The Foreign Nature of Language in Your Classroom

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Background

- By 2030, ELLs are expected to compose 40% of the school-aged population (Guglielmi, 2012)
- Many teacher lack pedagogical skills needed to assist with academic content and language development (Freeman & Crawford, 2008; Lee, Lee, & Amaro-Jiménez, 2011)
- More than 90% of pre-service teachers in U.S. teacher education programs are white, middle class, with limited to no second language experiences (de Oliveira, 2011)

Background

- Teachers must understand and respond to linguistic challenges of **all students** (de Oliveira, 2011)
- Misconception: Math is a universal language of symbols and numbers requiring little to no language support
- Reality: Math is an academic language filled with specific vocabulary and symbols that have unique meanings in the discipline (Freeman & Crawford, 2008)

Study

- Series of problems requiring simultaneous manipulation of language and mathematics
- Problems which replicate challenges of ELLs and native English speakers with language deficiencies
- Recognition that students with communication barriers are often overlooked, tend to have lower test scores, increased risk for dropout, exhibit greater anxiety, have weaker social skills than counterparts (Freeman & Crawford, 2008)

Problems

- Martian for Beginners (Erickson, 1996)
- The Spanish Problem
- Magic with Mayan Math (Overbay & Bond, 2007)

Martian for Beginners

A Martian lands at the UN Building in New York and you're in charge of talking with it. Unlike a typical Sci-Fi moving alien, it only speaks Martian. Fortunately, your clues are scraps from the *Berlitz Martian-English Dictionary* and the *Comparative Martian-English Grammar*. Your group has to decipher the Martian's utterances and prepare appropriate responses. Who knows what might happen if you succeed?

Erickson, E. (1996). United We Solve: Math Problems for Groups. Eeps Media: Oakland, CA.

The Spanish Problem

Translation:

Two eagles, A and B, are flying 80 meters high. There is a distance/separation of 115 meters between them. A mouse appears, at some point on the line between the two of them, but on the ground. Eagle A is 100 meters from the mouse. If both eagles are flying at equal speed and the mouse remains still, which will catch it first?

Discussion

- Why do you think you were posed with these problems? What's the point?
- Discuss your experiences with these problems?
- What strategies did you use to solve the problems?
- Explain the role of language in your problem solving process.

Reflection

- What did you learn about yourself through this experience?
- How has this problem impacted your beliefs about the relationship between language and mathematics understanding?

Emerging Themes

- Interconnected nature of language and mathematics
- Explicit communication
- Collaborative problem solving
- Working within ZPD
- Empathy for others

Interconnected Nature of Language and Math

- "I didn't realize she was reading the problem."
- "I didn't listen much because I didn't know what she was saying."
- "It was a multitask problem. We not only had to solve the problem being asked, but we had to solve the [language] problem to know how to solve the math problem."
- "Mathematics is a language itself, so I will have studenst that learn better when I discuss a problem with them rather than having them [just] do the work. To fully understand a problem, students must be able to discuss where their answer came from and be able to prove their ideas."
- "All of these problems have greatly supported my belief that math and language go hand-in-hand. Much of math is about communication and convening information in an effective manner. Math is somewhat a language in itself and any student, ESL or not, can experience difficulties understanding math."

Explicit Communication

- "We thought that initially it was to focus on ELLs, but then we thought it was to help us explain our answers. You know, figuring out the words to explain what we were doing."
- "The problem helped me to realize the importance of communicating ideas clearly. People interpret things in different ways; therefore, as teachers we must be able to teach our students the importance of being open to different viewpoints. By talking the problem out, we were able to come to an agreement about how each of our ideas are connected."

Collaborative Problem Solving

- "... me staring at the paper is not going to make me all of a sudden understand it."
- "I need to take into account other factors in why students get a wrong answer [rather] than just the mathematics involved."
- "I learned how much I rely on my group to help me out."

Working in their ZPD

- "I realized that I would have given up pretty quickly if the second sheet wouldn't have been passed out. I learned that visual aids help me more than I thought. It gave me a clearer picture about what I was actually solving. [It] gave me a purpose for working."
- "Even though I knew the numbers and certain key words, it was essential that I had more resources in order to completely solve the problem."
- "I learned that I need to learn how to break down problems into small components when I don't understand initially. This is a skill I need to teach my students."

Developing Empathy for Others

- "I enjoy solving math problems. . . I have never really thought about how difficult math could be for ESL students."
- "I learned that I don't like having to work with any type of language barrier. I am fairly quick to give up and just quit that problem. I think if I were constantly in this position, I would probably just be very frustrated and not want to try."

Connections to SMP

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Questions

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