



# Examining Storylines of Emergent Bilinguals in Algebra Textbooks

Zandra de Araujo, Erin Smith, and Amy Dwiggin

University of Missouri-Columbia

• Cambio Center

• October 2018

Textbooks tend to dictate what is taught in mathematics classrooms, particularly at the secondary level (Kloosterman & Walcott, 2010). In addition to providing student activities, the teacher's edition of a textbook, also called the teacher's guide, is meant to be educative. That is to say, teacher's guides aim to support teachers in effectively enacting the curriculum. Commonly, teacher's guides do so by providing pedagogical suggestions as well as unpacking the motivation behind particular exercises.

For example, in Glencoe's Algebra Teacher's Guide there are recommendations, such as creating vocabulary flashcards, to help teachers facilitate students' acquisition of mathematical vocabulary.



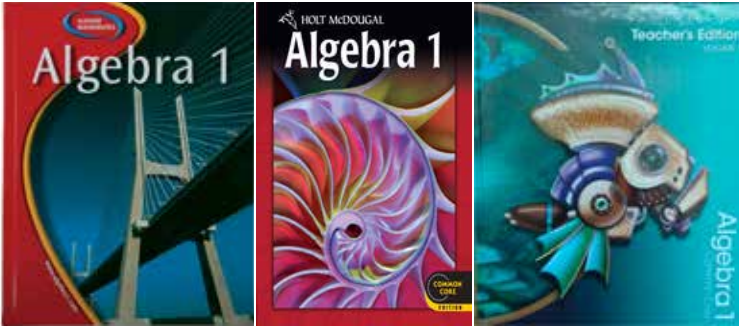
In the past decade, public school funding has largely remained stagnant or declined (Leachman, Albares, Masterson, & Wallace, 2016). As districts reallocate funds to keep schools running, administrators often decrease funds for professional development. Thus, teachers are forced to seek out their own professional development or rely on existing resources such as teacher's guides. Furthermore, in areas, such as Missouri, with small numbers of English learners (ELs), professional development for teaching ELs is often not given precedence over more pressing needs such as literacy. Thus, teachers may turn to resources such as their teacher's guides to learn how to better accommodate ELs in their classrooms.

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*Suggested citation:* de Araujo, Z., Smith, E., and Dwiggin, A. (2018). Examining Storylines of Emergent Bilinguals in Algebra Textbooks. *Cambio Center eBrief*. University of Missouri, Columbia, Missouri.

## Examination of High School Algebra Textbooks

The purpose of our study was to examine the resources and suggested pedagogical strategies provided in high school algebra teacher's guides. In particular, we wanted to understand how the resources and pedagogy aligned, or not, with those provided in mathematics education research.



We chose three high school algebra textbooks from major publication houses (Glencoe, Holt-McDougall, and Pearson, pictured respectively to the left). The decision to focus on algebra was due to its position as a “gatekeeper for [U.S.] citizenship” (Moses & Cobb, 2001, p. 14).

1. First, we compiled the list of resources the textbooks marketed specifically for ELs.
2. We then noted whether each resource was available in the teacher's guide or in a supplemental resource book or software program.
3. In addition, we noted whether the resources were meant for teacher or student consumption.
4. Finally, when applicable, we noted whether the resource was also tagged for other populations, such as struggling or advanced learners.

While examining the textbooks, we kept in mind that **stereotypes of mathematical learners often permeate society through storylines (or narratives) that maintain the status of whiteness** (Nasir, 2016). Stereotypes typically reserved for emergent bilinguals (EBs) include an ill-preparedness for school mathematics instruction and a need of remediation and support. When these storylines manifest in the classroom, they impact EBs' access to high-quality mathematics instruction, the availability of mathematical identities, and reify a marginalized status (Battey & Leyva, 2016; de Araujo, Smith, & Sakow, 2016). To understand the storylines of ELs exhibited in curriculum resources, **we used positioning theory** (Harré & van Langenhove, 1999) **to examine the instructional supports of the three high school algebra textbook teacher's guides.**

Teaching Tip **Reading Math** The words *gradient*, *slant*, and *incline* have meanings similar to *slope*. ENGLISH LANGUAGE LEARNERS

Teaching Tip **Reading Math** Point out that the word *linear* includes the word *line*. ENGLISH LANGUAGE LEARNERS



## Findings

We found that the majority of resources were intended for student use. Moreover, most of these resources were not in the main student textbook, but rather in separate workbooks or software programs. One of the more striking aspects of this initial investigation was that the resources tagged as EL-specific were often suggested for use with struggling learners and seldom suggested for advanced students. This suggested the authors viewed the mathematical capabilities of ELs as below grade level. As might be expected, many of the student resources focused on vocabulary support.

In addition, the mathematical activities provided in the supplemental materials included a high proportion of low cognitive demand tasks (e.g., repetitive, skill-based exercises) and lacked opportunities for ELs to engage in problem solving and the mathematical practices. This counters research that suggest ELs must be provided opportunities to engage in cognitively demanding mathematics tasks (see Table 1).

Once we summarized the types of resources and their availability, we looked more closely at the resources specifically intended for teachers. These resources were in the form of pedagogical notes found in the margins of the teacher's editions. Some of these notes were aligned with research, such as connecting to prior knowledge (Secada & De La Cruz, 1996), however a number of the notes simply emphasized the need for teachers to frontload vocabulary and provide remediation.

In light of our findings, we suggest there is great need for the provision of research-based professional development to help teachers teach mathematics with ELs. These resources must go beyond vocabulary and avoid perpetuating deficit notions of ELs' mathematical capabilities. Researchers should work to provide open access resources for teachers as teachers have limited financial resources to seek out quality professional development in this area.



**Table 1: Recommendations for Teaching English Learners: Teacher’s Guides vs Research**

Assumptions of ELs in Teacher’s Guides	Recommendations for Teaching ELs from Research in the Field
<ul style="list-style-type: none"> <li>• Can’t handle challenging mathematics tasks (i.e., enrichment)</li> <li>• Require remediation</li> <li>• Can’t engage in reasoning and sense-making</li> </ul>	<ul style="list-style-type: none"> <li>• Provide challenging mathematics tasks</li> <li>• Provide resources as needed (including challenge)</li> </ul>
<ul style="list-style-type: none"> <li>• Shouldn’t be expected to engage in productive mathematical communication</li> <li>• Lack mathematical vocabulary</li> </ul>	<ul style="list-style-type: none"> <li>• Focus on academic language</li> <li>• Develop vocabulary through mathematical activity (don’t frontload)</li> </ul>
<ul style="list-style-type: none"> <li>• Are fluent in L1</li> </ul>	<ul style="list-style-type: none"> <li>• Allow ELLs to use their first language as a resource</li> <li>• Allow students to collaborate with others of the same language</li> </ul>

**References**

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Kloosterman, P., & Walcott, C. (2010). What we teach is what students learn: Evidence from national assessment. In B. Reys & R. E. Reys (Eds.), *Mathematics curriculum: Issues, trends, and future directions* (pp. 89–102). Reston, VA: National Council of Teachers of Mathematics.

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Secada, W. G., & De La Cruz, Y. (1996). Teaching mathematics for understanding to bilingual students. In J. LeBlanc Flores (Ed.), *Children of la frontera: Binational efforts to serve Mexican migrant and immigrant children* (pp. 285–308). Charleston, WV: ERIC Clearinghouse on Rural Education & Small Schools.

**Zandra de Araujo**

University of Missouri  
[dearaujoz@missouri.edu](mailto:dearaujoz@missouri.edu)



**Erin Smith**

University of Missouri  
[emsxh3@mail.missouri.edu](mailto:emsxh3@mail.missouri.edu)



**Amy Dwiggin**

University of Missouri  
[add39c@mail.missouri.edu](mailto:add39c@mail.missouri.edu)

