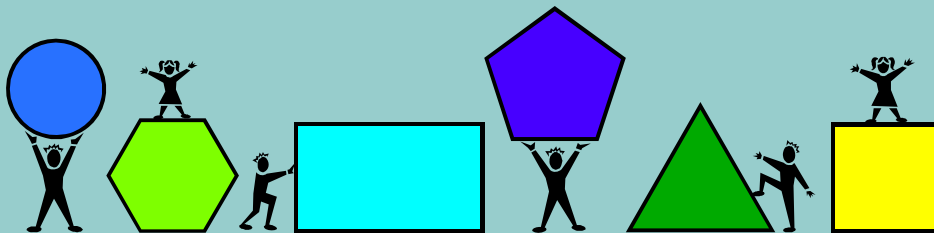


USING MANIPULATIVES AND GEOMETER'S SKETCHPAD TO HELP ENGLISH LANGUAGE LEARNERS DEVELOP MATHEMATICS VOCABULARY

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MELL Conference
July 31, 2008



Today's Agenda

- What Can Teachers Do
- Using manipulatives
 - Geometry activities
 - Measurement activities
- Using Geometer's Sketchpad

What Can Teachers Do

- Step 1 – find out where your students are in language development and mathematics knowledge
 - TELPAS ratings for each ELL student
 - Beginning and intermediate levels need more help
 - Mathematics diagnostics test or prior grade performance
- Step 2 – allow extra time for ELLs to practice saying and writing the language of mathematics
 - Reading, writing, listening, speaking
 - Incorporate into mathematics lessons and word problems

What Can Teachers Do

- Step 3 – Plan time for ELLs to discuss mathematics concepts and vocabulary with a partner
 - Speaking and listening
 - Accountable discourse
- Step 4 – Have students explain and justify their understanding of mathematical vocabulary
 - Both orally and in writing

What Can Teachers Do

- Step 5 – Intentionally teach vocabulary within the context of the mathematics lesson
 - Much more than just a language objective
 - Show multiple representations
 - Say the word, write the word, and associate a picture or diagram with the word
 - Use verbal scaffolding (Sheltered Instruction)
 - Paraphrasing – restate student's response to show correct vocabulary definitions
 - Think-alouds – show how you (the teacher) would define and use a mathematics word
 - Reinforce contextual definitions – an equilateral triangle, one with all sides and angles congruent

What Can Teachers Do

- Step 5 – Intentionally teach vocabulary within the context of the mathematics lesson (cont.)
 - Use the mathematical register
 - Say reflection not “flip” except to provide support
 - Have students say and write mathematical definitions as much as they can using their developing English skills
 - Write word problems using mathematical words, not conversational English (and then provide support)
 - Model vocabulary with manipulatives and pictures
 - Polydrons to learn classification of solids and to “see” surface area
 - Use geoboards, tangrams, color tiles, and snap cubes to “practice” the mathematical terms

What works for ELLs and struggling students

- Using technology for discovery and content reinforcement
- Visual support for mathematics concepts
- Working with a partner
- Hands-on activities
 - Doing mathematics

Use of Geometer's Sketchpad by Teachers

- Goal: to strengthen teacher content knowledge
- First step: become proficient with Geometer's Sketchpad
 - Tours
 - Lab tasks
 - Test items
 - Projects

SAMPLE LAB TASKS

- Construct a generic pentagon, measure the interior angles, and verify that the sum always stays the same. Are you using inductive or deductive reasoning?
- Construct an isosceles trapezoid and draw the two diagonals. Do the diagonals bisect each other, bisect the angles, meet at right angles, and are they congruent?
- Construct an equilateral triangle, using a method that was similar to the method we used when constructing a square.
- Use midsegments to show the relationship between the area formulas for triangles and trapezoids

SAMPLE TEST QUESTION

- Carrie wants to use Geometer's Sketchpad to show her students the difference between complementary and supplementary angles. Design an activity to do this and turn it in prior to taking the rest of your exam.

Use of Geometer's Sketchpad by Teachers

- Second step: create classroom lessons
 - Using sketchpad
 - Laboratory or classroom demonstration
computer – depending on sketchpad
availability
 - Examples

Use of Geometer's Sketchpad by Teachers

- Lessons to show
 - Tessellations
 - Angles in parallelograms
 - Transformations on coordinate grid

Use of Geometer's Sketchpad by Teachers

- Third step: class projects to deepen geometry understanding

Examples of student work

Feedback

- From pre-service teachers
 - I love the program!
 - It makes geometry come alive.
 - I will definitely use this in my classroom.
 - Sketchpad helps me “see” geometric concepts.

Feedback

- From in-service teachers
 - My colleagues were excited to hear that I am learning to use Geometer's Sketchpad and want me to share my ideas.
 - When I asked my principal, he said we had Geometer's Sketchpad but that no one knew how to use it. I told him that I did.
 - My mathematics department chair asked me to make a presentation at one of our staff meetings.
 - My co-teachers are afraid that they'll "have to learn something new – and I don't have time."

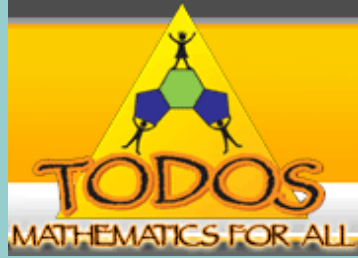
For More Information

www.tsusmell.org

– MELL project web site

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A national organization that supports equitable and high quality mathematics education for all students, with particular emphasis on Latino/Hispanic students.

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