RECOMMENDATIONS FOR FORMATIVE MATHEMATICS ASSESSMENT FOR ENGLISH LEARNERS

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Understanding Language | Language, Literacy, and Learning in the Content Areas

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CEMELA

OVERVIEW

Recommendations for formative math assessment practices:

- Aligned with math Common Core
- For English Learners (ELs) and other students developing academic literacy in math

Assume academic literacy in math is intertwined:

- Math proficiency, Math practices, Math discourse

Why focus on formative assessment?

- Provide students "opportunity to learn" what is in CCSS

General Recommendations for Assessing English Learners

Multiple resources, modes, and situations

1. **Multiple resources:**

   Linguistic (home & everyday language)
   Cultural (alternative algorithms)
   Representational (gestures, objects, etc.)

2. **Multiple modes:** Written PLUS oral reports, presenting, talking, reading, writing, drawing, graphing, etc.

3. **Multiple situations**: Students describe, compare, explain, argue, articulate ideas, interpret information, share explanations, present solutions, defend claims, etc.

FORMATIVE MATH ASSESSMENT

✧ **More than talk or text**

a) MULTIPLE REPRESENTATIONS: Objects, manipulatives, drawings, symbols, equations, tables, graphs etc.

b) MULTIPLE MODES: Talking, reading, writing, drawing, graphing, etc.

✧ **More than whole-class/teacher-led discussions**

MULTIPLE PARTICIPATION STRUCTURES are ESSENTIAL for ELs

CYCLE→ Write responses alone, pair work, small group work, then whole-class discussion

Scaffold presentations by providing ELs opportunities to prepare, share, review, and practice their presentation

FORMATIVE MATH ASSESSEMENT PRACTICES ALIGNED WITH CCSS

1. Balance conceptual understanding & procedural fluency
2. Maintain high cognitive demand
3. Develop beliefs: math is sensible, worthwhile, and doable

What are students doing?

✓ Students use and connect multiple representations
✓ Students show and describe meaning for symbols
✓ Students share, refine, and critique their reasoning

➢ **Students engaged in activities that reflect the STANDARDS for MATHEMATICAL PRACTICE (8)**

CLASSROM VIGNETTE
"They never get together"

- 3rd grade urban Bilingual classroom in California
- 33 students LEP (Limited English Proficiency)
- ESL math lesson, students use English to describe quadrilaterals using paper shapes
- Teacher asked: "Who can describe a rectangle?"

FOCUS QUESTIONS:

1. What mathematical practices did students use?
2. What resources did students use?

VIDEO CLIP

http://ell.stanford.edu/content/mathematics-resources-coming-soon

Video Clips

Here's the video clip from the Understanding Language math webinar of the elementary school classroom titled "Never get together." This is the same video clip used in the Understanding Language paper "Math, the Common Core, and ELs." For an analysis of a longer excerpt from this lesson, see this short article "Supporting the participation of ELLs in mathematical discourse" published in the journal *For the Learning of Mathematics.*

http://www.youtube.com/watch?v=I4AVFIW-GT4

TRANSCRIPT

1. Tcher: **Can somebody tell me something else about this rectangle,** if somebody didn't know what it looked like, what, what . . . how would you say it.
2. Julian: **Parallela ……..**[holding up a rectangle, voice trails off].
3. Tcher: **It's parallel. Very interesting word. Parallel. Wow! Pretty interesting word, isn't it? Parallel. Can you describe what that is?**
4. Julian: **Never get together. They never get together** [runs finger over top side of rectangle].
5. Tcher: **What never gets together?**
6. Julian: **The parallela . . . they . . . when they go, they go higher, they never get together.** [runs two fingers parallel to each other first along the top and base of the rectangle and then continues along those lines]
7. Antonio:Yeah!
8. Tcher: **Very interesting. The rectangle then has sides that will never meet. Those sides will be parallel.** Good work. Excellent work.

RECOMMENDATION #1

Focus on students' mathematical reasoning, not language accuracy.

Why? Assess content knowledge as distinct from fluency of expression in English.

Challenge of hearing mathematical reasoning

Emerging language can be imperfect:

- Julian said "parallela" with hesitation.
- Mixed English & Spanish: Added "a" pronounced in Spanish
- Singular then plural: parallela …. when they go higher"

- Julian was accurately describing a property of parallel lines.
- If we focus only on language accuracy, we miss his mathematical reasoning.

  Emerging language can be refined through instruction, participation in math practices, teacher rephrasing.

RECOMMENDATION #2

Focus on content and mathematical practices, not "language" as single words, vocabulary, or grammar.

Why? Over-emphasis on correct vocabulary limits how we see and hear student competencies.

#2. Focus on math practices, not single words or vocabulary

What mathematical practices did Julian use?

Abstracting, generalizing, imagining

- Describing an *abstract* property of parallel lines
- Making a *generalization* that parallel lines will *never* meet.
- *Imagining* what happens when the parallel sides of a rectangle are extended.

➢ If we only focused on accurate vocabulary, we would miss math practices.

Recommendation #3

Treat everyday and home languages as resources, not obstacles.

Why? Treating home or everyday language as obstacles limits the linguistic resources for communicating mathematical reasoning.

#3. Everyday language as resource

What language resources did Julian use?

- Everyday expressions
  "go higher" "never get together"
- Everyday language was resource not obstacle

What did teacher do?

Focused on hearing and extending math reasoning

Rephrased using more formal language:

"The rectangle then has sides that will never meet. Those sides will be parallel"

"extended" "meet"

#4. CONSIDER LANGUAGE DEMANDS OF WORD PROBLEMS

1. Language complexity at sentence and paragraph level: passive voice no agent, subordinate clauses, nested constructions (Cook & MacDonald, 2012)

- Change passive voice to active, reduce nested constructions and subordinate clauses, use shorter sentences with a clear subject.

2. Background knowledge for understanding and imagining the context (Martiniello, Solano-Flores)

- Provide glossary explanations of the setting/context

SUMMARY: Recommendations for Formative Math Assessment for ELs Aligned with CCSS

#1. Focus on student mathematical reasoning, not accuracy in using language.

#2. Focus on content and math practices, not single words, vocabulary, or grammar.

#3. Treat everyday and home languages as resources, not obstacles.

#4. Consider language demands of word problems, not at word level but at background, sentence, and paragraph levels.

REFERENCES (on handout)

- Mathematics, the Common Core, and Language

  Online "Understanding Language" web site ell.stanford.edu
- Beyond words to mathematical content: Assessing English Learners in the mathematics classroom. In A. Schoenfeld (Ed.), *Assessing Mathematical Proficiency*.
- **Secondary examples:** Supporting mathematical reasoning and sense making for English Learners. In *Focus on High School Mathematics: Fostering Reasoning and Sense Making for All Students*, NCTM.
- **Publications** posted: http://people.ucsc.edu/~jmoschko/

THANK YOU!

Other resources:
ELPD Framework
On “Understanding Language” web site
- Webinar with video clip

Coming soon:
- Materials
- Annotated Math Tasks, more