

Mathematics Teachers' Perceptions of Their Instructional Materials for English Learners: Results from a National Survey

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Abstract

This paper presents results from a national survey of 1,084 K-12 mathematics teachers focused on teachers' use of curriculum materials to meet the needs of multilingual learners classified as English learners. The results show (a) Elementary teachers were most likely to use the school or district-recommended instructional materials, (b) Most teachers assessed their materials as adequately addressing mathematics standards, and (c) The majority of teachers in this sample did not judge their materials as culturally or linguistically appropriate for their students who were classified as English learners. This work implies that additional curriculum development efforts are needed to develop instructional materials that are responsive to research-based recommendations for teaching multilingual learners.

Objectives

At the school and classroom levels, mathematics instructional materials such as textbooks and curriculum guides are one key element of the environment that shapes the quality of teaching and learning (Ball & Cohen, 1996). Researchers have found a correlation between student achievement and mathematics teachers' use of high-quality, standards-aligned instructional materials (e.g., Koedel et al., 2017; Reys et al., 2003). Despite the potential of instructional materials as a tool for the improvement of educational outcomes, there is a gap between research-backed guidance for teaching multilingual learners¹, and the “suggestions for teaching English learners” that appear in mathematics textbooks. De Araujo and Smith found that most guidance for teaching English learners in the most commonly used algebra textbooks in US schools was rooted in deficit orientations to students and focused on remediation (de Araujo & Smith, 2021). More broadly, we know that students who are classified as English learners and students who are minoritized due to their language are often denied opportunities to learn grade-level content in mathematics (Callahan, 2005; Kanno & Kangas, 2014). The lack of alignment between research-backed practices for supporting multilingual students and the guidance provided in instructional materials is one contributing factor to the inequitable mathematics learning outcomes for students who are classified as English learners.

In one survey that used a nationally representative sample of teachers, the majority of respondents reported that they were satisfied with their instructional materials for meeting the needs of English learners. However, teachers in the sample who taught classes with more than 10% ELs also reported modifying their instructional materials to meet the needs of their students (Prado Tuma et al., 2021). Given the seemingly contradictory results from Prado Tuma et al.'s survey—teachers reported their materials were satisfactory for teaching ELs AND

¹ We “multilingual learners” as an asset-based description of the focal students of this research. We use “English learners” when it aligns with the official descriptions of students or when that is the language used in prior research studies.

teachers of ELs modified their materials—there is a need for additional research that can provide insight to understand how teachers of multilingual learners use instructional materials and how they design learning experiences for multilingual learners.

In this paper, we present results from a national survey of 1,084 K-12 mathematics teachers who worked in school districts in which more than 10% of students were classified as English Learners. Our survey focused on the teachers' impressions of the quality of their mathematics instructional materials for teaching multilingual learners using a research-based framework for the survey question design. In the discussion we consider the empirical results in light of research on high leverage practices for teaching multilingual learners. The empirical question we answer are

Research Questions

- 1) What are the strengths of materials for teaching multilingual learners who are classified as English learners as reported by the teachers?
- 2) What are the areas of weakness in the materials for teaching multilingual learners who are classified as English learners as reported by the teachers?

Theoretical Background and Prior Research

The survey deployed in this work was developed using the *Guidelines for Improving Math Materials for English Learners* published by the English Learners Success Forum (ELSF, 2023) as a framework. The ELSF guidelines were developed in consultation with scholars in the content areas and in multilingual education who use asset-based sociocultural perspectives on designing mathematics instructional materials for multilingual learners (ELSF, 2023). For example, one of the explicit foci of the ELSF guidelines is providing opportunities for students to develop mathematics and language together through engaging in disciplinary practices. This focus in the ELSF guidelines emerged from Moschkovich's recommendations and framework for developing academic literacy in mathematics (Moschkovich, 2015). Similarly, the ELSF

guidelines suggest that mathematics problems posed in real life contexts should be used to support student reasoning, and students should be supported to understand contexts. This is an insight from Chval's work in this area (Chval et al., 2014). Throughout the guidelines is an asset-based orientation to teaching mathematics to students who are designated English Learners, and students' primary language(s) and home-based knowledge is regarded as an asset.

Methods and Data Sources

We developed a survey to capture (a) what materials teachers use, (b) how teachers use instructional materials in combination with supplementary materials, and (c) how teachers rate the effectiveness of their materials for teaching multilingual learners who are classified as English learners. The survey was developed by a team of researchers and pilot tested through think aloud interviews with a convenience sample of teachers who worked with multilingual learners. While Prado Tuma et al.'s (2021) survey was about curriculum in general, in this survey we focused specifically on how teachers use their materials for teaching multilingual learners. The part of the survey focused on teachers' instructional materials homed in on the five main focus areas from ELSF's guidelines: (a) Interdependence of mathematical content, practices, and language, (b) Scaffolding and supports for simultaneous development of mathematics and language, (c) Developing mathematical rigor in and through language, (d) Leveraging students' assets, and (e) Assessing mathematics content, practices, and language.

The survey was deployed using the RAND American Educator Panels (AEP) to reach a nationally representative sample of teachers. The AEP administrators sampled the population of teachers working in school districts where at least 10% of students are classified as English Learners. The 10% threshold was chosen because English Learners comprise approximately 10% of all students in K-12 schools (National Center for Education Statistics, 2023). Thus, we focused on teachers who worked in school districts where the proportion of students classified as ELs was at or above the national proportion of students classified as ELs.

Teachers were asked to respond to the survey by focusing on either mathematics or language arts materials. The survey received 2,558 complete responses, of which 1084 focused on mathematics. In what follows we focus on results from the 1,084 teachers who reported on their mathematics materials. Table 1 shows the number of teachers who responded to the survey about their mathematics materials, sorted by the grade-level band.

Table 1. Number of Responses by grade band

	Elementary (K-5)	Middle School (6-8)	High School (9-12)	Multiple Grades / Specialists
Number of Responses	493	265	272	54

We primarily present proportions of responses to the survey questions. The survey also included open-ended responses where teachers could elaborate on their answers to the selected response questions. In order to give voice to respondents, we also provide select open-ended responses from the teachers. The proportions we present are based on all of the data and weighted using the weights provided by AEP. The open-ended responses are illustrative rather than representative of the sample.

Results

An important prerequisite to understanding teachers' use of instructional materials is to know what materials teachers are using for their daily teaching. The majority of teachers at the high school level reported that they *do not use* their school or district-recommended instructional materials as their primary instructional materials, or they did not have recommended materials. Conversely, most elementary teachers reported using their school or district-provided instructional materials. Figure 1 shows the distribution of responses to the question "Do you use

your school or district’s recommended instructional materials as your primary instructional materials, i.e., the instructional materials that you use most frequently in your class?”

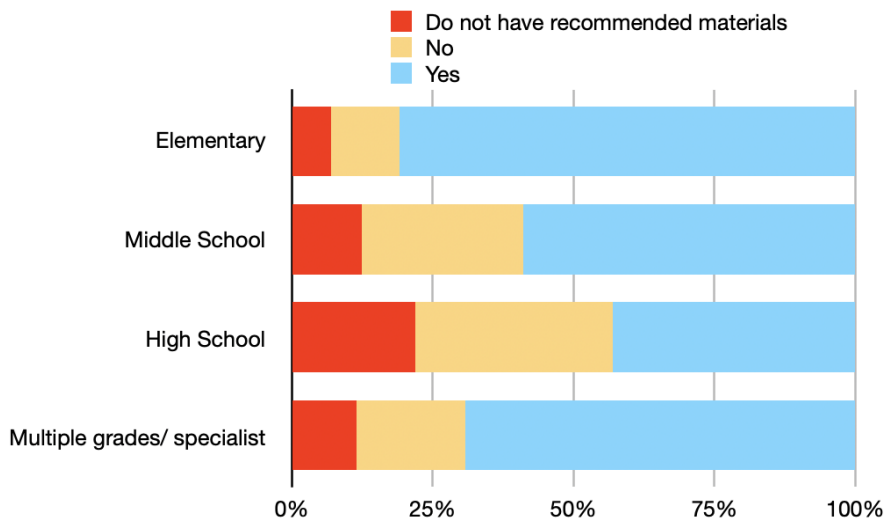


Figure 1. Teachers use of instructional materials from their district or school.

The open-ended responses on the survey helped illuminate why many teachers choose to not use the school- or district-recommended materials. For example a first grade teacher from Texas wrote “I use the district provided materials sometimes, but it isn’t my primary material. I prefer materials that my team and I make because they are better suited to the teaching of my particular students.”

Teachers Reported that Instructional Materials were Aligned with Grade Level Standards

One strength of materials that this survey found was that the majority of the mathematics teachers reported that their instructional materials were aligned with grade level content standards. In particular, one block of questions on the survey asked teachers to rate the extent to which their materials, *inter alia*, aligned with grade level standards, supported math language development, and helped promote grade-level procedural skills. In this block of questions over

50% of the teachers reported their mathematics materials did meet these goals either to a “moderate extent” or “to a great extent.” Figure 2 shows the proportions by question.

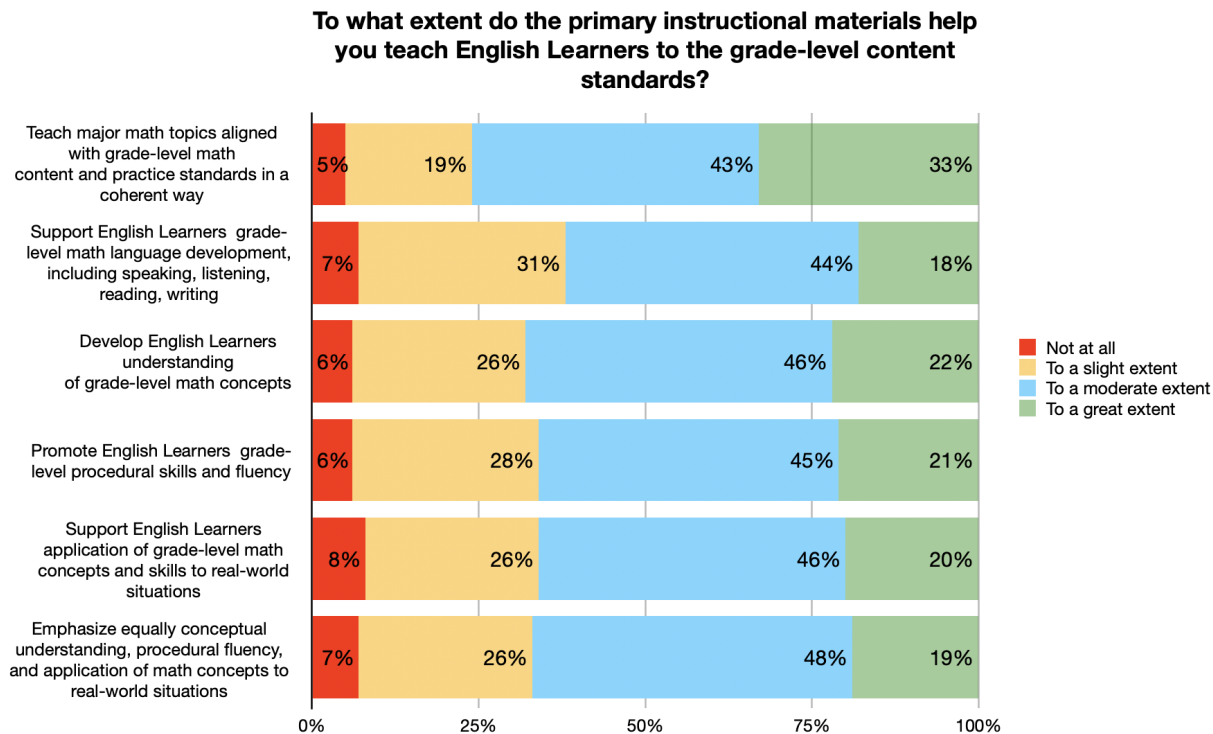


Figure 2. Proportions of responses for standards aligned mathematics materials.

This area of strength may indicate that the push to align teachers’ curriculum and instruction with state and national grade level standards over the past two decades has borne results. For policy makers and educational leaders who view instructional materials as a possible lever of reform (Ball & Cohen, 1996), this result indicates that standards based reforms have made inroads in the instructional materials used by teachers of multilingual students.

Teachers Noted Two Major Areas of Weaknesses: Cultural Relevance and Assessment

One area of weakness that emerged in this survey was the extent to which teachers judged that their instructional materials were “relevant” for their multilingual students. This series of questions related to the ELSF guidelines focus on leveraging students’ assets. In this block of

questions response patterns indicated that their materials did not “connect math concepts to ELs' lived experiences and cultures” and their materials did not “build upon students' home language(s) or informal ways of talking” to develop math concepts (Figure 3).

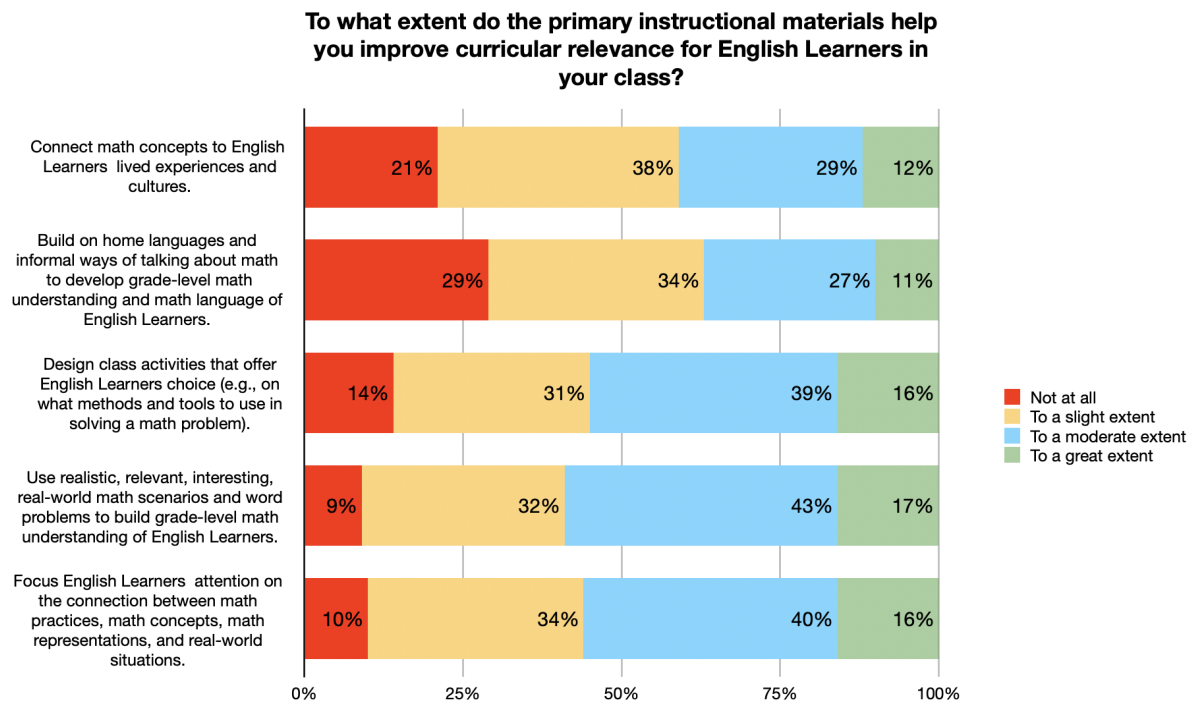


Figure 3. Proportions of responses for curricular relevance of mathematics materials.

Some of the respondents held very strong feelings about curricular relevance, expressed in their open-ended responses. For example, an eighth grade mathematics teacher from Florida wrote “There are absolutely no relevant cultural connections made in these textbooks - not for any culture.” Relatedly, and offering a possible solution, a second grade teacher in Georgia wrote “I believe teachers need to be trained on cultural relevance in the classroom. They need to see the importance of connecting the home life with school life.”

The second area of weakness that teachers identified in this survey was in the focus area of assessment. For example, 55% of the mathematics teachers in this survey judged that their instructional materials were not well-developed to “provide consistent feedback strategies to promote English Learners’ math writing over time.” For all of the other questions in the

section on assessment, over 40% of the teachers rated their instructional materials as lacking, responding either “not at all” or “to a slight extent” for each question in this block (Figure 4).

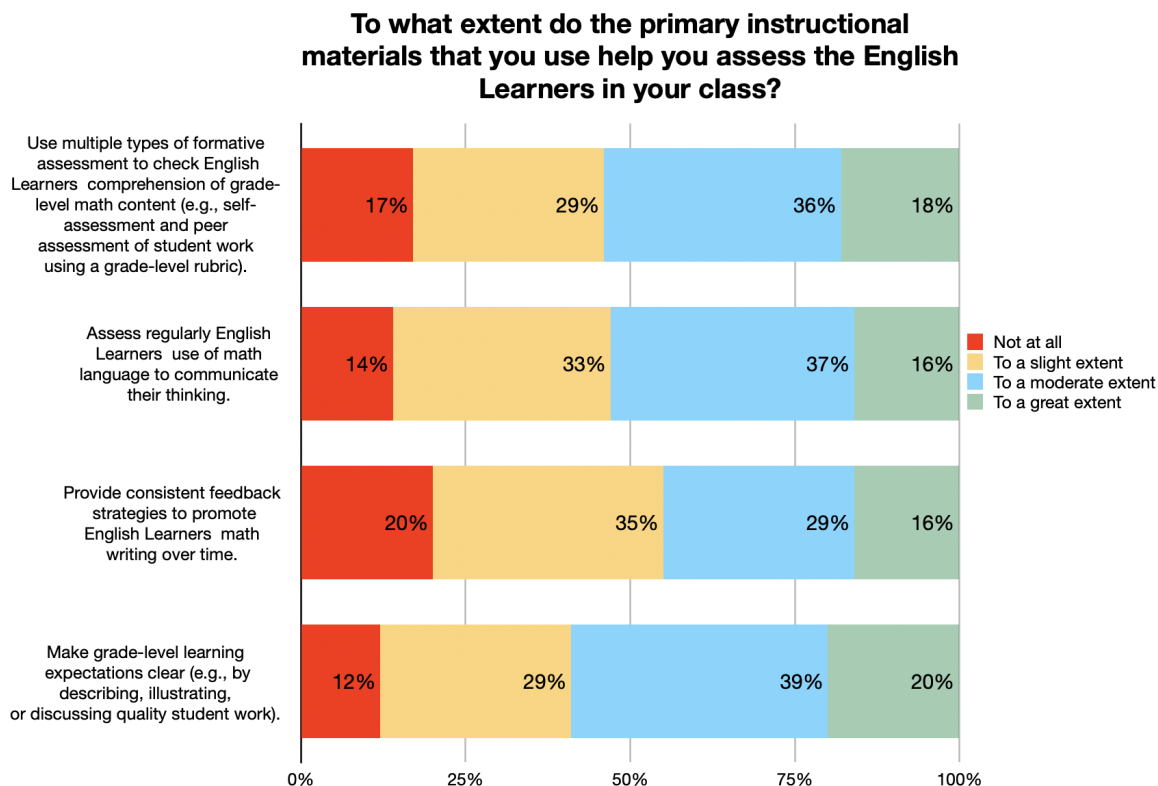


Figure 4. Proportions of responses for quality of assessment opportunities in mathematics materials.

Discussion and Significance

This work provides a snapshot of mathematics teachers’ impressions of the quality of instructional materials for teaching multilingual students who are classified as English Learners. By using a focused framework for the survey design and by focusing on specific features of instructional materials, this research adds nuance to the results from prior surveys that found teachers reported their instructional materials are satisfactory for teaching English learners (Prado Tuma et al., 2021). In particular, this work indicates that mathematics teachers who work

with ELs do not find their materials culturally relevant, and the materials do not provide appropriate guidance for assessment. Given the importance of students' social and cultural development, this work highlights important areas for future development of instructional materials.

One strength of this work was our use of the AEP to field a nationally representative sample of teachers who work in districts with a relatively high proportion of multilingual learners. One limitation of this study is that many of the teachers reported using a bricolage of self-designed materials and materials from other teachers. The theme of the 2024 meeting of AERA is "Dismantling Racial Injustice and Constructing Educational Possibilities: A Call to Action," and we view this work presenting a possible area of action. Recognizing the weakness of instructional materials allows researchers, instructional designers, and teachers to collaborate in a focused way to improve instructional materials for multilingual learners. Through such efforts, educators may build on the promise of instructional materials as a tool for educational reform (Ball & Cohen, 1996).

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