



## Technology-interactive Classroom-embedded Modules for Measuring Challenging Math and Science Skills of ELs

### Background

Within the United States, English Learners' (ELs') assessment scores are typically lower than those of their English proficient peers in all subject areas, including mathematics and science<sup>1</sup>. Research indicates that achievement gaps can be partially attributed to traditional assessments confounding language proficiency and content knowledge<sup>2</sup>. This makes it difficult to know whether an EL's performance is due to his/her understanding of content material or to what extent language proficiency also plays a role. This is also true in classrooms when teachers are trying to formatively assess ELs because most classroom-based assessments also rely heavily on language.

The purpose of this project is to develop proof-of-concept, computerized formative assessments that support teaching and assessing ELs' knowledge of complex mathematics and science and reduce the overall English language load typically associated with traditional assessments. Specifically, the project entails:

- Developing performance assessment tasks for two mathematics and two science units (4-6 tasks per unit) and end-of-unit assessment modules. The tasks and modules are based on learning progressions and new college and career readiness standards in mathematics and science. Tasks and modules will assess students' understanding of the following topics:
  - Extending the Number System (<http://www.corestandards.org/Math/Content/6/NS/>)
  - Proportional Relationships (<http://www.corestandards.org/Math/Content/7/RP/>)
  - Structure and Properties of Matter (<http://www.nextgenscience.org/msps-spm-structure-properties-matter>)
  - Heredity: Inheritance and Variation of Traits (<http://www.nextgenscience.org/msls3-heredity-inheritance-variation-traits>)
- Conducting experimental trials to determine and document the effects of the tasks and modules based on detailed feedback from teachers and students as well as student performance reports.
- Synthesizing the research findings related to the creation of formative assessments that can measure grade-level conceptual understanding in mathematics and science using a reduced English load, and use of immediate feedback to students and teachers as the basis to improve instruction for ELs.

The project uses an existing methodology called ONPAR that has been used effectively to develop summative assessment tasks (see <http://iassessment.wceruw.org/> for examples). The newly developed and tested assessment tasks with the accompanying analysis and research make up the 'proof-of-concept' that would show whether this approach to formative assessment is viable and useful for teachers and students. If viable, these methods may inform other test developers and assessment instruments on new ways of assessing ELs.

### Opportunities for Involvement

In the first phase of development, teachers' input is important for the development of the assessment tasks, and bias review. In the following school years, school districts will be asked to participate in classroom tryouts (2015-2016) and controlled trials (2016-2017).

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<sup>1</sup> Lee & Fradd, 1998; National Center for Educational Statistics, 2001; National Science Foundation, 1994

<sup>2</sup> Abedi, Leon, & Mirocha, 2003; Kieffer, Lesaux, Rivera, & Francis, 2009; Kopriva, 2008; Ruiz de Velasco & Fix, 2002; Wolf, Herman, & Dietal, 2010



#### Educator panels (approximately June – September, 2015):

**Who:** Three to five mathematics educators and three to five science educators at the middle school level.  
**What:** Review panels. Educators review assessment task storyboards and prototypes and provide feedback.  
**When:** Review meetings will take place every 2-3 weeks over the summer during one-hour online sessions between 3 and 5 pm EST.  
**Compensation:** Participants will be compensated at their district hourly rate by the project.  
**Data:** N/A  
**Total time commitment:** 6-15 hours total over 3-6 months.

#### Classroom Tryouts (October, 2015 – January, 2016):

**Who:** Four middle schools.  
**What:** Classroom tryouts (beta-testing). Teachers administer prototype computerized formative assessment tasks during regularly scheduled mathematics or science classes (~30 minutes); teachers and students answer questions (based on a researcher protocol) about their experience with the tasks.  
**When:** Tryouts take place on two separate days over the course of the unit at a time deemed instructionally appropriate by the participating teacher. The first day, project researchers will be present to conduct observations. The second day, researchers will be available for teachers administering the tasks (e.g., online or via phone).  
**Compensation:** Schools will receive a \$250 incentive.  
**Data:** No personally identifiable data is collected. Total number of ELs within a class is requested.  
**Total time commitment:** Organizational call with researchers prior to administration of tasks (~60 minutes), task administration time (~30 minutes per class), and discussion time (~10-20 minutes).

*Benefits to participants.* In general, districts benefit from research that includes ELs with beginning levels of proficiency in English, attending urban school districts, in the development of content assessment tools. Teachers from participating districts will receive professional development on new college and career readiness topics and formative assessment techniques for ELs—at no cost. Teachers also have the opportunity to test formative assessments based upon the latest research in mathematics and science, and use the new personalized learning reports to inform instruction. Once the project is completed, the newly developed formative assessment resources will be available online free of charge<sup>3</sup> for all members of the Council of Great City Schools for up to five years.

To participate or for more information, contact:

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<sup>3</sup> A small maintenance fee may be required for maintaining technical support.