



## Mathematics Learning and the Latino Student: Suggestions from Research for Classroom Practice

**T**he mathematics learning—and overall academic achievement—of Latino children is still a major concern of educators across the country. As we think about the educational issues surrounding Latinos, we need to take into account factors related both to learning in two languages and to learning English as a second language (ESL). A major characteristic of the majority of Latino children is their affiliation with Spanish regardless of their proficiency in that language. Even a child who may not seem to be proficient in speaking Spanish may come from a home or community in which Spanish is spoken extensively. Thus, the child's environment is bilingual, which has a profound influence on his or her experiences, perceptions, and knowledge base. The challenge for mathematics educators is to understand and posi-

tively use the linguistic strengths and experiences that children bring to school.

The purpose of this article is to highlight important ideas from current research on the learning of Latinos that provide insights into classroom practices. These ideas are drawn from research in both bilingual and ESL education and mathematics education. In the sections that follow, I present what I believe to be the most fundamental and important elements related to creating effective mathematics learning environments for Latino second-language learners (SLLs). Furthermore, in my professional development work over the last two decades with teachers of mathematics who have significant numbers of Latino students in their classrooms, I have found these ideas to be the most relevant—and the most overlooked. Note, however, that this discussion touches only “the tip of the iceberg” of what is known about effective instruction for SLLs, of which Spanish speakers make up the largest group; the reader is encouraged to refer directly to works cited and to look further into bilingual and ESL professional development opportunities.

### Redirecting Our Thinking

Effective instruction for Latino SLLs in mathematics requires that we reconsider the fundamental assumptions that guide our instruction. In classroom-based studies of effective teachers of mathe-

Lena Licón Khisty

*Lena Licón Khisty, llkhisty@uic.edu, teaches in the College of Education at the University of Illinois at Chicago, Chicago, IL 60607. Her areas of interest include discourse processes and the development of meaning in mathematics, particularly in multilingual contexts; teacher development in mathematics; and issues equity for diverse students.*

*Edited by Carol Langbort, clangbo@sfsu.edu, Department of Elementary Education, San Francisco State University, San Francisco, CA 94132. Readers are encouraged to send manuscripts appropriate for this section to “Research, Reflection, Practice,” NCTM, 1906 Association Drive, Reston, VA 20191-1502.*



matics with Latinos (for example, Khisty, McLeod, and Bertilson [1990]; Khisty and Viego [1999]; Khisty 2001), one of the factors that differentiates these teachers from others is that their mode of thinking about their students is different. These teachers' assumptions about students differ in two ways. First, they genuinely believe that their students are capable of advanced work in mathematics regardless of the students' current educational status or home background. These teachers operate on the assumption that poor social and economic statuses are political disadvantages, not educational deficits. This assumption is clearly manifested in the curriculum they provide for their students. For example, Chval (2001) describes one fifth-grade teacher who began the school year with a study of right triangles and used this exploration as a problem-solving theme all year long. In this class, which was entirely Latino, students used calculators to solve complex problems and frequently wrote long mathematical explanations about their understanding of geometric figures and their strategies to solve problems. To some observers, this work seemed like that of a gifted class. In fact, some students in this class began the school year as much as two levels below grade, but all finished the year at or above grade level. In other words, some students, including some designated for special

education, actually gained as much as two to three grade levels in one year (Chval 2001).

In my own informal observations of classrooms, most Latino students are not exposed to such a rich and challenging mathematics curriculum. This observation is consistent with the work of other researchers (see, for example, Knapp [1995]), yet we know that teaching advanced academic subjects to underachieving students is possible (e.g., Knapp [1995]). The question of why we do not see many more classrooms similar to the one noted above is puzzling. Myths about the relationship among poverty, linguistic diversity, and academic ability prevail and may actually inhibit students' learning. Too often, the idea of "beginning where the students are" is misinterpreted as a need to emphasize remedial work instead of focusing instruction on students' thinking and experiences. Too much concern for students may also lead teachers away from challenging them as a way of protecting students from feeling defeated in schoolwork.

The second assumption relates to teachers' understanding of the different aspects of proficiency in a second language. Cummins (1989) early on argued that language proficiency has two dimensions: basic interpersonal (what is used in social conversation) and cognitive academic (what is used for schoolwork). Failure to recognize these two dimensions accounts for misinterpretations of students' actual abilities in the second language. In essence, the assumption that a student who can adequately use the second language, English in this discussion, in a social context can function just as well with the academic language that is found in textbooks and general learning activities is erroneous. In the social context, many cues, such as gestures, expressions, and so on, aid comprehension; in academic work, meanings are obtained mostly through words. Moreover, researchers (such as Collier [1989]) have found that the development of the academic language takes five to seven years and requires deliberate instruction. In other words, gaining proficiency in English to read texts and to write academically takes much longer than the traditional two to three years that most teachers allow, and such proficiency cannot just be "picked up."

The teachers I have studied, both bilingual and English-only speakers, were always cognizant that their students were learning in a second language and still developing their academic profi-

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ciency, regardless of grade level. Thus, the teachers combined knowledge of bilingual and second-language acquisition theory and practice with principles of reformed mathematics teaching. Mathematics was used as a context to teach English; at the same time, mathematics was taught as a subject that is itself full of language, including its own expressions (including symbolic representations) and mode of writing. The teachers did not avoid the difficulties that mathematical language presented but used them as a vehicle to extend and strengthen students' language proficiencies and subject understanding. The assumption was that students could learn both the language and the content with appropriate instructional supports. Clearly, we need to identify some of those instructional supports. The following section highlights a few of them.

## Making Instruction Comprehensible

If we assume that Latino students are still developing their proficiency in the academic dimension of English, then our attention is directed toward

strategies that ensure that instruction in the second language is as comprehensible as possible. We must take steps to make sure that what students hear is unambiguous. These strategies do not require additional time and can be part of the regular instructional routine.

The most important idea to keep in mind is that listening is the weakest academic language skill for SLLs. Teachers can address this deficiency by minimizing the requirement for students to learn by listening only.

This strategy can be accomplished in a variety of ways, including:

- Write words on an overhead projector or on the board as they are spoken or point to words in a prepared written text as it is delivered.
- Always contextualize instruction through the use of models, real objects, drawings, and other visual aids.
- Have students physically act out problems or concepts. I observed one teacher who had students walk around and touch the perimeters and areas of various items with their hands.

The effective teachers that I have studied are also conscious of their speech (see, for example, Khisty,

McLeod, and Bertilson [1990]) and use multiple strategies identified by Krashen (1982) to ensure clarity. For example, they enunciate clearly and delineate distinct word boundaries so that the sounds of words do not run together, they use tone of voice to emphasize key words, they use simpler sentence structures, and they avoid ambiguous pronouns. For many more useful strategies, I recommend the work by Echevarria and her colleagues (2000).

## Pedagogic Talk

To acquire the target language, SLLs need opportunities to hear it. In the classroom, the most important model of academic language and its meanings is the teacher. Chval (2001) found that the teacher's mathematical speech became what students acquired as part of their own spoken and written language. The teacher in this study, along with others I have observed, used both spoken and written questions and statements as tools for teaching. These teachers all recognized that their students had thoughts about what they were learning but did not have words to describe those thoughts. Their task was to give the students the means to express their thoughts. Consequently, the teachers' talk was very deliberate but not unnatural. Chval and Khisty (2001) describe a teacher of fifth graders who used the word *congruent* more than forty times in one lesson but not in a repetitive manner. In the following excerpt, we see a glimpse of how *congruent* is brought into the students' repertoire of language:

*Teacher.* I have two congruent triangles here—two equal parts, two exact triangles. I want only the area of my original triangle, *ACB*... [Several teacher and student exchanges occur.] Would you please read that, Julia?

*Julia.* The triangle and its [long pause] . . .

*Teacher.* Congruent.

*Julia.* [Struggling] around . . . con . . . con . . . congruent.

*Teacher.* Look at that word, everyone. *Congruent*. What does that mean? [Students offer explanations that the teacher incorporates into her lesson. After several exchanges, the teacher picks up the discussion.] They appear to be congruent to each other. I agree. They appear to be congruent. But this one and this are not congruent, are they?

This short excerpt suggests that a teacher's speech serves two purposes. One is to guide students' thinking and the other is to provide a model that shows how to use the second language for mathematics. Teachers must become skillful at

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using language to achieve these two purposes while balancing teacher talk with opportunities for students to talk.

## Conclusions

Current research shows that culturally and linguistically sensitive learning environments are essential to Latinos' success in mathematics and that teachers' speech is important in cultivating these environments. To create such environments, we must integrate principles of effective instruction for SLLs with mathematics teaching. This article has touched on only a few fundamental ideas. For additional information on the principles of effective instruction for SLLs, the reader may want to explore the Web site for the Center for Applied Linguistics at [www.cal.org](http://www.cal.org).

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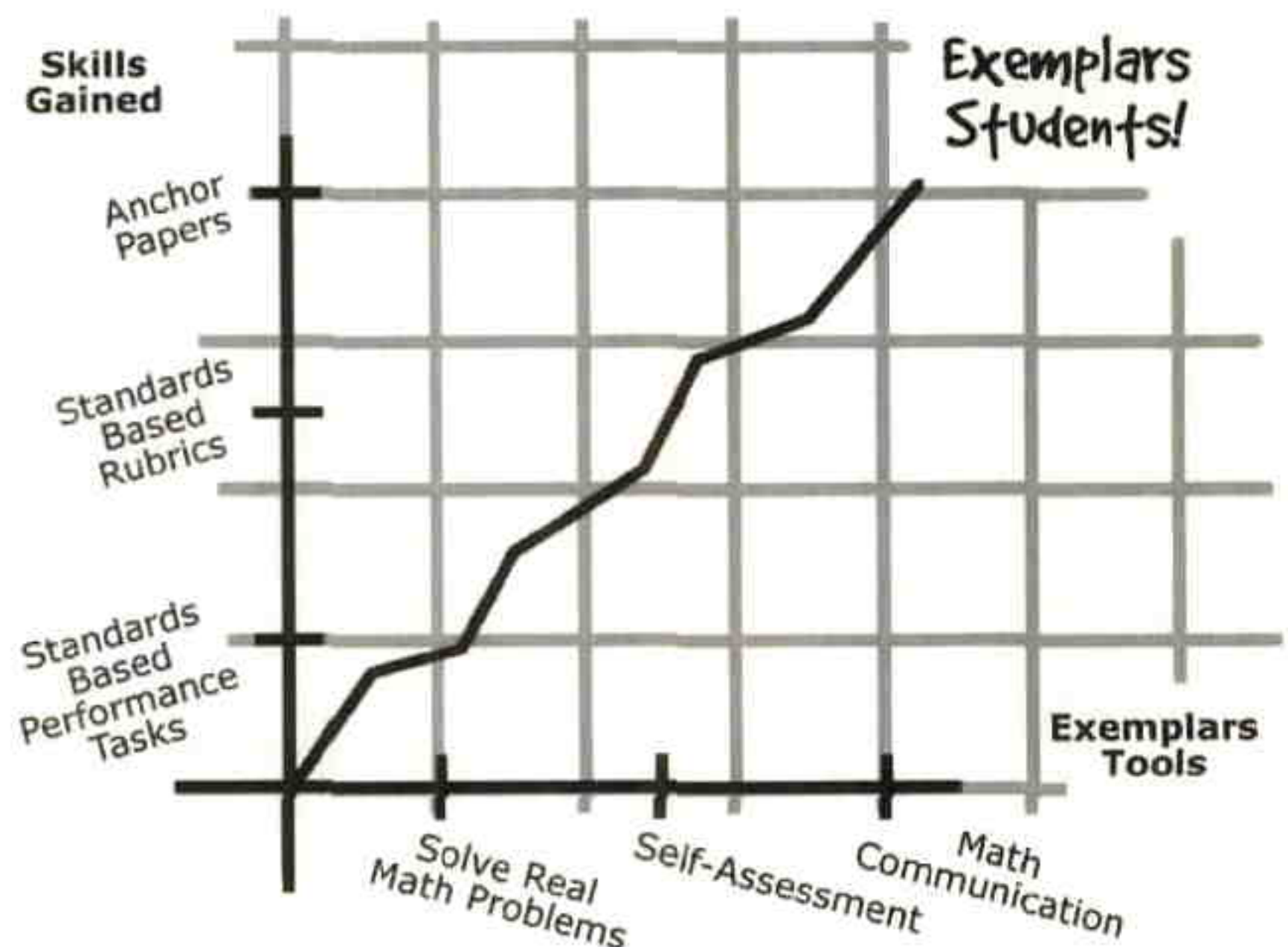
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