Spanish-English Language Issues in the Mathematics Classroom   4

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The role of language in the mathematics classroom has become increasingly important in the current trend toward mathematics reform. Children are encouraged to reflect on their mathematical solutions and verbalize their explanations. It is not that language was not important before but rather than the new emphasis is an acknowledgment of the important role of language in mathematics education.

Language is so pervasive in our everyday lives that we tend to take it for granted. Since we all learn language effortlessly, we may assume that we and our children have acquired a higher level of language skills than we actually have. This pervasive attitude toward language has resulted in two serious misconceptions that affect how we deal with language issues in both the monolingual and bilingual mathematics classroom.

The language of mathematics (i.e., the language we use to talk about mathematics and to express mathematical concepts) is often assumed to be an intrinsic part of our everyday language. Under this assumption, we fall into the misconception of considering the language of mathematics to be as easily acquired as everyday language is. Furthermore, we assume that everyday language reflects mathematical symbolic language in a straightforward manner. Although we recognize that certain words and phrases (such as *horizontal* and *vertical, subtract, difference,* etc.) are a specialized vocabulary that the child needs to learn, we may assume that the language we use to make those words meaningful are a part of the child's everyday language.

Constructing meaning in mathematics through the use of language (i.e., using the language of mathematics) goes beyond explaining a mathematical term in simpler words. We sometimes fail to recognize that learning the language of mathematics is a process that takes time and effort. The fact that children (or adults) can use language to communicate does not automatically mean that they know how to use it to construct meaning in mathematics.

If we cannot take for granted what it means to know the language of mathematics in just one language, matters get more complicated when we consider bilingualism and mathematics. After all, what does it really mean to be bilingual? It is rare for a bilingual person to be equally strong in both languages, whatever they may be, in all aspects of his or her life. Usually bilingual persons have learned certain topics in only one of the languages spoken, and for those topics they lack the necessary vocabulary and fluency in the other language.

When we think about the mathematics classroom, we are faced with a second misconception about language, namely, that if a person is bilingual, he or she automatically knows the language of mathematics in both languages. Bilingual teachers may sometimes be unprepared to teach the language of mathematics (and therefore the mathematical concepts that that language expresses) for the simple reason that they lack that specialized language in the language or languages in which they teach.

The language issues discussed in this paper concentrate on the grades K–3 classroom. The elementary school classroom offers unique insights for the study of language in the mathematics classroom for several reasons. First, children of elementary school age are still learning how to use and manipulate language. Second, children are first exposed to the language of mathematics at this educational level. For these reasons, therefore, these grade levels are the crucial place to begin to study how the language of mathematics emerges. At this point, the language of mathematics is simple enough that its relationship with the everyday language can easily be explored in a way that is much more difficult when the language of mathematics becomes more complex.

The analysis of the language of the mathematics classroom proposed here arises from three sources: (1) extensive experience in a Spanish-English bilingual elementary school classroom for three years while I participated in a research project focused on helping children learn word problems, (2) experience in translating a large collection of word problems as a resource for teachers, and (3) extensive work in tutorial sessions with young children to determine the major difficulties that children have with particular word problems.

THE LANGUAGE OF THE MATHEMATICS CLASSROOM

With the current worldwide trend of mathematics reform, language is becoming as important in mathematics—and rightfully so—as it is in language arts. Mathematics reform curricula put a great deal of emphasis on having children explore, explain, reflect, reason, and communicate. The goal is to have children become proficient at analytical reasoning, not just at calculation. All this exploring, explaining, reflecting, and reasoning is communicated through language.

When children enter the school system, they enter a new world in which the rules of the game are different from those they have been using to that point. They are expected to sit still and listen, pay attention to their teacher and classmates, and speak or be silent when asked to. Along with learning new social skills, they have to learn how to use language in a different way.

The language of the classroom has very specific norms that differ from the way we use language in our everyday lives. For instance, in the classroom, turn-taking decisions (e.g., when it is permissible to take a turn in the conversation or to talk or interrupt) are as highly structured in the classroom as the introduction of a topic and of the purpose of the discourse, which is usually initiated by the teacher with the direct or indirect goal of teaching and learning (Gawned 1990).

If the language used in the classroom is a subset of the everyday language but governed by different rules of discourse, the language of mathematics is usually thought of as a subset of the language of the classroom. For instance, in the circular model proposed in Gawned (1990), different aspects of the language of mathematics are part of the language of the classroom, which is in turn part of the "real world" language.

Models like this obscure the fact that the language of mathematics differs from the everyday language in a very important aspect: the language of mathematics is not acquired effortlessly and naturally through social interaction but rather learned and taught in school as a separate register and often as a consciously memorized vocabulary. A *register* is the specific, sometimes specialized, vocabulary and expressions associated with certain domains. In the example of mathematics, we do not go through our daily life saying things like "Oh, I already have these two items on my shopping list, so I have to subtract two from the list of items I need to buy," even if that is exactly what we do by crossing them off our list. The word *subtract* does not form part of the language of most five- or six-year-olds, even if they have an emerging model of that mathematical concept, before they are introduced to it in school.

In this sense, mathematical terms are not items of everyday language, even though mathematical operations are part of our everyday lives.

We do, however, use everyday language to build up the mathematical concepts and the language we use to express them. Doing so is especially important if we are trying to make the mathematical concepts meaningful. The use of language in the mathematics classroom is best described as a process of language learning with four separated stages of language development, as illustrated in figure 4.1.
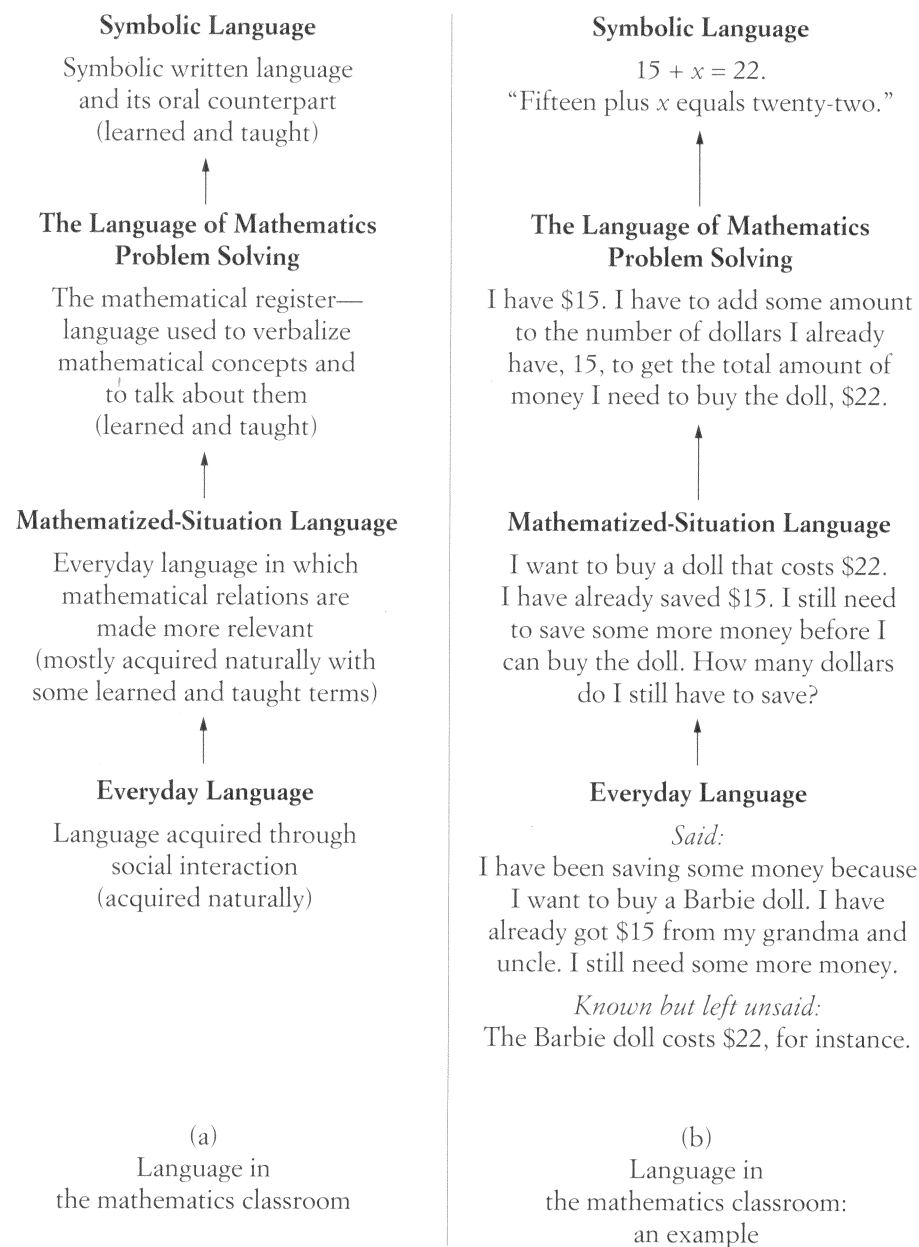
Symbolic Language

Symbolic written language
and its oral counterpart
(learned and taught)

↑

**The Language of Mathematics
Problem Solving**

The mathematical register—
language used to verbalize
mathematical concepts and
to talk about them
(learned and taught)

↑

Mathematized-Situation Language

Everyday language in which
mathematical relations are
made more relevant
(mostly acquired naturally with
some learned and taught terms)

↑

Everyday Language

Language acquired through
social interaction
(acquired naturally)

(a)
Language in
the mathematics classroom

Symbolic Language

$15 + x = 22.$
"Fifteen plus x equals twenty-two."

↑

**The Language of Mathematics
Problem Solving**

I have $15. I have to add some amount
to the number of dollars I already
have, 15, to get the total amount of
money I need to buy the doll, $22.

↑

Mathematized-Situation Language

I want to buy a doll that costs $22.
I have already saved $15. I still need
to save some more money before I
can buy the doll. How many dollars
do I still have to save?

↑

Everyday Language

Said:
I have been saving some money because
I want to buy a Barbie doll. I have
already got $15 from my grandma and
uncle. I still need some more money.

Known but left unsaid:
The Barbie doll costs $22, for instance.

(b)
Language in
the mathematics classroom:
an example

Fig. 4.1

In figure 4.1, the path toward symbolic mathematical language starts with the everyday language. Everyday language, the language the child has when she or he enters school, is used to create a mathematized-situation language in which mathematical relations are made more relevant. The mathematized language is basically a manipulation of the everyday language, and as such it shares many of its characteristics.

However, the mathematized language expresses relations that are not necessary or important in the everyday language. For instance, although the relation "having

more" is easily expressed in the everyday language, the relation "having more than" is not; to express that relation we use mathematized language. At this step, the language, is very similar to the everyday language, but the mathematical nature of the concepts in question becomes more relevant.

Consider, for instance, a situation in which a child is saving up money to buy a toy. Everyday language can be vague and ambiguous. In everyday language, we may not say how much the toy costs or how much money the child has already saved. In the mathematized situation language, the elements that are mathematically relevant—the amount needed to buy the toy, the amount already saved, and the relationship between the two amounts—are made explicit. In the elementary school, word problems are the best example of mathematized-situation language.

The mathematized-situation language is used in turn to build up the language of mathematics and the language of mathematics problem solving, the language in which mathematical concepts are expressed. This is the language in which the mathematical register is expressed; such language is learned, not casually acquired or picked up. The language of mathematics loses the ambiguity found in everyday language.

Mathematical terms that are common in the everyday language are redefined according to the mathematical properties of the construction or concept they express. For instance, what we call a circle in the everyday language may be redefined in mathematical terms as a circle, an ellipse, or an oval region or as none of the above, for example, a convex region. In the example of the child saving up to buy a toy, the mathematized-situation language is interpreted and "translated" into a problem-solving statement.

Ultimately, the language of mathematics is "translated" into the mathematical language of symbols and equations in written and spoken language. This is the most abstract level of language development and the one that most clearly requires conscious learning.

At each successive stage, the language is not so much absorbed naturally in normal use but becomes more consciously learned and the mathematical nature of the register becomes more relevant (see fig. 4.1). While building up this language, the child is constructing the meaning and concepts that that language is used to represent. The child is going from the informal, spontaneous mathematical concepts of the everyday language to the formal concepts of the language of mathematics (Vygotsky 1986). The mathematized language is the link between the two types of concepts, and the concepts expressed in this language can therefore be considered as "referenced" concepts, where the mathematics is still intimately linked to the everyday language of the child (Fuson et al. 1995).

The most important aspect of this model of the language of mathematics is that the everyday language the child brings from home along with the mathematized language the child is exposed to in class is the foundation of the language of mathematics. Without a strong development of the child's language skills, the language of mathematics can become meaningless.

Going from the everyday language, which is by nature vague and ambiguous, to the mathematical language, which is precise and unambiguous, can result in errors that generally stem from the misconception that mathematical symbolic language directly represents natural language and vice versa. Take, for example, Oscar, a first grader from El Salvador, who attends a Spanish-English speaking bilingual class in an inner-city school in Chicago.

In Oscar's classroom, children were expected to write in their mathematics journals every day. On a particular day, Oscar shared his journal entry which he read as follows:

Drawn on the blackboard	O O O O + O O O O
Written on the blackboard	4 + 4 + 8 =
Spoken	*"4 más 4 más, 8"* (4 plus 4 more, 8)

Oscar used the mathematical plus symbol (read in Spanish as *más*) to represent both the symbolic language term *más* (plus) and the everyday language term *más* (more) and therefore produced an incorrect equation. Oscar was, however, familiar enough with simple equations to know that he had to include the equals symbol, which he did by adding it at the end. Note that his rendering of the mathematical expression *4 más 4 más 8* lacks a verb when compared to the more accurate form *4 más 4 más son 8* (4 plus 4 more *are* 8).

Translating from natural language, be it the everyday language or the language of mathematics, to a symbolic mathematical expression is not easy even for adults. When translating the mathematized-situation expression "there are six times as many students as professors" into the symbolic language of equations, even university engineering students incorrectly used the equation $6S = P$ (where S is the number of students and P the number of professors) instead of the correct $S = 6P$ (Rosnick and Clement [1980]; Clement, Lochhead, and Monk [1981]; Kaput and Clement [1979]; and Rosnick [1981]).

That common mistake seems to come from incorrectly interpreting the equals symbol to mean "for every" (Cocking and Chipman 1988). Furthermore, the students are confusing the equation for a problem in which the situation is represented by "for every six students there is one professor" with the solution equation for a problem in which the equality between the two quantities is established, that is "the number of students equals six times the number of professors" (see also Fuson, Carroll, and Landis [1996] for more details on this topic).

THE BILINGUAL CLASSROOM

If dealing with one single language can produce such a complex system, it stands to reason that the system can get more complicated when two or more languages come into play. Whatever the ultimate reason, language-minority students lag behind monolingual students in their mathematics achievement, especially on word problems, in which language and mathematics are more intricately linked (Macnamara 1967; Cummins 1979, 1981; Cocking and Chipman 1988; Mestre 1988).

Bilingualism is sometimes used to refer to different degrees of competence in two languages. This is particularly true when taking into account the language of mathematics, since that language is largely taught in school and not usually acquired outside school. A bilingual person may have attained different degrees of bilingualism in the language of mathematics, as shown in figure 4.2.

In the example of a bilingual person, we have to take into account not only the knowledge, or lack thereof, of the language of mathematics in both the dominant language (L1) and the weaker language (L2) but also the degree of transference between the languages. For instance, a student may know how to count to ten in both English and Spanish and not be able to immediately translate the word for a number from English to Spanish, or vice versa.

Bilingual adults will usually be proficient in translating from the everyday language to symbolic mathematical language in the language in which they were schooled (the dominant language, or L1). The same cannot be said, however, for the weaker language, L2. In the second language, their mathematical knowledge could be sketchy. Although a bilingual adult will have a strong everyday language in L2, the mathematized-situation language may not be as well developed as in the dominant language. The knowledge of the language of mathematics problem solving and of symbolic language could be even weaker. To acquire true bilingualism in mathematics, a person has to study mathematics in both languages.

In the example of a Spanish-speaking child in the United States, the picture becomes more complex because the child still has to learn all the stages of the language of

mathematics in the language used in school. A Spanish-dominant child who is being taught in English may have the added difficulty of constructing the language of mathematics on a weak base of the everyday language in English. A teacher in this instance would have to provide more opportunities to improve and develop the child's second language in school.
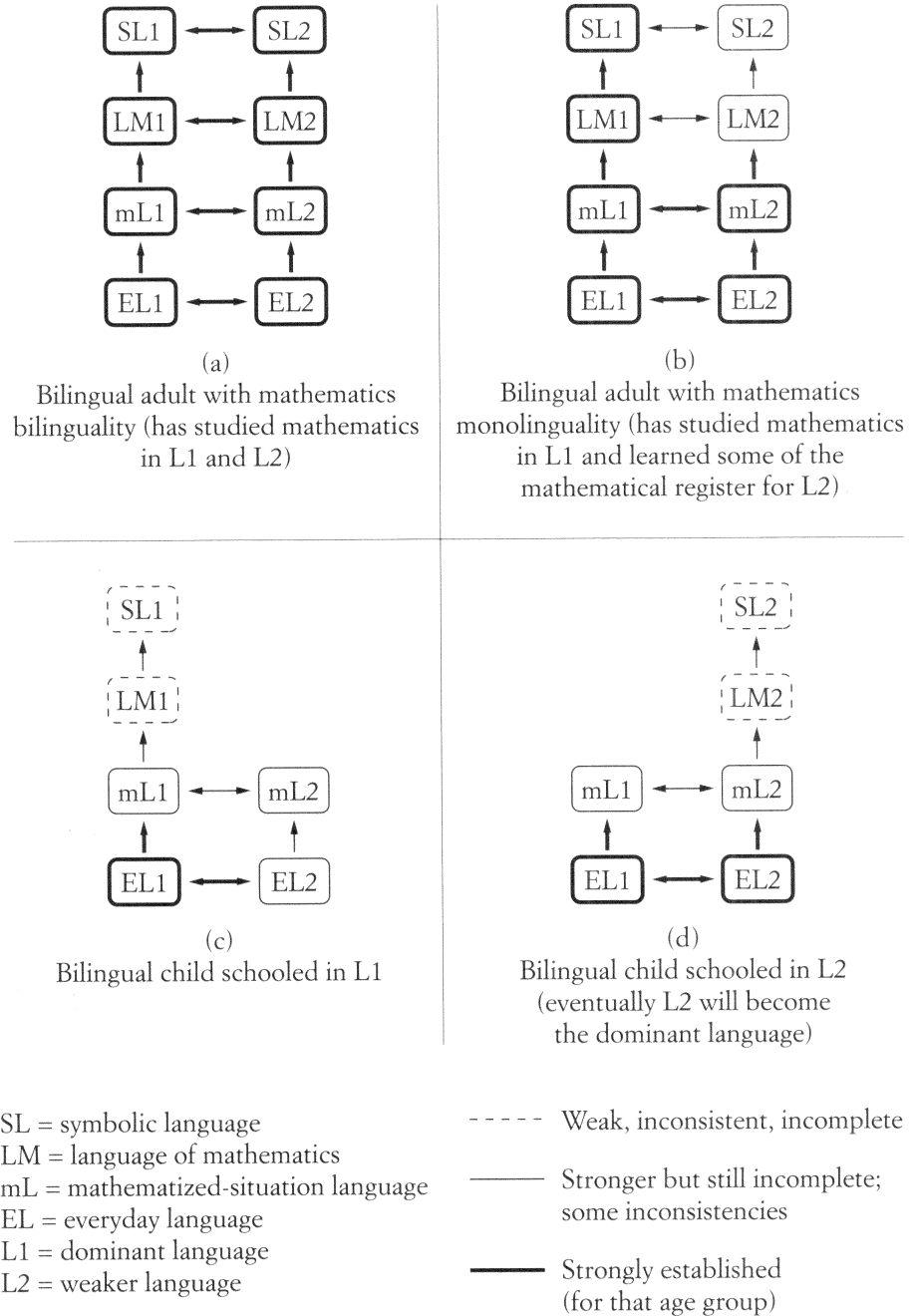
(a)
Bilingual adult with mathematics bilinguality (has studied mathematics in L1 and L2)

(b)
Bilingual adult with mathematics monolinguality (has studied mathematics in L1 and learned some of the mathematical register for L2)

(c)
Bilingual child schooled in L1

(d)
Bilingual child schooled in L2 (eventually L2 will become the dominant language)

SL = symbolic language
LM = language of mathematics
mL = mathematized-situation language
EL = everyday language
L1 = dominant language
L2 = weaker language

- - - - - Weak, inconsistent, incomplete

———— Stronger but still incomplete; some inconsistencies

■■■■ Strongly established (for that age group)

Fig. 4.2. Degrees of bilingualism and the language of mathematics

These different degrees of bilingualism can give rise to very different problems. A child may have a strong everyday language in his or her dominant language, for instance, Spanish, and a weaker everyday language in a second language, say, English, but he or she may still be schooled in the weaker language, English. That child may well have an everyday language in the weaker language that lacks even the most common elements of the mathematics register. Such an example is Dora, a bilingual, English-dominant third grader in an inner-city school in Chicago.

She attends an English-speaking class, but both English and Spanish are spoken at her home. She has volunteered to help in an after-school tutoring program and is working with two Spanish-speaking first graders. When working on word problems, she asks to use English, her dominant language. Because her students do not speak English, she is given the problems in both English and Spanish—English so that she can understand the problems and Spanish so that her students can understand them, too. After a short while, she asks if she can read the problems in Spanish but say the numbers in English. Although she has no problem using her everyday Spanish to communicate, she does not know all the number words in Spanish.

Even when a child learns the language of mathematics in both the dominant language, for instance, Spanish, and in the weaker language, English, the transfer, or translation, from one language to the other is not automatic. Carola is a Spanish-speaking third grader who attends an English-speaking class. When she is being interviewed on a variety of mathematical tasks, the interviewer offers her a choice of language to use and she chooses Spanish. Although Spanish is her dominant everyday language, she has an imperfect transference of the language of mathematics between the two languages. As illustrated below, English is progressively becoming her dominant language in the language of mathematics.

> *Interviewer:* ¿*Cuántos son 9 más 6?* (How much is 9 plus 6?)
>
> *Carola:* ¿*Cuál es* más—*plus or minus?* (What is *más*—plus or minus?)

In some instances, the transference can also produce errors in L1 that have their origin in errors in L2. Take the example of Freddy. As a Spanish-speaking kindergartner in a bilingual English-Spanish classroom, Freddy could easily count from 1 to 10 in both languages. However, if asked to translate a number from one language to the other, Freddy would have to count in the other language until that number was reached. He could not translate directly from L1 to L2, or vice versa.

When he moved on to first grade, Freddy was in a Spanish-speaking classroom. Although classified as one of the more advanced children in his class, he had trouble counting to 100. When asked to count by tens, he would very often make the typical English mistake of using the teen numbers instead of the decade numbers from 30 onward.

> *Freddy: Diez, veinte, trece, catorce, quince, dieciseis, diecisiete, dieciocho, diecinueve, veinte* (10, 20, 13, 14, 15, 16, 17, 18, 19, 20)

This mistake has a phonological basis in English because *thirteen* and *thirty* are very close in pronunciation from the perspective of Spanish speakers. In Spanish, teen numbers, however, are not similar in pronunciation to decade numbers; for instance, consider *trece* (thirteen) and *treinta* (thirty). Freddy's error in English can be explained only if we posit an L2 interference in the meaning of the numbers.

This interdependence of L1 and L2 at each stage of the development from the everyday language to the mathematical symbolic language is particularly important if we consider that in most bilingual programs in the United States, bilingual children are taught for a number of years in their dominant language before they are mainstreamed into English-speaking classes. Proficiency in the everyday language in L1 and L2 does not necessarily mean that mainstreaming is going to be successful unless the students attain a similar degree of proficiency in the language of mathematics in both languages.

WHAT CAN THE GRADES K–3 TEACHER DO?

The connection between language and mathematics for bilinguals, and even for monolinguals, has been recognized for a long time (Knight and Hargis [1977]; Morris [1975]; Cummins [1979, 1981]; Mestre [1988, 1989]; Cuevas [1984]; Saxe

[1988]; Spanos et al. [1988]; Khisty [1995], among others). Language issues in the elementary school classroom come across most clearly in solving word problems.

Word problems are a crucial element of mathematics instruction in the primary grades because they are used for developing analytical reasoning skills that children will need later on for algebra. Most of those problems, however, depict artificial situations that attempt to recreate real-world situations through language. In this sense, they must be considered primarily as texts that have to be interpreted and secondarily as problems that have to be solved.

In the primary grades, solving mathematical word problems often requires language learning before the child can interpret the problem and solve it. Children must go through a number of steps that are intimately connected to the different levels of development in the language of mathematics.

First, children have to understand the language in the word problem. Second, they have to interpret the mathematical relations in the problem so that they can understand what unknown quantity the problem asks about. Third, they have to find a way to identify that unknown quantity. That is, the children have to figure out how to make use of the mathematical relations to find a mathematical solution to the problem. At times, the children may be asked to go one step further and translate that solution procedure to the abstract symbols of a mathematical equation.

Language plays an important role at each of these three steps. All children enter school with an everyday language, or more than one such language if they are bilingual, that has not been formally taught but rather has been acquired effortlessly through social interaction before entering school. A teacher has to use the language that the child brings to the school to construct a mathematized language in which mathematical relations are made more relevant. That is the birthing ground from which the language of mathematics will emerge.

Teachers are then confronted with an enormous task: to teach the children the language before they can teach them the mathematics. To teach the language, teachers have to be able to manipulate it, to play with it; for the bilingual teacher that task can be overwhelming. We have to consider again the misconception of what it means to be bilingual in the mathematical domain. Mathematical concepts are abstractions that transfer from language to language.

For instance, if one grasps the concept of multiplication in L1, then one also grasps the concept of multiplication in L2. What may be missing is the language of multiplication in L2. For that reason, a Spanish-English bilingual teacher who has been schooled primarily in English can encounter a number of difficulties when teaching in Spanish. Those difficulties can hinder the learning process in the mathematics classroom.

For example, teachers may lack the appropriate mathematics register in the bilingual students' dominant language, and may even lack the necessary resources, such as appropriate textbooks, that could provide that register. Furthermore, teachers may not be able to exploit the linguistics characteristics of the children's dominant language or may not be aware of the language aspects that may confuse the children.

Even if a teacher is completely bilingual in the mathematics domain and therefore has all the elements of the mathematized language and the language of mathematics in both languages, that by itself does not guarantee academic success for the students. After all, just using the Spanish term for a mathematical concept does not ensure that the children are going to immediately understand that concept. Children have to experience mathematics before they can understand mathematics. Part of that experience comes from experimenting with language.

Children need to be involved in producing language, both oral and written; in understanding the meaning of language; and in taking advantage of the flexibility of language. Part of a teacher's job, then, is to ensure that children are exposed to multiple ways of expressing the same mathematical concept whenever the language allows for multiple expressions. A child with extensive experience with the mathematized

language is better prepared to deal with the language of mathematics and the mathematical concepts conveyed by that language than a child who lacks such experience (see Fuson, Hudson and Ron [forthcoming] and Lo Cicero and Fuson [1996] for ways to implement this language exploration in the teaching of word problems in the elementary school classroom).

Experience with mathematized language will greatly enhance a child's ability to interpret and solve a word problem correctly. In a sense, this means that children have to learn new applications for language. A teacher must then involve students in language experimentation, that is, exposing the children to mathematized language so that the language of mathematics and the concepts expressed by it are more accessible to the children.

What exactly do we mean by language experimentation? Let's take, for instance, a word problem involving a comparison. The comparison situation represented in figure 4.3 can be expressed in multiple ways, such as orally and graphically.

Everyday Language:
Rosa has seven peanuts.
Joshua has five peanuts.

Mathematized-Situation Language:
Rosa has more peanuts than Joshua.
   How many more?
Joshua has fewer peanuts than Rosa.
   How many fewer?
How many extra peanuts does Rosa have?

How many peanuts extra does Rosa have?
How many peanuts does Rosa have to eat to
   have as many as Joshua?
How many peanuts does Rosa have to eat to
   have the same number of peanuts that
   Joshua has?
How many peanuts does Joshua have to buy
   to have as many as Rosa?
How many peanuts does Joshua have to buy
   to have the same number of peanuts that
   Rosa has?
How many more peanuts does Rosa have
   than Joshua?
How many fewer peanuts does Joshua have
   than Rosa?

Everyday Language:
Rosa tiene siete cacahuates.
Joshua teine cinco.

Mathematized-Situation Language:
Rosa tiene más cacahuates que Joshua.
   ¿Cuántos más?
Joshua tiene menos cacahuates que Rosa.
   ¿Cuántos menos?
¿Cuántos cacahuates más que Joshua tiene
   Rosa?
¿Cuántos cacahuates extra tiene Rosa?
¿Cuántos cacahuates de más tiene Rosa?
¿Cuántos cacahuates le sobran a Rosa?
¿Cuántos cacahuates de menos tiene
   Joshua?
¿Cuántos cacahuates menos que Rosa tiene
   Joshua?
¿Cuántos cacahuates le faltan a Joshua?
¿Cuántos cacahuates tiene que comerse
   Rosa para tener tantos como Joshua?
¿Cuántos cacahuates tiene que comerse
   Rosa para tener la misma cantidad que
   tiene Joshua?
¿Cuántos cacahuates más tiene que comprar
   Joshua para tener tantos como Rosa?
¿Cuántos cacahuates más tiene que comprar
   Joshua para tener la misma cantidad que
   tiene Rosa?

The Language of Mathematics
   Problem Solving:
What is the difference between Joshua's
   peanuts and Rosa's?
If we compare Joshua's and Rosa's peanuts,
   who has more? How many more?

How many more peanuts does Joshua need
   to catch up to Rosa?

The Language of Mathematics
   Problem Solving:
¿Cuál es la diferencia entre los cacahuates
   que tiene Joshua y los que tiene Rosa?
Si comparamos los cacahuates de Rosa y los
   de Joshua, ¿quién tiene más?, ¿cuántos
   más?
¿Cuántos cacahuates necesita quitarle
   Joshua a Rosa para que los dos tengan la
   misma cantidad?

Fig. 4.3. Exploring language: an example from matching word problems

Children can be asked to "say" the problem in one way, then in a different way, and so on. In classrooms where both English and Spanish are spoken, the aim should be not a literal translation of the problem into the other language, since some expressions

have no clear equivalent in the other language, but rather different ways to express the same situation in both languages. In a word problem involving a comparison, a teacher could explore alternatives similar to those shown in figure 4.3. The sentences in this example are not translations but different ways to express the same comparison situation in the two languages.

After children have experimented with the language of comparison, they should be able to interpret these problems correctly. In addition, this experimentation, along with a graphic representation of the problem, allows a child to posit possible solution procedures for the problem of "how many more peanuts does Joshua need to catch up to Rosa?"

CONCLUSION

It is important to understand that language issues in the monolingual classroom offer insights into the bilingual situation. A bilingual child who is being schooled in a language other than his or her dominant language will face more linguistic challenges than those experienced by the monolingual student who speaks the language of instruction. A weak everyday and mathematized language can result in increased difficulty in learning the language of mathematics and therefore in the child's mathematical ability. Bilingual children may need more opportunities to explore the languages involved for the simple reasons that (a) they are using more than one everyday or mathematized language and (b) the transference between L1 and L2 is not automatic.

In situations like these, a teacher who wants to improve language skills among her students is forced to take on the role of language expert and sometimes even of translator. It is clear that bilingual teachers have professional needs that go beyond the need of good materials published in the language of instruction. Those professional needs must be met in order to enable those teachers to prepare their students better for academic success. In particular, bilingual teachers need to have access to (a) a knowledge base about the linguistic characteristics of the language(s) of the classroom that may facilitate or hinder mathematics understanding; (b) techniques for using the mathematized language, which is the building block that links the everyday language to the language of mathematics; and (c) knowledge about cultural practices and issues that may affect the understanding of mathematics.

The model proposed in this article has an important consequence for bilingual teachers or teacher's aides who lack bilinguality in mathematics. Given that the language of mathematics is learned mostly in school and not acquired naturally, a teacher who does not have this specialized register needs to make a conscious effort to learn it. The mathematical concepts that the teacher already understands will transfer from one language to the other. The "new" learned language will enhance the teacher's ability to teach bilingual children.

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