Nicolás	He oído eso y suena distinto. [*I've heard that and it sounds different.*]
6	Luis	Como (C) *isòscels*. [*Like* (C) *isòscels.*]
7	Pedro	¿Todas las figuras tienen lados opuestos? [*Do all figures have opposite sides?*]
8	Nicolás	Umm… ¿Dibujamos un triángulo recto (C) *isòscels?* ¿Con el recto arriba? [*Umm… Shall we draw an* (C) *isòscels right triangle? With the right angle at the top?*]
9	Pedro	¿Estás seguro de que se dice así? [*Are you sure you call it this?*]
10	Luis	Sí, lo he oído otras veces. [*Yes, I've heard that before.*]
11	Pedro	Pon el ángulo recto abajo. Que los lados iguales coincidan con la vertical o la horizontal, como Pitágoras. [*Let's put the right angle at the bottom. Make the equal sides coincide with the vertical and the horizontal, like Pythagoras.*]

Pedro adopts a normative discourse on the right way to use Catalan by suggesting that words cannot be said wrongly and mis-pronounced [1, 3, 9]. It is interesting the way in which he interrupts twice the mathematical discussion to clarify the Catalan translation and pronunciation for isosceles, which is "isosceles," very similar to the Spanish word "isosceles," like the case with "product" and "producto" in Tucson. The video clip confirms the efforts made by Pedro to reproduce speech accents that cannot be seen in the transcript. Overall, the students in the group establish a discourse that includes references to their mathematical knowledge and the languages in the classroom [3, 4, 5, 6, 8, 9, 10]. The experience of difficulties with technical words is consistent with the complexity of gaining access to the language of mathematics. From this episode we want to stress two aspects. One, Pedro is engaged in the mathematical discussion through his exploration of the meaning of opposite, using his home language, Spanish, as a resource [7, 11]. Second, Pedro is clearly concerned about the proper way to say the word "isosceles" in Catalan, to the point that he interrupts the mathematics to emphasise the language correctness in the language of instruction [1, 3, 9]. This points to language-as-political.

By the end of the lesson, during the time devoted to class talk, we can see how Pedro moves to a lower level of participation that is mainly evidenced through repetition of sentences that are first said by Anna, a Catalan-dominant student in the class. This is something that happens quite often during main-class talk in all lessons that were observed by Núria. Most of the students who took responsibility for introducing mathematical ideas in whole-group discussion were Catalan dominant. In short, what occurs is that Pedro does not further elaborate on ideas that have appeared in his group, so that his peers and the teacher cannot expand their learning by listening to them (for example, in addition to the definition of the side opposite a given side in a polygon, Pedro spent time developing a conjecture that connects side and angle conditions, "the less acute is the angle, the biggest is its opposite side").

The episode below took place almost entirely in Catalan. It starts with the teacher asking what makes a triangle an acute-angled. Some students answer, "angles not greater than 90." This is quickly rephrased by Pedro into "angles not greater than 89" [2], and contested by Anna, who points to the difference between the two numerical conditions [3]. In an effort to summarise the reasoning that is taking place, the teacher intervenes (for an extended version of the transcript below, see Planas 2012a, pp. 59–60):

1	Teacher	(C) Així, un triangle és acutangle… [*So a triangle is an acute-angled…*]
2	Pedro	(C) Angles no més grans de 89. [*Angles not greater than 89.*]
3	Anna	(C) Tenir més de 89 no és tenir menys de 90. [*Being more than 89 is not being less than 90*]
4	Teacher	(C) Veieu la diferència? [*Do you see the difference?*]
5	Anna	(C) Els nombres de 89 a 90. [*Numbers from 89 to 90.*]
6	Luis	De 89 a 90. [*From 89 to 90.*]
7	Pedro	(C) Els nombres de 89 a 90. [*Numbers from 89 to 90.*]
8	Martí	(C) No els dibuixes, però hi són. [*You don't draw them, but they are there.*]
9	Anna	(C) Tens infinits nombres enmig. [*You have infinite numbers in between.*]
10	Pedro	Entonces el acutángulo… (C) No pot tenir els angles més grans de 90 o igual a 90, sinó més gran de 89. [*Then the acute-angled… cannot have angles greater than 90 or equal to 90 but greater than 89.*]

Pedro comments on the comprehension of the condition of acute-angled and the numerical distance between 89° and 90° [7], and Anna and Martí (also Catalan dominant) explain their interpretation of this distance [8, 9]. Some confusion appears in relation to how it is explained that an acute-angled may have an angle that is both greater than 89° and less than 90° throughout the episode. We do not know if the rather confusing explanations are due to the experience of mathematical difficulties, of language difficulties or both (similar to the case of Ernesto in Tucson, when he does not seem to understand Marta's request (in English) that he solve the equation and Marta proceeds to say it in Spanish). Although there is no evidence of Pedro having language difficulties with the use of Catalan, he does not seem relaxed in his interventions and is rather stiff in comparison to how he behaves in the small group. This is similar to the findings with the students in the Tucson case (e.g., Larissa above; also, Civil 2011). In the whole group, Pedro is primarily centred on listening to what is being said by others and does not take the initiative to introduce some of his points. Pedro had actually used the expression of "angles being less than 90" (in Spanish) in the small group, so that his confusion with the alternative expression "angles being greater than…" might have been more easily figured out if he had felt confident and relaxed in the discussion with his peers.

In all lessons, Pedro rarely positions himself as linguistically different, and does not show major difficulties with the language except for vocabulary and pronunciation (e.g., "isòscels"). He does not use Spanish as a tool in whole-class interaction and only occasionally changes to his dominant language (e.g., in the episode about "isosceles" triangles in the small group), although Spanish is sometimes used by the teacher in her interaction with him. The use of Spanish in the public space of the classroom tends to occur when a dominant Spanish speaker expresses difficulties with the mathematics and another Spanish speaker offers help. On these occasions,

opportunities to keep using Spanish are not totally favourable. More generally, Pedro seems to speak with a "hedge" in deference to what he sees as other persons' greater authority in the class, although he may be certain about his mathematical approaches. Students may participate for shorter periods of time in the larger group because there is less time per student as opposed to when students are in small group. And in a large group they may summarize longer engagements than they had before. Nevertheless, it is worth noting that while Pedro was very engaged in all small-group episodes collected, we found only two short episodes in which he participates in the whole class discussion.

Discussion

We have developed the argument that, even if languages other than Catalan and English are accepted and certain pedagogies may be close to a language-as-resource approach, the use of the students' languages is politically mediated in such a way that its pedagogical value (as a medium of communication and learning) is not always taken into account in the bilingual mathematics classroom. In this article we have focused on classroom episodes with students to support this argument. We also have some insights from the teachers, which we share here to further support the argument, but which also introduce possibilities for further research. The teachers with whom we collaborated indicated that students whose home language was not the language of instruction and who were placed in segregated environments participated more in those settings than in the mainstream classroom. The teacher in Tucson said:

> I work only with ELL students. Our kids feel afraid to be in the regular classroom because they feel the other kids have the power. So, even if I have a very brilliant kid… he is not going to be that brilliant because they are going to ask them questions in English so they don't know how to explain themselves and they're going to be quiet. So, they're going to be relegated to the back of the class.

The teacher in Barcelona, referring to students who attended the special class, made a comment along the lines of: "They receive plenty of support when they are in the special class. They are not so much challenged with the language, and can feel more comfortable." This comment hints at a similar situation as the ELL students in the Tucson case, who also appeared to be more comfortable in the ELL classroom where they could use their home language more freely. In what follows we use the similarities across the two cases to reflect on the tensions between language-as-resource and language-as-political and on which model may be most conducive to students' participation in the mathematics classroom

The tensions between language-as-resource and language-as-political in Barcelona and Tucson are similar. Some of the tensions that have been documented have to do with, on the one hand, the role that the students give to languages by implementing certain uses and, on the other, the political role that languages bring with them. The Spanish-dominant students in both contexts use their home language as a resource in significant moments of their mathematical practices, and as a tool for the interaction with other students with the same first language. While being engaged in the mathematics work using their home language, a focus on the language of instruction

is still present (e.g., in the Tucson case, students did all the reading and writing in English; in the Barcelona case, students know that the whole-class discussion will be in Catalan, and hence feel the need to prepare for that). Sometimes the focus on the language of instruction becomes problematic in that it implies an interruption in the students' mathematical participation. It is on these occasions that the tensions between language-as-resource and language-as-political are represented in terms of commitment on the part of the students to either the mathematics or "the" language.

The tension arising from the students' experiences with language-as-resource and language-as-political can be seen as an expression of the major tension between the focus on either the mathematics or the language in the multilingual mathematics classroom. In particular, we have documented that the experiences of language-as-political (i.e., the concern about the use of the language of instruction) has a significant impact on the development and continuity of the students' mathematical participation in our research contexts. Therefore, analysing the ways in which the tensions between language-as-resource and language-as-political are manifested can help understand some of the unexpected and apparently contradictory changes in the mathematical participation of the students whose language is not the language of instruction. Certain experiences of such tensions pose more difficulties to the mathematical participation than others as they require more acts of resistance than others. In our work, the mathematical participation of the students can be viewed as successful ways of resistance to the experience of language-as-political. One such form of resistance is the fact that in both contexts they use Spanish in their small-group work, despite knowing that the writing and oral communication to the whole class will be predominantly in the language of instruction.

Barwell (2012) describes four tensions involved in the teaching and learning of mathematics in linguistically diverse classrooms. The set of tensions that we have identified in our study is close to what Barwell typifies as "the tension between school and home languages" (p. 320) for those contexts in which there is a clear stipulation of an official language of schooling. As Barwell says, "There is an inevitable tension, then, between the languages that students use in or out of the classroom and the requirements to use a particular language to talk about mathematics" (p. 321). Drawing on our two sets of data, such tension is expressed through the simultaneous need to reinforce and improve the language of instruction and that of sharing knowledge in the home-dominant language. To better understand the tension, it is our position that we have to examine a variety of practices inside and outside the classroom, as well as the responses to these practices. To privilege only either the language of instruction or the home language is problematic. Instead we argue for the need to promote a flexible use of the two languages in order to support students' personal and academic development.

The tensions that we have identified are also close to what Barwell (2012) names "the tension between language policy and mathematics classroom practice" (p. 324), in relation to the existence of official statements of how language(s) should be used in the multilingual mathematics classroom. One issue that is important to consider in relation to these official statements is how students interpret them. For example, in the mainstream classroom in Barcelona, Catalan speakers dominated the whole-class discussion and rarely switched to Spanish (Planas 2012a, b). Further research would be needed to uncover their reasons for using only Catalan. In the Tucson case, students expressed concern about being in a segregated environment as they thought that they were using Spanish a lot and not learning enough English (Civil 2011; Civil

and Menéndez 2011). In our two research contexts, the tension between policies and practices is manifested in the nature of participation in the mathematics class (who, how, and when). In particular, students whose dominant language is not the language of instruction may withdraw from participating in whole-class discussions and defer to the students whose dominant language is that of instruction. This potentially limited participation on the part of some students due to language issues may affect the opportunity to learn mathematics for all students, as some voices are silenced. Language policies, then, become even more public in that they are identified as a classroom norm and constitute a reference for the students' practices. We have found that policy statements (and dominant social representations) are acknowledged in the everyday classroom practices. The relationship between policies and practices is somehow marked by how the students and the teacher interpret practices as a place for enacting responsibility for what are experienced as important aims. Further, the existence of practices with a flexible use of languages points to efforts by students and teachers for continuous discussion and reinterpretation of official statements.

Conclusion

In this article we have focused on individual students (e.g., Pedro in the Barcelona case; Larissa and Ernesto in the Tucson case) to illustrate some of the tensions. While we are aware that as individuals they have their own traits, preferences, and inclinations, the tensions they exemplify are not unique to them. These students are representative of the tensions we encountered in our larger data set. And, we would add, while the political and language policy contexts may be different, the tensions discussed here resonate with some of the tensions in other bilingual settings (see Barwell 2009, for studies across the world in multilingual (including bilingual) contexts). Underlying these tensions is the question of what model may be best for the mathematics education of students whose first language is not the language of instruction. So, what do we do? Do we encourage the use of their first language even though this may be going against the language policy in place? This may not be an avenue in contexts such as Tucson where teachers fear the possible consequences of not enforcing the language policy. In reading our article one may get the impression that if the goal is mathematical learning, then encouraging and even promoting the use of Spanish in both our contexts would make the most sense. In fact, this was Marta's positioning in her work with the students in the Tucson case, in which she often engaged with them in Spanish because her emphasis was on encouraging the students to participate in mathematical discussions. Also, based on the two teachers' comments on the segregated environment versus the mainstream classroom, a message one could take away is that students may be more comfortable and willing to participate in a language-segregated environment.

Despite how "tempting" it may look from the point of view of opportunities to learn mathematics, segregating the students whose first language is not the language of instruction is not an avenue either (see Gándara and Orfield 2012, for a description of harmful effects of language segregation). The message in these segregated environments, whether it is Barcelona in the special classrooms, or Tucson with the 4-hour block that results in de facto segregation, is that the students' home language (Spanish, in this case) is not as valued as the language of instruction and that the goal is to acquire

the other language as soon as possible to be able to be in the mainstream classroom. Setati and Planas (2012) describe the case of an immigrant student in Barcelona who seems to view his home language (Spanish) as a weak resource in the teaching and learning of mathematics in his current context. He views the special classroom as his opportunity to learn Catalan well so that he can move to the mainstream classroom. Similarly, Civil (2011) writes about the students in the case of Tucson:

> Interviews with the students—and in some instances, with parents—showed that these adolescents were very aware of their segregation… Most of them expressed a desire to move out of [the segregated classrooms], and some believed that they were not learning as much English as they would if they were with the non-ELL students. Thus, in retrospect, it is not entirely clear that these students were necessarily comfortable with the idea of using Spanish in the mathematics classroom, since that may have contributed to their perception that they were not advancing enough in their English. (p. 88)

Students in both contexts develop perceptions about the different educational arrangements and the messages these arrangements send about their home language, the language of instruction, and who gets to participate in the mathematics classroom and how. Thus, a question to consider is: To what extent are students' perceptions and desires taken into account when implementing a plan for the mathematics education of students whose home language is not the language of instruction? And more generally, "how can we challenge and change the status quo around language barriers in school mathematics?" (Jorgensen 2010, p. 327). Although some researchers (e.g., Moschkovich 2007; Setati 2005), including ourselves, would argue for a more fluid model in which code-switching plays a central role, we are aware that the situation is too complex to explain by only saying that code-switching should be seen as a resource and hence used in the teaching and learning of mathematics. There are issues related to the informal-formal registers (Clarkson 2009a; Morgan 2007) that need to be taken into account; and there are also issues related to language valorisation, even when code-switching is considered a normal practice in the classroom. Ultimately, we cannot separate the "language issue" from the socio-political context in which students are embedded. As Valdés (1997) writes, "Bilingualism can be both an advantage and a disadvantage, depending on the student's position in the hierarchy of power" (p. 420).

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