



How to support ELL's learn the Mathematics Process Standards

RME Conference 2015

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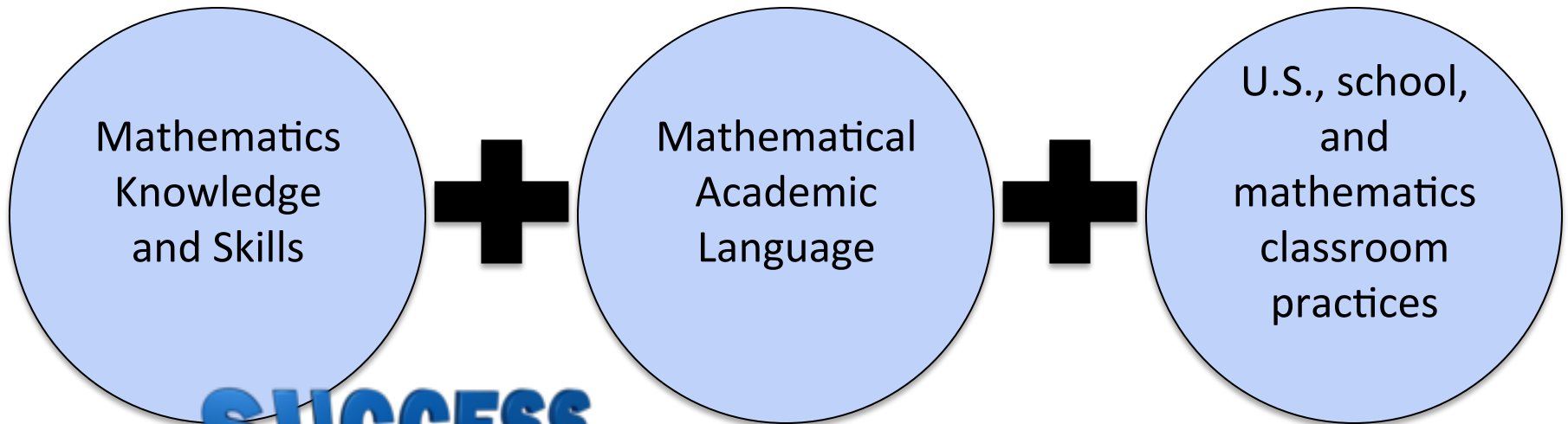
My Presentation...

- Basic Assumptions about ELLs and Mathematics
- Considerations about ELLs and the Process Standards
- Practices to Address the Standards Linguistic Demands



The Daily Struggle of ELLs

To be successful in Mathematics ELLs need to
SIMULTANEOUSLY learn...



SUCCESS

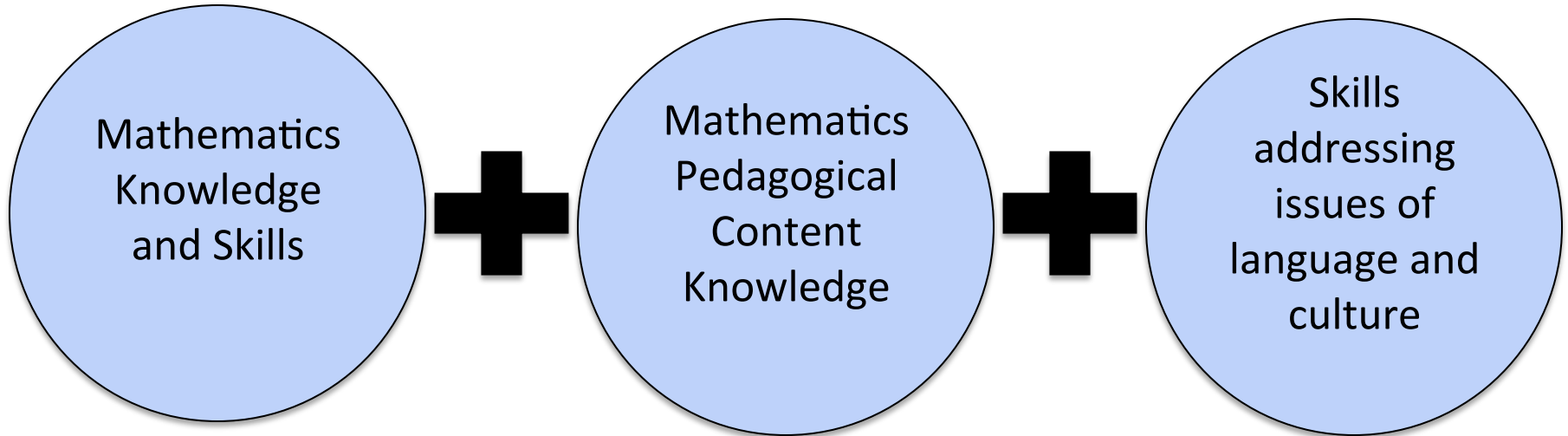
ELLs have **MORE** work to do...

Therefore, they need **MORE** instructional support



The Skills that Teachers Need

To be successful in teaching Mathematics to ELLs teachers need to have...

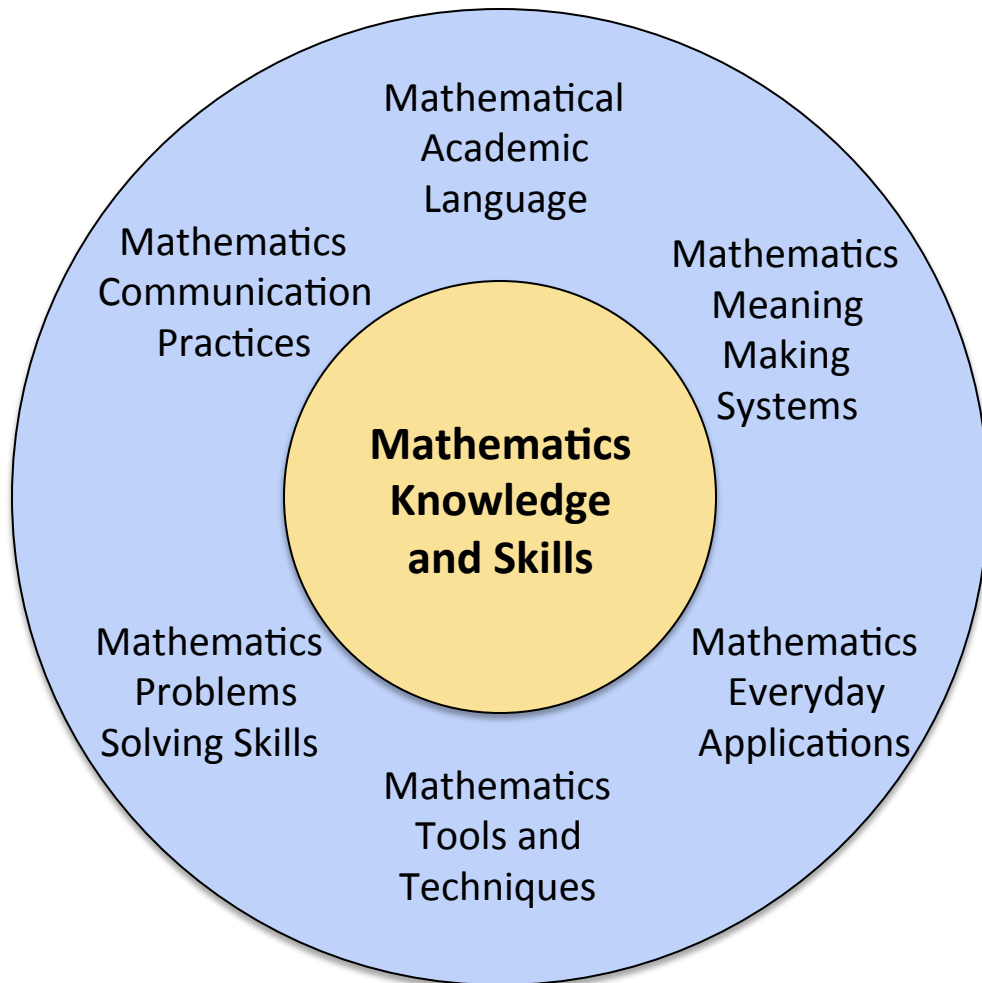


Teachers who teach Mathematics to ELLs have **MORE** work to do

They need **MORE** professional development support

The GOOD News...

To be successful learning and applying Mathematics knowledge and skills **ALL STUDENTS** need to learn and use...



The Mathematics Process standards acknowledge and emphasize the need of these skills!

TEKS Mathematics Process Skills

Students are expected to:

A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

The CHALLENGING news...

The process standards offer additional challenges to ELLs:

Academic Challenges:

- a) Learn content addressed.
- b) Learn about mathematical relationships.
- c) Learn problem solving skills.
- d) Learn to use tools and techniques.

Cultural Challenges:

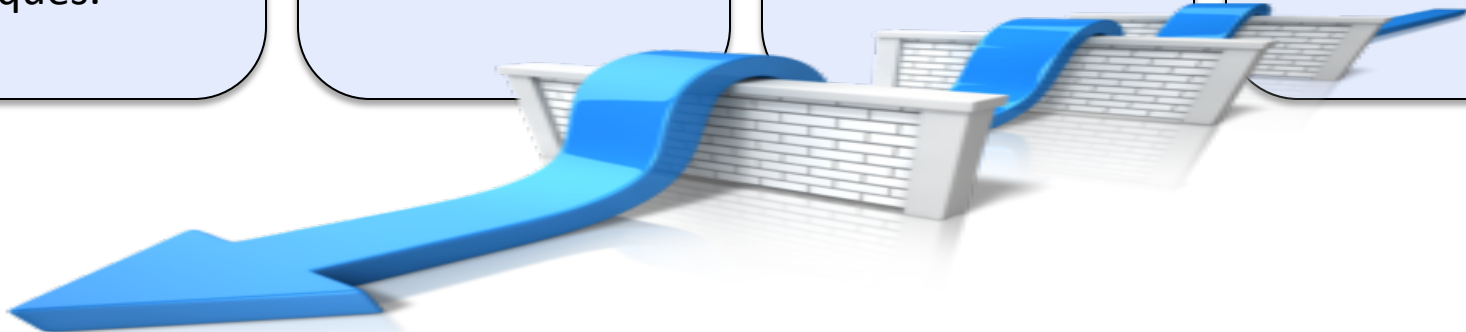
- a) Develop familiarity with expected processes and practices.
- b) Understand the U.S. “everyday” life, society, and workplace.

Linguistic Challenges:

- a) Develop English proficiency to understand information.
- b) Develop English proficiency to use language functions.

Semiotic Challenges:

- a) Integrate and interpret multiple representations to understand ideas.
- b) Integrate and use multiple representation to communicate ideas.



In this presentation...

We will focus on the development of Mathematical academic language because...

- a) Its proficiency is essential to learn mathematics
- b) It is complex and mostly learned in classrooms
- c) ELLs face multiple challenges learning it

We will discuss how teachers can support ELLs develop Mathematical academic language through their:

- **Instructional context**
- **Planning efforts**
- **Instruction delivery**
- **Assessment practices**



About the instructional context...

Teachers need to be able to offer an instructional context that promotes mathematical academic language development. In this contexts...

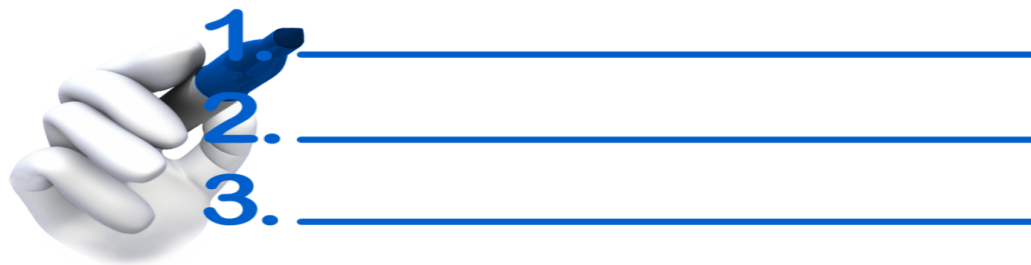


- a. ELLs feel frequently interact with the teacher and peers
- b. Learning activities are clearly introduced and concluded
- c. Learning activities offer enough exposure to new language
- d. Learning connections are promoted and made explicit
- e. Teacher uses clear speech volume, speed, and organization
- f. Teacher frequently confirms understanding during delivery

About the planning process...

Teachers need to be able to plan for mathematical academic language development. In this planning process, teachers...

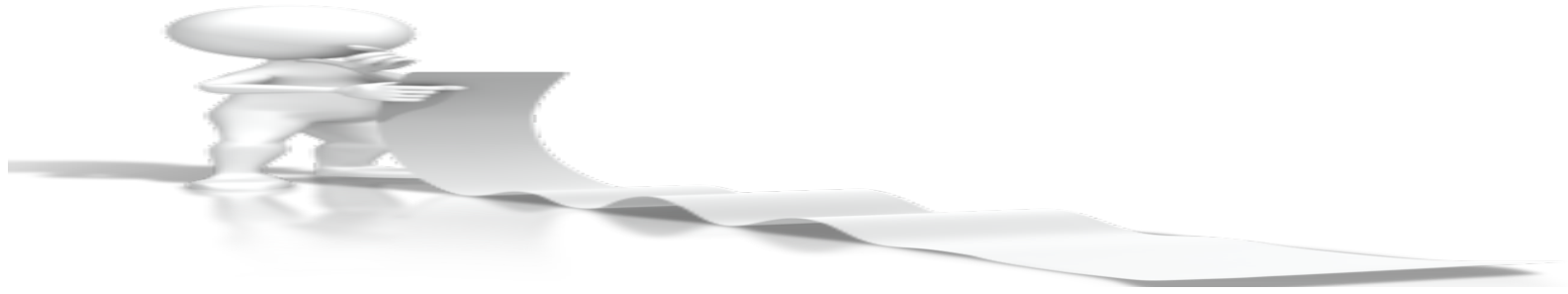
Goals



- a. Consider which words, sentences, and discourse are necessary to master in the mathematics lesson
- b. Identify clear, specific, and measurable language objectives that advance ELL students' language proficiency
- c. Plan to teach, model, practice, and formatively assess the language objectives during the mathematics lesson

About the complexity of the task...

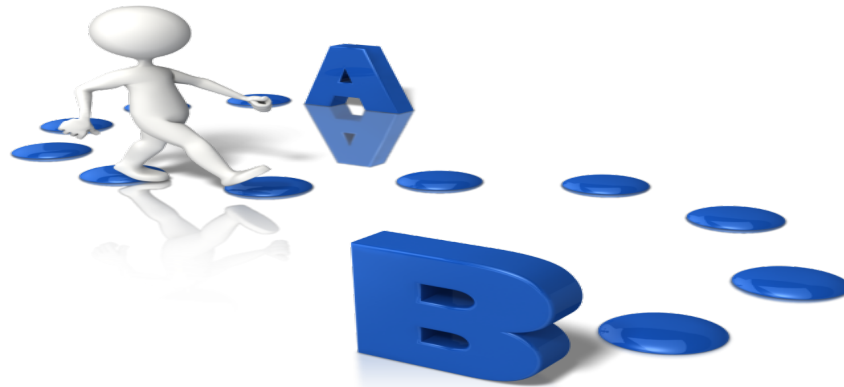
Teachers need to be able to consider the complexity of mathematical academic language including that it...



- Presents meaning through the interaction many semiotic systems (Lemke, 2003).
- Encodes meanings through economy and condensation (O'Halloran, 2005).
- Makes meaning based on implicit knowledge and principles (O'Halloran, 2005).
- Achieves argument cohesion through logical order (Solomon & O'Neill, 1998).
- Requires representation precision and communication clarity (Schleppegrell, 2010).
- Uses everyday language in usual and in unusual ways (Schleppegrell, 2010).
- Requires precise technical language to construct certain meanings (Schleppegrell, 2010)
- It is rarely learned outside the mathematics classroom (Schleppegrell, 2010).

About the lesson delivery process...

Teachers need to explicitly teach and model the use of the four language modes in Mathematics. They also need to offer multiple opportunities to practice these modes. For this purpose, teachers need to...



- a. Develop awareness in their use of language
- b. Get out of their current “literacy comfort zone”
- c. Promote listening for multiple learning purposes
- d. Teach clarification and conversation skills
- e. Read multiple sources for understanding
- f. Write to address different meaningful purposes

About the assessment process...

Teachers need to be able to formatively assess ELLs mathematical academic language development. For this purpose, teachers need to...



- a. Make the lesson language objectives explicit to ELL students
- b. Purposefully obtain information about ELLs' mathematical academic language understanding and use
- c. Reflect on the significance of ELLs' language information
- d. Offer ELL students' mathematical academic language feedback or adjust instruction to advance their proficiency

Thank you for the work that you do!

I hope that this information was helpful...



Please do not hesitate to contact me if you have any ideas, comments, or questions!

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