Stories & Technology: Gateways to Mathematics for All

Dr. Karen Terrell, University of Massachusetts Dartmouth
Dr. Dennis DeBay, University of Colorado Denver

MATSOL Annual Conference
Framingham, MA
May 31, 2018

Introduction Activity

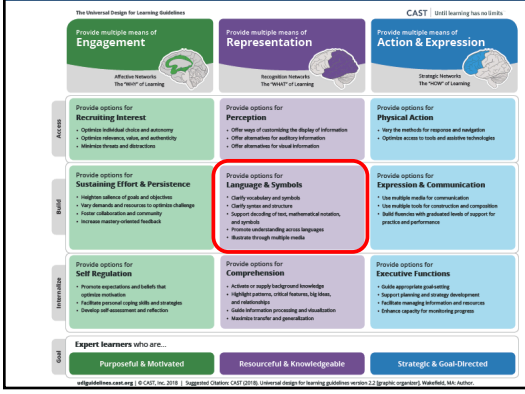
- Listen to the following story…
- Consider:
  - What kind of mathematics is being explored?
  - How is the language being addressed?
  - Why might the story medium be considered helpful?

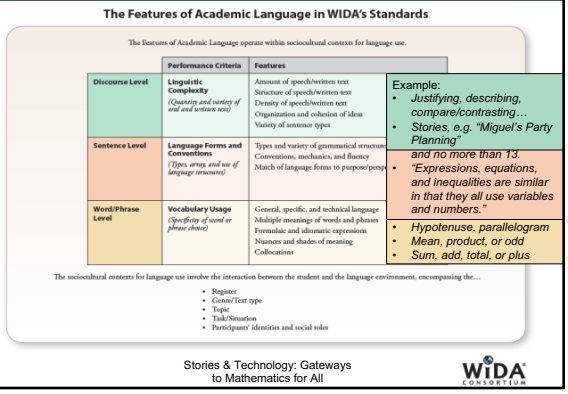
Agenda

- A sample story
- Our Guiding Framework: Universal Design for Learning
- Why use stories in mathematics?
- Why use technology in mathematics?
- Technology demonstrations
- Your turn!
- Q&A

Universal Design for Learning

- Teachers can offer feedback to students in a ubiquitous way beyond time and space constraints through use of technologies.
- Teachers can manage multiple means for representation and expression using multimedia resources
- Teachers can provide multiple means of engagement through use of technologies
- Teachers can design culturally relevant teaching for multilingual learners by addressing students' funds of knowledge





Why use stories in mathematics?

- "Mathematicians use language to make meanings and to share understandings." (Marks & Mousley, 1990, p.118)
- "Language gives students the means to talk about mathematics, record mathematical sentences, and clarify their feelings about mathematics… Literature is natural way to introduce a new concept." (Nevin, 1992, p.142)

Why use technology?

NCTM Position Statement (October 2011)

"It is essential that teachers and students have regular access to technologies that support and advance mathematical sense making, reasoning, problem solving, and communication. Effective teachers optimize the potential of technology to develop students' understanding, stimulate their interest, and increase their proficiency in mathematics. When teachers use technology strategically, they can provide greater access to mathematics for all students."

Why use technology?

WIDA Focus on Technology in the Classroom (2014)

"Well-selected tools can provide avenues for creation, expression, and the kinds of meaningful activities that facilitate academic language development, as well as frame various learner identities for ELLs. Different kinds of media afford different kinds of activity and interaction. Teachers can take advantage of different forms of media within a learning ecology, from traditional books to digital tools like creation apps, games, and interactive stories."

How can common technologies provide access?

- Text can be easily translated, summarized, highlighted, and converted to speech (Rao & Torres, 2017)
- Teachers are able to connect students with digital content through "smart supports," such as hyperlinks, graphics and animations, sequenced supports, and tools for expression and organization (Hitchcock, et al., 2002)

How can common technologies provide access?

- Instructional technology tools can reinforce higher-order thinking skills and constructivist learning environment (Schoenfeld, 1992)
- Integrating technologies in mathematics education develops students' motivation, higher-order thinking, researching skills, and communication among the peers and their school community (NCTM, 2000)

Technology Demonstrations

- Story: "Miguel's Party Planning"
- Platforms:
  - PowerPoint
  - UDL BookBuilder by CAST (bookbuilder.cast.org)

Your turn…

- Brainstorm with your group
- Complete story outline
  - Goformative.com
  - "Join Code"
  - **NMNHUQ**
- Share out!!!

Possible topics:
- Classification of triangles
- Linear equations or inequalities
- Quadratic functions
- Perimeter or area of polygons
- Special right triangles
- Systems of equations or inequalities
- Volume

Next steps…

- For you:
  - Complete our exit slip (GoFormative: **YAZANY**)
  - Upload and use your stories
    - Even have your students create their own! ☺
  - Share your stories and experiences!!!
- For us:
  - Incorporate your feedback
  - Continue to research

Q&A

- Karen L. Terrell, kterrell@umassd.edu
- Dennis J. DeBay, dennis.debay@ucdenver.edu

Resources

- Hitchcock, C., Mayer, A., Rose, D., & Jackson, R. (2002). Providing new access to the general curriculum: UDL. *Teaching exceptional children, 17*, 1-17.
- Marks, G. & Mousley, J. (1990). Mathematics education and genre: Dare we make the process writing mistake again? *Language and Education, 4*(2), 117-130.
- National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics.* Reston, VA: Author.
- National Council of Teachers of Mathematics. (2011). *Technology in Teaching and Learning Mathematics: A Position of the National Council of Teachers of Mathematics.* Reston, VA: Author.
- Nevin, M.L. (1992, November). A language arts approach to mathematics. *The Arithmetic Teacher, 40*(3), 142-146.
- Rao, K. & Torres, C. (2017). Supporting Academic and Affective Learning Processes for English Language Learners with Universal Design for Learning. *TESOL Quarterly*, *51*(2), 460–472.
- Schoenfeld, A.H. (1992). Learning to think mathematically: Problem solving, metacognition, and sense-making in mathematics. In D. Grouws (Ed.), *Handbook for Research on Mathematics* (pp. 334-370). New York: MacMillan.

A framework for exploring Language Development

Criteria	1	2	3	EVIDENCE/Examples
Language: Vocabulary Level				
Language: Sentence Level				
Language: Discourse Level				
Cognitive Demand				