

RESEARCH MEMORANDUM

An Approach for Personalizing Accommodations in Digital Content Assessments for Multilingual Learners

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Abstract

In this research memorandum, we propose a practical approach for personalizing accommodations for multilingual learners in digital content assessments (e.g., mathematics, science). We begin by providing background information about multilingual learners in public schools in the United States and the accommodations commonly used in content assessments. Next, we describe our personalized approach to assigning accommodations to multilingual learners, which we believe is not only effective but also feasible to implement. This approach includes specific actions before, during, and after the assessment. We then provide a sample use case to illustrate how this approach works in practice. Finally, we outline the empirical evidence needed to validate this approach, further supporting its effectiveness.

Keywords: assessment accommodations, content assessments, digital assessments, empirical evidence, multilingual learners, personalization, validation

Author Note

Alexis A. López is currently a visiting lecturer at Southern New Hampshire University.

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Introduction

Multilingual learners are individuals who use or are in the process of learning multiple languages (Jessner, 2014). This paper focuses on multilingual learners who are still developing their English skills and are classified as English learners in U.S. public schools. Although we acknowledge the term English learners as defined by the Elementary and Secondary Education Act (ESEA, 1965), we prefer to use the term multilingual learners to highlight the diverse linguistic abilities of these students and emphasize their strengths rather than concentrating solely on areas where they may need improvement. However, for the sake of consistency with original sources, we will occasionally use the term English learners (ELs). This paper proposes a practical framework for personalizing accommodations for multilingual learners in digital

content assessments and aims to inform the development of these assessments as well as educational policies regarding accommodations for multilingual learners.

English learners in U.S. public schools constitute a diverse and rapidly growing student population (NCES, 2024). These students, whose primary language is not English, present a unique set of opportunities and challenges (Calderón et al., 2011; Horne, 2021). Their diverse backgrounds, languages, and cultures, coupled with a wide range of language proficiency and literacy levels and varying educational and personal experiences, necessitate the development of adaptive learning and assessment systems. These systems should be tailored to the distinct characteristics, needs, and interests of multilingual learners in order to effectively address the challenge of educating such a diverse population.

English learners often require specialized instruction such as bilingual or English as a second language (commonly referred to as ESL) program models to support their English language development and academic growth (Barrow & Markman-Pithers, 2016). Schools and educators play a crucial role in providing inclusive environments, culturally responsive teaching, and appropriate resources to help multilingual learners succeed academically (Calderón et al., 2011). As the number of multilingual learners who need language support increases, there is an ongoing need for effective policies and practices to ensure they receive equitable and high-quality education (Callahan et al., 2022).

Similarly, there is a pressing need for appropriate content assessments to gauge the academic knowledge and skills of multilingual learners in subjects such as mathematics, science, and social studies. Most content assessments require students to demonstrate their knowledge and skills in English (Ascenzi-Moreno et al., 2023; García, 2008; López et al., 2017). As a result, many multilingual learners, still developing their English proficiency, encounter unique challenges and require assistance in taking these content assessments (Martiniello, 2009; Schlepppegrell, 2012). Language barriers can hinder their comprehension of assessment instructions and content, often leading to lower performance that does not accurately reflect their content knowledge (Abedi, 2006). Despite accommodations such as extended time, simplified instructions, and bilingual glossaries, multilingual learners still developing their English proficiency may require additional accommodations to demonstrate their true

capabilities on the targeted constructs (Abedi, 2014; Koran & Kopriva, 2017; López, 2023; Roohr & Sireci, 2017; Turkan et al., 2019; Wolf et al., 2021). Schools must continually adapt and refine their assessment practices to ensure they provide an equitable measure of multilingual learners' academic skills: one that balances the assessment of learners' content knowledge with accommodations for their ongoing language development (López et al., 2015).

It is crucial to recognize the potential of multilingual learners to excel in school and have the same academic rigor as all students. Their diverse cultural backgrounds, educational experiences, background knowledge, language, and literacy skills can be seen as assets that enrich the learning environment. Equally important is to enhance content assessments for multilingual learners by offering them better opportunities to demonstrate their content knowledge and skills. A personalized assessment approach to content assessments could allow teachers to respond to the diverse needs of multilingual learners and provide necessary support. Personalized assessments recognize that multilingual learners come to school with various cultural backgrounds, educational experiences, background knowledge, language, and literacy skills (Hodge & Cobb, 2019). Moreover, personalized assessments allow multilingual learners to demonstrate their understanding of content in comfortable and familiar ways. Furthermore, multilingual learners can be empowered to bring their cultural references into the content assessment space by enabling them to utilize all their linguistic and semiotic resources (Ascenzi-Moreno et al., 2023; García & Wei, 2014).

We build this approach from previous work on personalized assessment, including a theory of change to rethink developing assessments that are more responsive to the needs of students by (a) adapting the content of the assessments to the personal characteristics of the students and (b) providing multiple ways for students to access the assessment and to demonstrate what they know and can do (Bennett, 2023). We also build upon the culturally enhanced caring assessments framework (Lehman et al., 2024), which aims to improve the assessment experience for students by considering their personal, cultural, social, and linguistic characteristics and experiences. The caring assessments approach provides various methods for students to demonstrate their knowledge and skills, which in turn allows educators to make informed inferences about their abilities (Lehman et al., 2018, 2024; Zapata-Rivera, 2017;

Zapata-Rivera et al., 2020). Similarly, there have been efforts to use conversation-based assessments to create personalized assessment environments in which students interact with virtual agents, receive scaffolding when needed, and have multiple opportunities to provide evidence of their knowledge and skills (e.g., López et al., 2021; Zapata-Rivera et al., 2007).

Finally, we are also leveraging previous work on implementing translanguaging in content assessments by allowing students to use all their language resources to access the items and demonstrate their knowledge and skills (e.g., López, 2023; López et al., 2019). Translanguaging is a practice that allows multilingual learners to use their diverse language abilities (García & Wei, 2014). It includes various forms of communication, such as using multiple languages, nonverbal cues, and multimodal practices (Wei, 2018). In our approach, we integrate all these principles to improve digital content assessments for multilingual learners.

In the following sections, we summarize current accommodation practices for multilingual learners in content assessments. We then describe an approach to providing personalized accommodations for these learners in digital content assessments, considering their individual characteristics, language and educational experiences, and performance on the assessments. Additionally, we discuss the types of accommodations that can be offered as well as the information required to make informed decisions about which accommodations to implement. Next, we explain how to report on the use of personalized accommodations. Lastly, we illustrate our approach with a use case scenario and outline the next steps needed to validate our method for personalized accommodations for multilingual learners in digital content assessments.

Accommodations for Multilingual Learners

One approach commonly used to mitigate language barriers in state accountability content assessments is the use of accommodations. These are supports provided to students for a given testing event, either through modification of the test itself or through modifications of the testing procedure, to help students access the content in English and better demonstrate what they know (Butler & Stevens, 2001, p. 5). The goal of accommodations in content assessments is of paramount importance. It is to make the assessment accessible to all students and is intended to increase the validity of the interpretations of what students know and can do

in a particular content area (Abedi, 2014; Roohr & Sireci, 2017). Various studies have investigated the use of accommodations for multilingual learners; however, there is no clear evidence of their effectiveness to support multilingual learners (Rios et al., 2020). It is important to highlight that most studies have measured the effectiveness of accommodations based on student performance and not on improving accessibility (Li & Suen, 2012; Rios et al., 2020; Wolf et al., 2012).

Several research studies have suggested that accommodations can have a positive impact on overall assessment scores (e.g., Abedi & Lord, 2001; Pennock-Roman & Rivera, 2011). However, it is essential to note that not all accommodations have shown consistently positive results. For instance, while linguistic modification of test items, plain English accommodations, and the use of customized glossaries or dictionaries have shown promise (Abedi & Lord, 2001; Pennock-Roman & Rivera, 2011), other accommodations, such as dual language or translation, have shown mixed results or remain underresearched (Pennock-Roman & Rivera, 2011). This underscores the need for more comprehensive research and evaluation in this area.

Typically, in K–12 public schools in the United States, online assessments include embedded accommodations for multilingual learners classified as English learners. However, only students who need additional assistance can use these accommodations. Typically, a team of educators who work closely with the student will assign their accommodations in consideration of the student’s English language proficiency and educational experiences (Rios et al., 2020). Furthermore, if a student has an underlying disability that qualifies them for a 504 Plan, accommodations are tailored to meet their specific needs. A 504 Plan provides necessary accommodations and modifications to ensure that students with disabilities have equal access to education, even if they do not require specialized instruction.

Other studies have underscored the need for research-based, individualized accommodations and improved instructional practices to support multilingual learners’ performance in content assessments (e.g., Koran & Kopriva, 2017; Roschmann et al., 2021). More research is needed to identify the individual factors that affect the effectiveness of various accommodations for multilingual learners. Educators must also ensure that these accommodations are tailored to effectively meet the diverse needs of these students. Thus, we

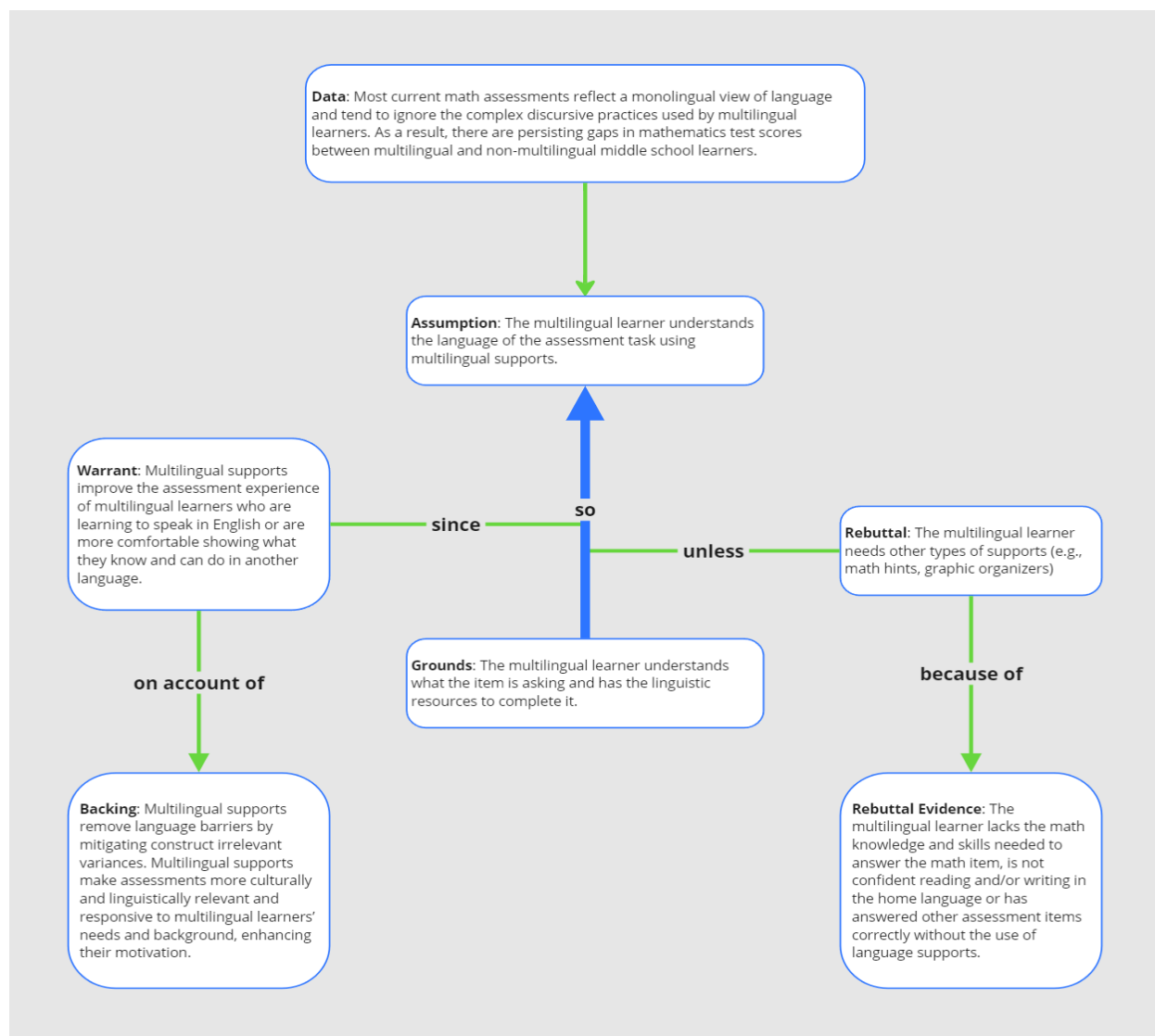
propose an approach to address the limitations of current accommodations for multilingual learners. In the next section, we present a method for personalizing accommodations for multilingual learners in digital content assessments. Our goal is to enhance the effectiveness of these accommodations and explore ways to better address the individual needs of multilingual learners by tailoring the provided accommodations.

Approach for Personalizing Accommodations for Multilingual Learners

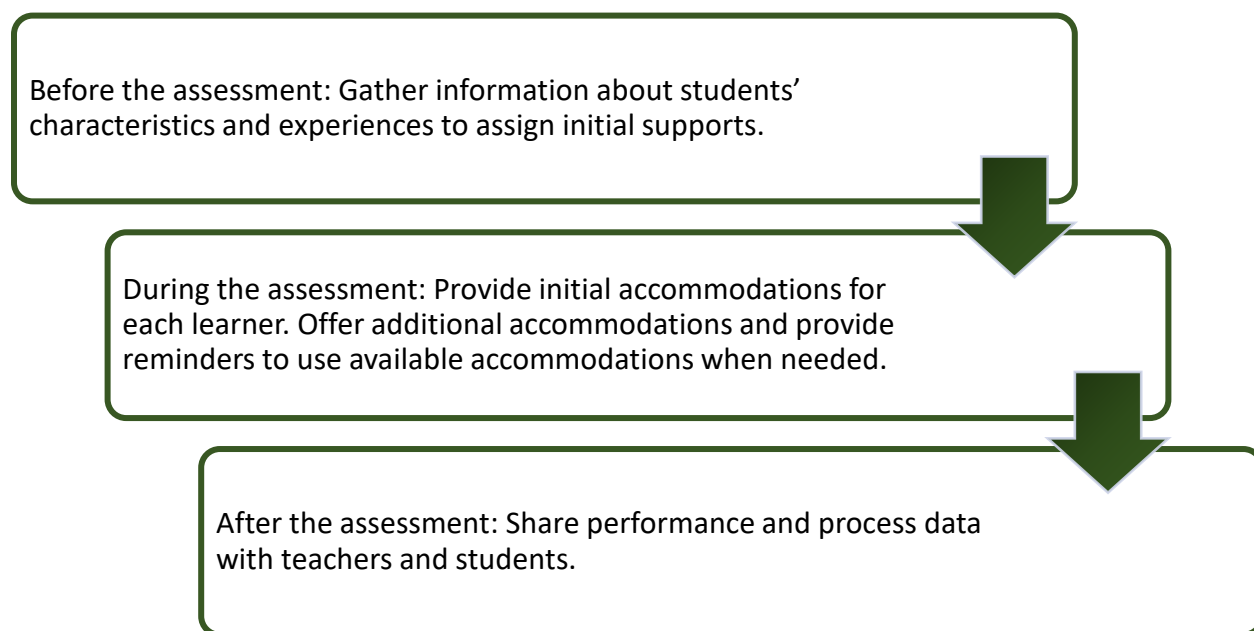
We are proposing a personalized approach that offers an equitable assessment experience in supporting multilingual learners in digital content assessments. This approach recognizes that multilingual learners with low English language proficiency (i.e., students classified as English learners) need language accommodations in English, their home language, or both to understand and respond to the questions in content assessments. However, the needs for language accommodations by multilingual learners are diverse due to learners' unique and varied educational and personal experiences.

Thus, in this approach, the different accommodations provided to multilingual learners in personalized assessments are assigned taking into consideration learner characteristics and experiences (see Figure 1).

For example, initial accommodations could be assigned based on (a) the student's language proficiency in the home language and in English and (b) educational experiences in the home language and in English (e.g., language of instruction used to learn the content). Although multilingual learners are initially assigned a specific set of accommodations, the system is designed to make on-the-fly adjustments based on real-time data regarding how the students interact with provided linguistic accommodations, their performance, and the amount of time they take to complete the assessment, among other considerations. The goal is to offer multilingual learners tailored accommodations based on their needs and assessment experiences to help them best demonstrate what they can do or know regarding the targeted construct. This personalized approach holds great promise in making educational assessment a more equitable and fair experience for multilingual learners.

Figure 1. Personalizing Accommodations to Improve the Assessment Experience

This approach for personalizing accommodations in content assessment for multilingual learners is a collaborative effort that requires the collection of information about the students' characteristics, educational experiences, and language abilities from all relevant stakeholders—including teachers, students, and parents (see Figure 2).

Figure 2. Process to Assign Personalized Accommodations and Share Information With Users

This stakeholder input is crucial in assigning an initial set of accommodations. These accommodations will always be available during the assessment, but students are not required to use them. Once the students start interacting with the assessment, the online system will monitor how students interact with the assessment using process data. The system will keep track of information about how they navigate through the assessment, which answers they select or provide, and how they use the assigned accommodations. Based on the students' needs, other accommodations can be made available. In addition, students could get reminders to use the embedded accommodations if they are not performing well, are not engaged, or are taking too long to respond. After completing the assessment, the students will receive detailed information about their performance, the accommodations they used, how often they used them, and when they used them. This information will also be shared with the teachers.

In the next section, we offer a more detailed explanation of our approach.

Information Needed to Assign Initial Accommodations

It is critical to collect student background information and prior learning experiences before students start interacting with the assessment. This student background information can inform the decision-making process to determine which accommodations each multilingual

learner needs. Several studies indicate a link between multilingual learners' language proficiency, their educational experiences, and the language accommodations they utilize (e.g., López, 2023, 2024). This suggests that multilingual learners selectively use available accommodations based on their specific linguistic and educational needs. Student background information may include the following:

- Student self-ratings of their English and home language proficiency (listening, reading, speaking, writing) and language preference(s) play a pivotal role in understanding the unique needs of each multilingual learner and offer invaluable insight into the students' perceptions of their language abilities and preferences.
- Student self-ratings of their content knowledge, interest in the content, and motivation to learn the content provide valuable information about prior knowledge and motivation to learn the content.
- Student self-reported educational experiences—such as their previous exposure to the content, the language in which they learned it, and their experience with content assessments—provide crucial context for their learning journey and inform the assessment process.
- Teacher ratings of students' language proficiency and content knowledge provide additional information about the student's language skills and content knowledge.
- Test scores in English language proficiency assessments, home language assessments, English language arts assessments, and content assessments are reliable indicators of students' language proficiencies, literacy skills, and content knowledge. They provide a standardized and objective perspective in the assessment process. Course grade(s) will provide additional information about the students' prior content knowledge.
- Student self-reported data about their familiarity with different accommodations are helpful indicators to determine whether students have had previous experiences using the available accommodations.

One potential way to gather information about the initial needs of multilingual learners and facilitate familiarization with all the available accommodations is to incorporate a screening diagnostic module at the beginning of the digital assessment. We can leverage this information to determine how to personalize the accommodations or to establish initial personalized paths (Zapata-Rivera & Arslan, 2021). Investigating which student background information to collect can enhance the decision-making process. In the following section, we outline the various types of accommodations available for multilingual learners within our personalized accommodations framework.

Available Accommodations

In this personalized assessment approach, each student will receive a predetermined set of accommodations based on the students' characteristics and experiences. Initially, we are considering embedding three types of accommodations: (a) language accommodations (in the home language and English), (b) content accommodations, and (c) a combination of language and content accommodations.

In the following subsections, we describe language and content accommodations.

Home Language Accommodations

By allowing students to use their home language, this personalized assessment approach incorporates an asset-based perspective that leverages multilingual learners' entire span of language resources to make the assessment content more comprehensible and approachable (López et al., 2017; Otheguy et al., 2015, 2019). Home language accommodations are more appropriate for multilingual learners who are at the beginning of their English language learning continuum, are beginning schooling in an English-mediated instructional environment, are literate in the home language, have had prior formal education experiences in their home country and the home language, and have experienced taking assessments in the home language. Home language accommodations may include the following:

- translations (e.g., using machine translation for the entire, or parts of, the question)
- read-alouds in the home language (e.g., using text-to-speech technology to read aloud the entire question or parts of the question in the home language)

- multilingual glossaries (e.g., generating automated pop-up glossaries of words or phrases the students do not understand)
- writing responses in any language (e.g., allowing students to write the response in English or their home language to complete the constructed-response items)
- saying responses in any language (e.g., allowing students to provide an oral response in English or their home language to complete the constructed-response items)

English Language Accommodations

As mentioned previously, multilingual learners have diverse needs based on their educational backgrounds and language proficiencies. Some multilingual learners might have limited English language skills that impede their ability to understand the items and provide responses. However, not all of them will have had prior experiences learning the content in their home language, or they may not be literate in the home language (i.e., reading and writing). Since these students have typically learned the content in English, they will benefit more if they receive English language accommodations to make the assessment content more comprehensible. English language accommodations may include the following:

- read-alouds in English (e.g., using text-to-speech technology to read the item or parts of the items to the students)
- English glossaries (e.g., generating pop-up glossaries of words or phrases the student does not understand; glossaries include synonyms, definitions, or pictures)
- linguistic simplification (e.g., revising the items to make the language easier to understand or use)
- word boxes for constructed-response items (e.g., providing students with useful words they can use to respond to the constructed-response items)
- sentence starters or sentence frames for constructed-response items (e.g., providing the beginnings of sentences to help students generate ideas to complete the constructed-response items)

Content Accommodations

Some multilingual learners may have had prior experiences in learning the content in English or their home language. These students usually understand the language of the assessment but require more information to determine what they need to do to show their knowledge and skills. Often, some students are unfamiliar with or need help to relate to the context of the assessment item or might be unsure of the procedures needed to complete the assessment items. Some students may benefit more from content accommodations, which is not limited to multilingual learners and can help all students. A few examples of content accommodations include the following:

- providing math hints or nudges (e.g., breaking down the question into smaller steps, asking follow-up questions, providing a formula)
- changing the context of the item (e.g., changing the context of the questions to make it more relevant to the students)
- stripping the context from the item (e.g., removing as much language as possible to help students access the content)
- using graphic organizers to highlight relationships (e.g., using multimodal representations of the content)

Feedback and Reporting

Process data from digital assessments can provide valuable insights into student engagement and accommodation usage (Wolf et al., 2021; Zhang et al., 2023). Thus, it is critical to examine how this information can be leveraged to improve feedback and reporting mechanisms. In this approach for personalizing accommodations, multilingual learners will receive a comprehensive AI-enhanced report that details their performance in each item, in each assessment section, and the entire assessment. This report empowers them to self-assess their knowledge and skills in specific content areas and to identify if they require additional accommodations. Moreover, it provides them with guidance on how to work in areas that need improvement. This guidance includes specific study strategies, recommended resources, or targeted practice exercises. The report also includes information on the accommodations they

utilized, allowing them to reflect on the impact of these accommodations on their performance. This self-reflection can help them determine if they need further assistance in developing their academic English skills.

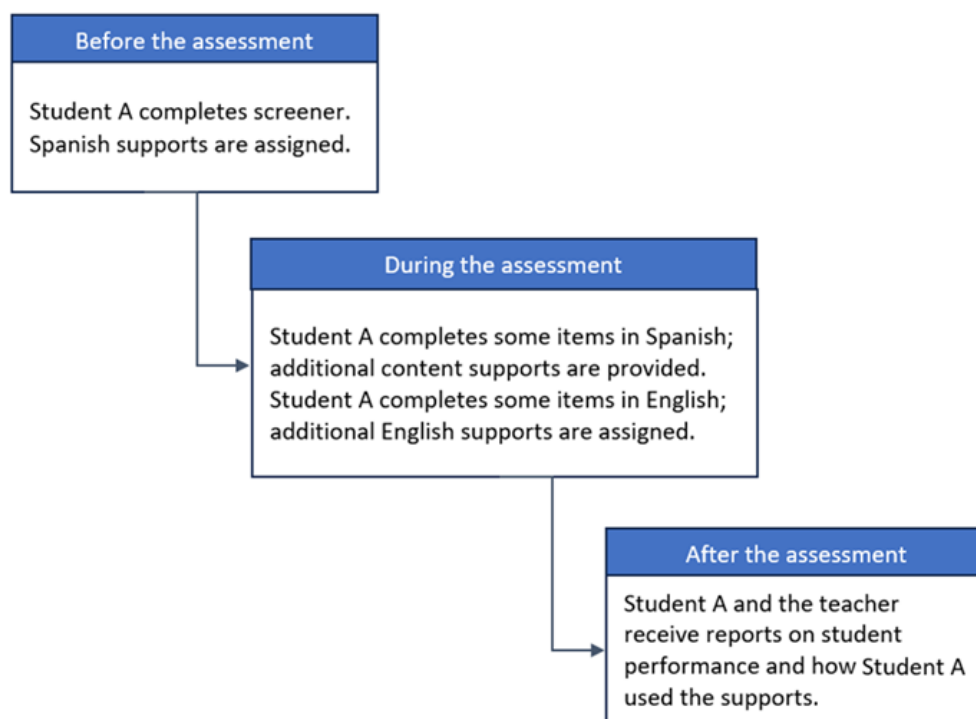
Additionally, teachers will receive detailed information about each student, group of students, or class at the item level, for a set of items (section), or for the entire assessment. Teachers can use this information to gauge students' knowledge and skills and identify students who require extra assistance. Teachers can also use this information to gain insights into the specific accommodations utilized by students, the frequency of their usage, and the timing of their use. This information aids in determining which students would benefit from further support in enhancing their academic English language skills. All assumptions about the potential usefulness of the information provided in the AI-enhanced feedback and reporting need to be validated. Further details about this validation process are included in the Next Steps and Future Research section.

Sample Use Case

This section describes a sample use case to illustrate the accommodations provided before, during, and after the assessment following the caring assessments framework approach (Lehman et al., 2018, 2024; Zapata-Rivera, 2017). Our use case is Emilio, a sixth-grade student born in Colombia who recently moved to the United States. He was identified as an English learner at the beginning of the school year and scored at Proficiency Level 1 (Entering) according to the schools' English language proficiency screener. He is enrolled in a mathematics class that is starting a new unit on geometry. The mathematics teacher assesses the students at the beginning of a new unit to gauge students' knowledge and skills. This assessment is instrumental in pinpointing students who require extra assistance. Before the assessment, students complete a screener, which is part of the digital assessment system, to get information about their English language proficiency, educational experiences, and prior knowledge (see Figure 3). Based on this screener, the teacher knows that Emilio has challenges understanding and expressing ideas in English; however, he can read and write well in Spanish. Emilio also has prior knowledge of geometry in Spanish, has a keen interest in geometry, and

has already demonstrated the ability to classify angles and shapes and graph points on coordinate planes.

Figure 3. Diagram Illustrating a Sample Use Case



Emilio has low proficiency in English but is literate in Spanish and has studied geometry in Spanish. Therefore, for the digital mathematics assessment, the AI-enhanced digital assessment platform initially provided him with home language accommodations. This included the option to view the assessment items in Spanish, use read-alouds in Spanish, and respond in any language, whether by writing or speaking (see Figure 3). Emilio began the assessment and used the home language accommodations in most of the items; however, he completed several items in English. In response, the AI-enhanced digital assessment platform reminded the student that there were several Spanish accommodations if he needed help understanding the items in English. Additionally, because Emilio was responding to some items in English, the system provided extra accommodations in that language. At that point, Emilio had access to read-alouds in English, multilingual glossaries, and sentence starters for constructed-response

items. He also received additional assistance while viewing items in Spanish because he took a long time to respond. In this situation, the system provided mathematics hints to help Emilio complete these items. It asked follow-up questions about the number of sides and angles, as well as the characteristics of these sides and angles in various figures.

At the end of the assessment, Emilio and the teacher received detailed reports documenting how the student performed on each item and how and when the student used the available accommodations (see Figure 3).

Based on Emilio's performance, he and his teacher learned that Emilio could recognize different shapes but needed help understanding the attributes of different two-dimensional figures. The feedback provided detailed insights into the specific accommodations that Emilio used, including how often he utilized them and when. Based on the information about how Emilio benefited from the language accommodations, particularly the sentence starters for completing constructed-response items, the teacher decided that he would benefit from additional accommodations to enhance his academic English language skills. As a result, the teacher began providing Emilio with sentence starters and word boxes in class to assist him in describing the attributes of different geometrical shapes.

Next Steps and Future Research

Our next crucial step is to gather empirical evidence, which will validate our approach to personalizing accommodations for multilingual learners in digital content assessments. The studies we describe in this section will be instrumental in providing this evidence.

Assigning Appropriate Accommodations for Multilingual Learners

We must confirm that the tailored accommodations address multilingual learners' cognitive, affective, and linguistic needs. This research has the potential to significantly improve the learning experience for multilingual learners. We also need to ensure that personalized accommodations make the assessment more comprehensible and relevant and give multilingual learners better opportunities to demonstrate what they know and can do in a content area. To get feedback on which accommodations are appropriate and relevant for multilingual learners, we will conduct studies with users (i.e., teachers, students). We will

create scenarios based on student characteristics, needs, interests, and preferences. Then, we will ask users which accommodations will be appropriate for each one of those scenarios. Based on the feedback we get from teachers and students, we will create a rule-based model that considers the students' characteristics and experiences to determine which accommodations are needed. Additionally, we will conduct further studies to gather feedback from both teachers and students regarding the AI-enhanced feedback and reporting system. Our focus will be on the usefulness of the information provided and how it can aid both teachers and students in guiding the teaching and learning process.

Using Artificial Intelligence to Create Automated Accommodations

Artificial intelligence (AI) and machine learning tools can potentially promote equity for multilingual learners with emerging English skills by making assessment content more accessible. Thus, we need to ensure that AI and machine learning tools can be used to personalize the accommodations based on the characteristics of the students. A few AI tools that will be explored to personalize accommodations in content assessments for multilingual learners include the following:

- machine translation to offer accommodations in multiple languages
- text-to-speech tools to automate read-alouds
- generative AI tools to adapt the content of the assessment
- AI-enhanced dashboards to streamline reporting and feedback

Our research aims to co-design AI-enhanced solutions with teachers, a process that will empower them to enhance content assessments. We will conduct several studies to ensure that the implementation of these accommodations benefits students, particularly those who need it the most. These studies will include an analysis of the accommodations the students use, how they use them, and the impact of the accommodations on their understanding, performance, and engagement. We will also examine the differential impact of different types of accommodations, such as English accommodations, multilingual accommodations, and content accommodations (e.g., nudges, feedback), with the overarching goal of improving student learning outcomes.

Piloting Our Approach for Personalizing Accommodations

To further explore the potential of personalized accommodations in content assessments for multilingual learners, it is essential to gather evidence of how teachers and students can use this personalized approach in the classroom. User experiences with this personalized assessment approach and their perceptions of the approach are invaluable to this study. We plan to pilot this approach in multiple classrooms to examine how students interact with the digital content assessment, when and how they use the accommodations, their effectiveness, and users' perceptions. We also need evidence that this personalized approach provides rich information about what students can do, with and without accommodations, to help multilingual learners improve their learning outcomes and continue their language development. Moreover, we need evidence that test users, both teachers and students, can use the AI-enhanced feedback and score reporting to enhance teaching and learning.

By offering personalized accommodations, this approach can greatly enhance the academic outcomes of multilingual learners, ensuring that their linguistic diversity is acknowledged and valued during the assessment process. We aim to leverage technology, such as AI and machine learning, to provide these students with tailored assistance, making digital content assessments more accessible and less reliant on language. This will ultimately promote a more inclusive and equitable evaluation of their knowledge and skills, empowering them to showcase their full academic potential.

Reflections on Close Collaboration With Bob Mislevy on This Project

We would like to finish this report by reflecting on the significant impact that Bob Mislevy had on our work concerning personalized assessments for multilingual learners. We had the fortune to have Bob serve as a consultant on this project in 2024. Bob's extensive knowledge of educational assessment and his experience in creating assessment arguments for innovative assessments were instrumental for the success of this project.

Bob helped us explore issues related to the value of personalized assessments for multilingual learners such as use cases where the value of these assessments justifies potential additional costs and how to communicate their value to various audiences. Our meetings were

very productive. We remember how he patiently listened to our ideas, asked insightful questions, and suggested potential next steps for continuing with this exploration.

Bob encouraged us to write about these ideas and illustrate the approach using use cases and diagrams. He was glad to see our progress and mentioned that he wanted to cite this work in one of his papers. We are grateful for having the opportunity to share and learn from Bob and look forward to continuing working on this area of research that he considered worth pursuing.

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