Making Thinking Visible: An Analysis of ELLs' Interactions With Access-based Science Assessment Items

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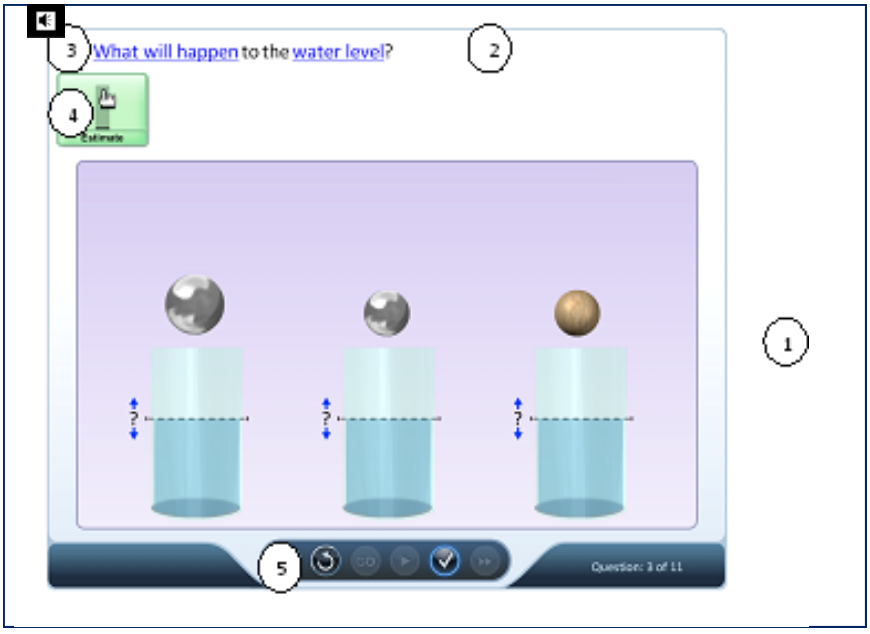
Introduction

In recent years, the *ESEA*, as reauthorized in 2001, has required that all students be tested yearly for adequate yearly progress purposes, creating the need for new and innovative assessments, especially for ELLs. One such assessment, Obtaining Necessary Parity and Academic Rigor-Science (ONPAR), uses an *access-based framework* [1] and replaces typical linguistically heavy test items with graphics, animations, and other support features to provide ELLs with greater access to content. Using video data of students interacting with ONPAR items in cognitive lab interviews, we examined how students at varying degrees of language proficiency access and process the semantic information of the assessment. We propose that meaningfully including ELLs in large-scale testing requires taking into account the cognitive resources they draw upon when interacting with test items, and that 'one-size-fits-all' approaches to assessment cannot accommodate ELLs adequately.

Background

Standardized test scores indicate that a significant achievement gap exists between linguistically diverse students and their native English-speaking peers across all academic areas [2]. Research suggests this may be due to tests' conflation of measuring language proficiency and content knowledge for ELLs [e.g., 3]. Some proposed accommodations include test translations and/or simplified language, to measure student achievement more accurately. However, there are limitations to these accommodations as valid test translations and consistent simplification of language are difficult to produce and require further study [4,5]. Another promising accommodation approach that has developed recently is an access-based framework in which items are modified to make content more accessible by changing structural and contextual factors. In assessing ELLs, the goal is to minimize the challenges that language may pose and to provide alternative means to "access meaning, solve problems, and demonstrate solutions without lessening the rigor of the item or changing the construct being measured" [6, p. 8].

ONPAR-Science is a new content assessment based on the access-based framework with items that include: (1) graphics and animations, (2) text prompts with hyperlinked vocabulary, (3) a speaker button that provides an oral Spanish translation of the text prompt, (4) an animated icon to demonstrate how to respond to an item physically, and (5) a navigation bar that allows students to go



1. *Graphic: conveys primary semantic information of item*
2. *Text prompt: conveys task demand*
3. *Speaker button: provides spoken text prompt translated into Spanish (optional)*
4. *Icon: demonstrates physical action needed to complete task (optional)*
5. *Navigation bar: allows students to navigate the assessment at their own pace*

Figure 1. An ONPAR-science item

forward and back and replay items (Figure 1). These features are intended to make ONPAR items more accessible to ELLs than traditional paper-and-pencil test items (see [7] for a full description of ONPAR methods go to http://www.onpar.us/sample_items.html to see the working item).

Methods

In order to investigate the ways in which students accessed and processed semantic information in the ONPAR test, 12 cognitive laboratory interviews with Spanish-speaking ELLs with a range of English proficiencies (three beginning, three intermediate, and four exited/bilingual ESOL students) from fourth and eighth grade were analyzed. Students chose the language (Spanish or English) of the approximately 45-minute interview, during which they worked through five or six ONPAR items. The students were asked to explain their answers, and an interviewer asked open-ended questions to clarify responses when needed. Thus, the cognitive laboratory interviews provide insight into comprehension difficulties and reasons for performance variation across items and languages.

The interviews were transcribed using the qualitative analysis tool Atlas.ti, which allowed for a close analysis of responses and quantitative coding across interviews, as well as analysis of visual and textual data. After the data were transcribed, three student strategies for accessing and processing the semantic meaning of an item were identified: (1) code-switching for scientific terminology, (2) use of the speaker button for native language support, and (3) reliance on graphics as demonstrated by deictic (pointing) gestures. These strategies were coded across the interviews in order to investigate how ONPAR's features afforded ELLs access to the meaning of the test items.

Findings and discussion

Code-switching for scientific terminology

Most students (8 out of 12) chose to be interviewed in English; however, even the four students who chose Spanish as the language of the interview often (at least 25% of the time) code-switched into English when using scientific terminology. Table 1 shows the amount of code-switching into English per student.

Table 1. Percent of occurrence of code-switching into English

4th grade	Maria	52%
	Sara	62%
8th grade	Ana	25%
	Sofia	36%

Although these students were more proficient in Spanish than English, their knowledge of scientific terminology in Spanish was limited. This suggests that providing information in students' second language (English) may be essential for accommodating even beginning ELLs.

Native language support

In contrast, some students relied heavily on their native language to access semantic information, even when they had chosen English as the language in which to be interviewed. Students had the option of clicking on a speaker button in order to hear a translation of the text prompt into Spanish. Figure 2 shows the percentage of times students clicked on the speaker button during an interview as a function of the total number of times the students were presented with the option of using the speaker button.

For some students (e.g., Ines, Jose, and Sofia) the speaker button seems to have been an important resource for accessing semantic content of item prompts. This demonstrates how test translation and other native language support tools may be necessary, yet not sufficient (as evidenced by students' code-switching into English for scientific terminology), assessment accommodations for ELLs.

Deictic gesturing at graphics

A final point of access to semantic information in the ONPAR test was graphic information. In order to code how students relied on the graphics in lieu of language, we focused on interactions in which students appeared to understand a graphic, but did not articulate linguistic terminology to describe it. We coded examples of deictic gestures (pointing) in which students gesturally referred to graphic information and used a deictic expression (e.g., a deictic

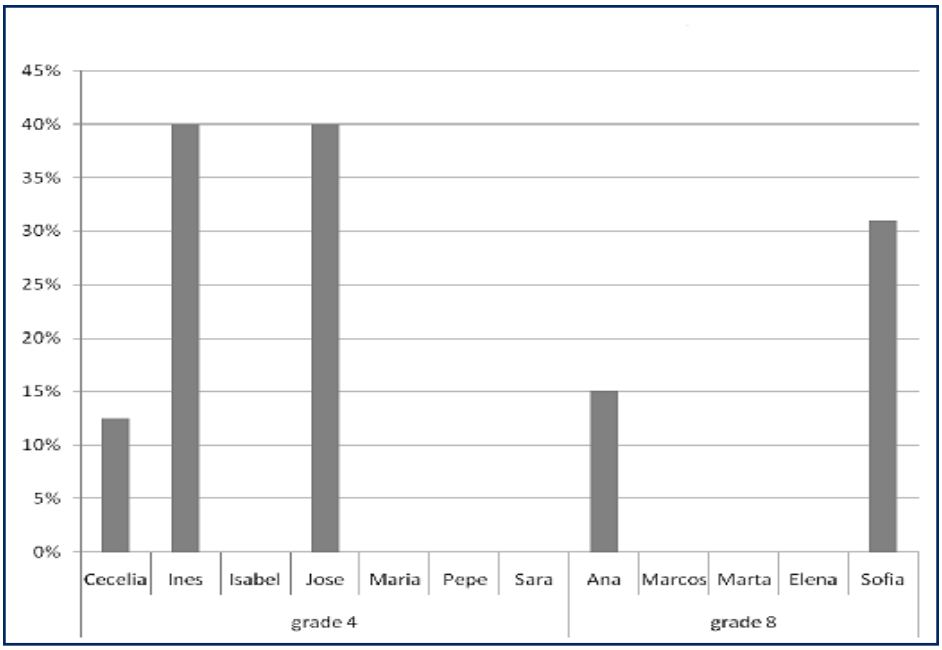


Figure 2. Total usage of audio button

pronoun, *this, that, these,* or *those)* as a proxy for linguistic terminology. Figure 3 shows the frequency of deictic gesturing per student during the interviews.

Almost all of the students used deictic gesturing as a strategy for managing language while interacting with the test items, with 4th graders using more gestures than 8th graders. This provides evidence that the multimodal features and graphics of ONPAR functioned as meaningful semantic information for students and may have helped them access and process content on the assessment. In this way, integration of visual support tools recommended by the access-based accommodation framework seems to provide students with additional routes to access and process information.

Conclusions and implications

Our findings indicate that each student has a unique profile in terms of strategy usage: some students (e.g., Sofia) used a variety of strategies to varying degrees in order to access and process content throughout the ONPAR-Science assessment; other students seemed to rely heavily on certain strategies (e.g., Pepe, who frequently pointed to visuals on the screen yet never utilized the audio translation button). We found that students' strategies seemed to be as diverse as the students themselves; thus, successful accommodations for ELLs on content tests must be diverse as well.

These results demonstrate the promise of an access-based accommodation framework that provides a variety of resources for students as they work through assessment items. Moreover, in the case of ONPAR, the integration of computerized multi-semiotic features may provide particularly useful tools for accommodating ELLs on content assessments.

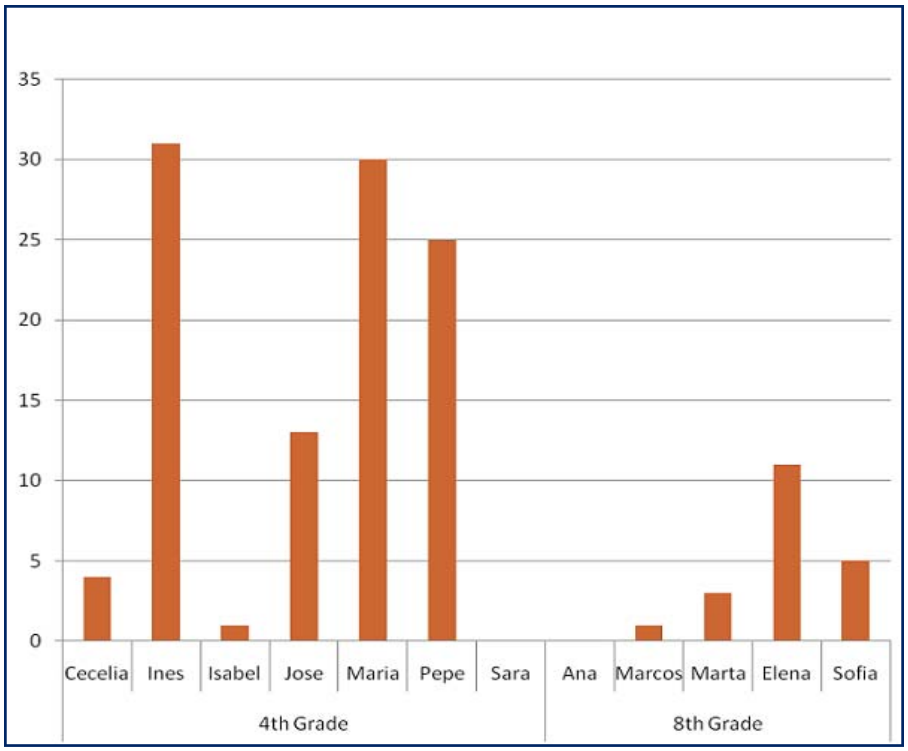


Figure 3. Number of deictic gestures

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Formative Assessment: FLARE Project

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Introduction

The reauthorization of *ESEA* in 2001 as the No Child Left Behind Act (NCLB) has led to enormous debate. Many praise its requirements. Many decry its intrusive mandates. It is not difficult to identify points to argue about in this law, but most, if not all, who praise or criticize acknowledge that previously underserved students, i.e., racial and ethnic minorities, special education students, and ELLs, now matter.

Prior to 2002, few states had assessments for ELLs created from state-adopted English language proficiency standards. Now, all states have assessments that are in some fashion related to state language proficiency standards. Substantial progress has been made in the development of large-scale ELL summative assessments. However, although it has long been accepted that formative (classroom) assessments are important, they have garnered little attention by the measurement community due to issues of validity and reliability. To address this deficit, a recent issue of *Educational Measurement Issues and Practices*, Volume 22:4 (2003) was dedicated to this subject exclusively. Investigation of classroom assessments is now "[a] cutting edge area of assessment research" [1, p. 150].

Background

Definitions of formative assessment have varied widely [2-6]. We find Brookhart's conception of formative assessment [7] the most useful. Her definition includes three important features:

- Students' focus on meaningful learning goals, supported by exemplars or models of "good work;"
- A mechanism or method of identifying where students are and where they need to be, relative to their learning goals; and
- A system that allows both teachers and students to act upon "gaps" between students' current status and desired learning goals.

Implicit in this definition is the notion of continuous or cyclical measurement. "Assessment needs to be conceptualized as an ongoing activity that involves gathering, interpreting, and evaluating information, and action, based on results, rather than mere documentation of student performance (i.e., measurement)" [8, p. 39]. Good formative assessments need to incorporate all of these elements, and their use "must become an integral part of the learning process" [7, p. 6].

The technical quality of these integral tools, however, often is limited. Teachers' own classroom assessments do not mention technical measurement concepts or principles, but emphasize "fairness