

Connecting Algebra and Geometry for English Language Secondary Students

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Mathematics for English Language Learners
Conference, San Marcos, TX

July 7-8, 2006

Repeat session: Saturday, 9:00-10:30

Objectives of Presentation

- To model “connections” through classroom-tested activities that integrate algebra and geometry.
 - To help teachers explore properties of transformations (1-, 2-, and 3-dimension)
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Objectives (Cont.)

- To share ideas that can provide ELLs opportunities to
 - develop both communication skills and logical thinking.

 - become successful on objectives 6-8 of the TAKS.
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NCTM standards for Gr. 9-12

□ To develop a deeper understanding of the **fundamental** mathematical concepts of –

■ function and relation



■ Invariance

■ Transformation

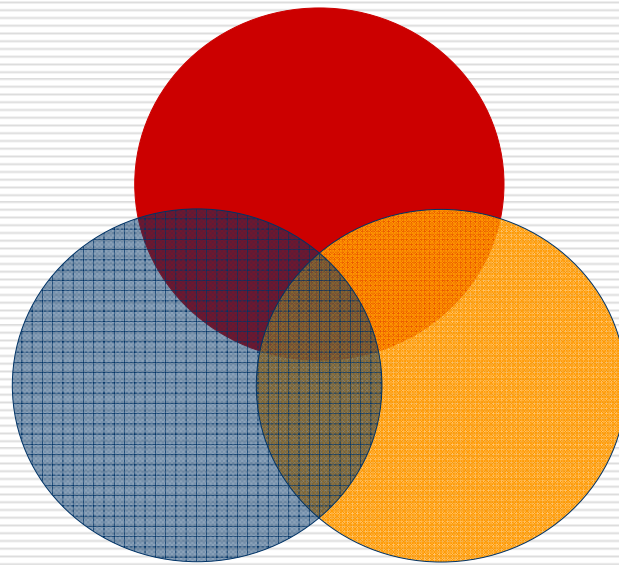


A Central Theme of the PSSM 2000

□ CONNECTIONS—

- Use instructional materials designed (intentionally) to weave together different content strands;
 - Make sure that math courses contain many integrative problems, solvable using a variety of methods (p.287-289).
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Geometry



Measurement

Algebra

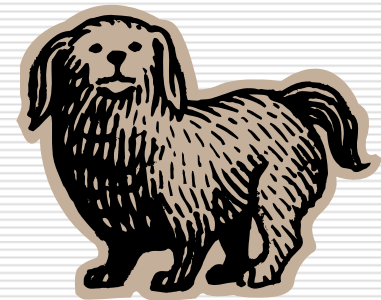
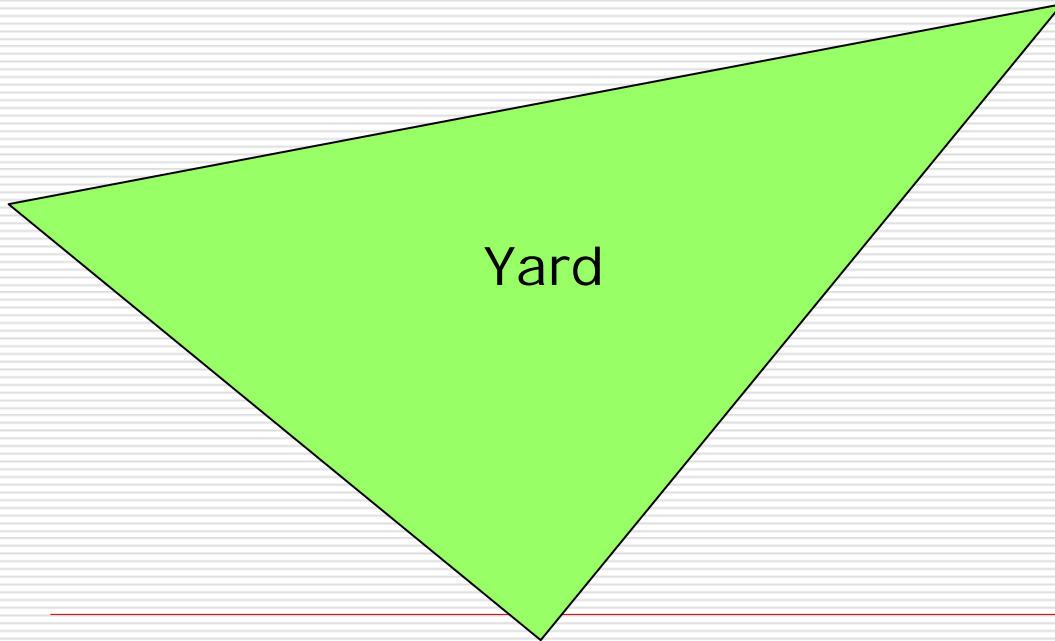
What should connections look like?

[small group sharing)



Sample of a problem that help make connections

The students in Mr. Alcantara's tenth-grade class was presented with a dilemma.



Fido

From PSSM 2000, p. 354.

I have a faithful dog and a yard shaped like a right triangle. When I'm away I want Fido to guard the yard. Because I don't want him to get loose, I want to put him on a leash and secure the leash somewhere on the lot. I also want to use the shortest leash possible, but wherever I secure the leash, I need to make sure that Fido can reach every corner of the lot.

Where do I secure the leash?

Help the ELLs “unpack” the language load

(group sharing)

Problem:

A piece of wire 16 inches is cut into equal pieces and soldered at the ends to form a square pyramid. What is the effect on the volume if the dimensions are doubled?

The problem is loaded

- What will you do to prepare the Math English Language Learner to be able to solve this kind of problem successfully?
 - How do you use this kind of problem to take the ELL to the higher order thinking?
-

How do you prepare the ELL to solve complex problems successfully without lowering the quality of the problem?

1. Build rich mathematics
vocabulary

2. Cut the long problems into chunks

3. Create a drawing/ illustrations/
diagram/ nets

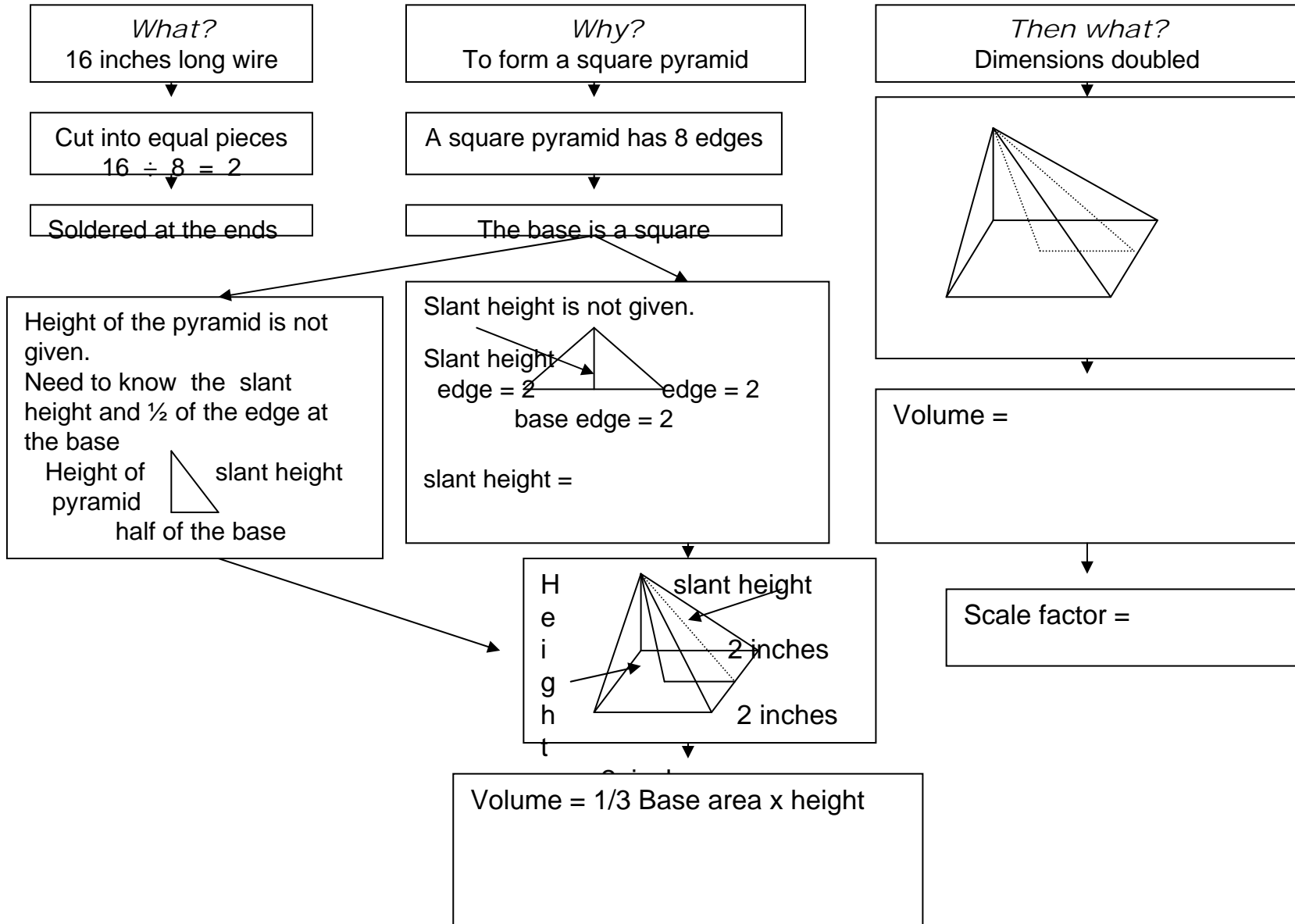
4. Solve the problem with guided questions

5. Dig prior knowledge or build an organized recall of prior knowledge

6. Use thinking maps

7. Create a problem solving map.

A piece of wire 16 inches long is cut into equal pieces and soldered at the ends to form a square pyramid. What is the effect on the volume if the dimensions are doubled?



How can teachers make the classroom more inclusive?

Suggestions by:

Miller & Endo (Kappan, June 2004, pp. 786-791)

Avila (Educational Leadership, Feb 2006)

Reduce the cognitive load

- Draw on prior knowledge and experiences
 - Take into account the capacities of students (e.g., content knowledge brought in varies)
-

Evaluate teaching strategies and approaches

- Classroom management styles maybe inconsistent with student's culture
 - Teach to both their strengths and needs
-

Reduce the cultural load

- Explain meanings, context, and how the English word is used.

(example: the word “yard” used in the dilemma problem)

Reduce the cultural load (cont.)

Include aspects of each student's culture (in the classroom) by___

- gathering information on the student (includes pronouncing names correctly)
 - treating with respect the learner's heritage, homes, and communities
 - building a personal relations with parents
-

Reduce the language load

- Carefully select words, phrases, and sentence structures that help learn rather than hinder success.

Help ELLs learn the academic English

(Rubinstein-Avila (Feb 2006, Educational Leadership))

- Combine visuals, verbal, and print cues (use multiple modalities);
 - Use lived experiences and prior or informal knowledge;
 - Allow for small group discussions in first language (to make sense of text).
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Help ELLs learn the academic English (cont.

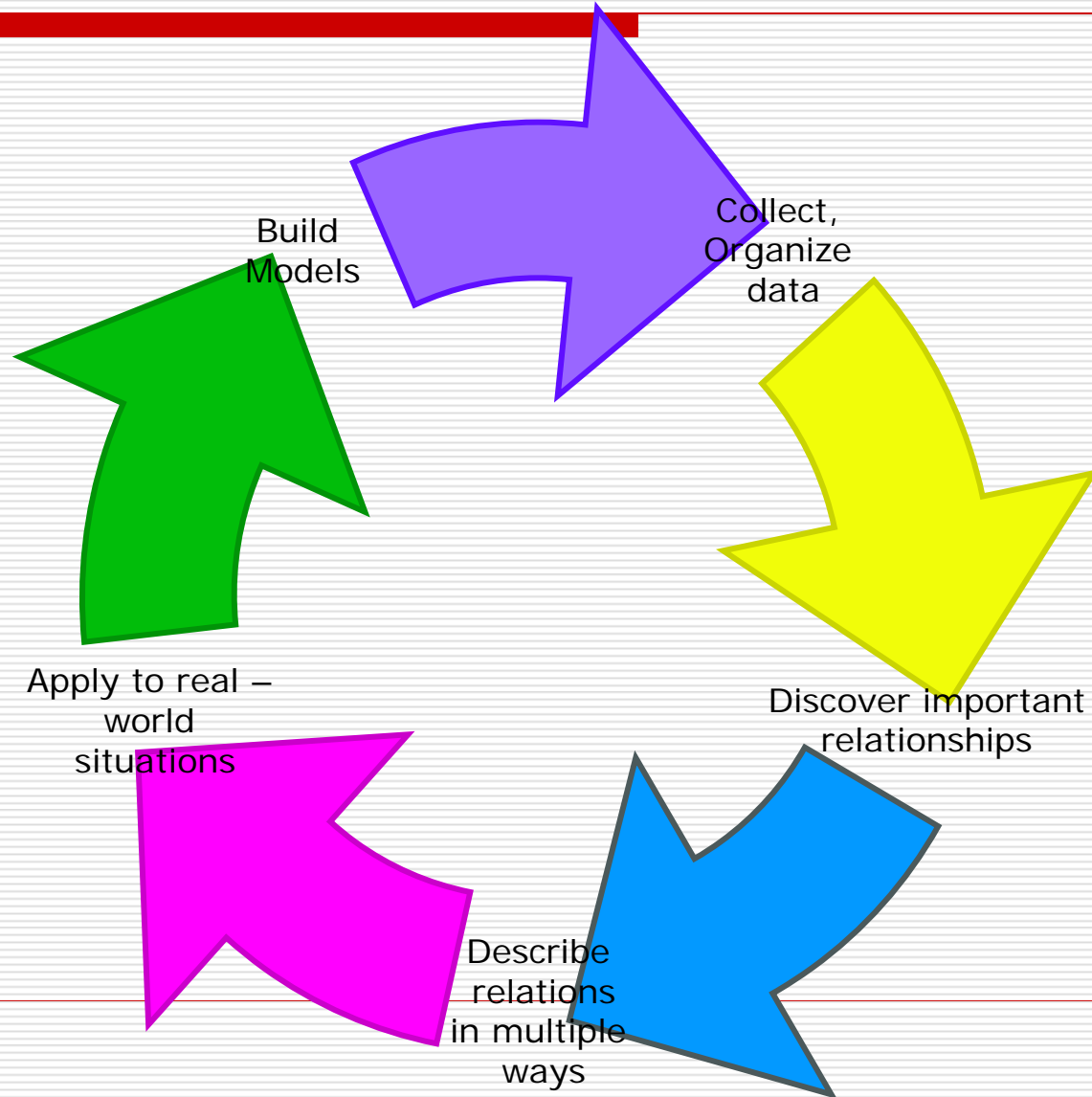
- Content-area cognates
 - Banco-bank
 - Meter-metro

 - Graphic organizers –visual devices that help access knowledge, tap into prior knowledge and/or relate concepts
 - Flowcharts
 - Timelines
 - Venn diagrams
-

A lesson plan using sheltered instruction

- (See handout lesson plan format)
-

Instruction to Engage ELLs



What is “Sheltered Instruction” for ELLs?

Teachers use instructional modifications or procedures that accommodate a range of abilities and language levels.

(Sonia White-Soltero, 2004, pp. 96-97)

Instructional Modifications (cont.)

- Adjusting speech
 - Using language in context; for meaning
 - Breaking directions into chunks
 - Checking for understanding regularly
 - Employing multi-sensory vocabulary building scaffolds (try to avoid idiomatic expressions)
-

Instructional Modifications (cont.)

Scaffolding techniques in math class
adapted from Echevarria, Vogt, &
Short, (2004)—

- Providing the much needed support and assistance in the early phase of instruction and then decreasing the amount of support later on.
-

Instructional scaffolding (cont.)

A. Verbal

- Paraphrasing
- Using think-alouds
- Reinforcing contextual definition

□ Examples:

- “Fido, my beloved dog”
 - “Aborigines, the natives living in Australia..”
-

Instructional scaffolding (cont.)

B. Procedural

Apply

Practice

Model

Teach

increase independence



Questioning

According to Echevarria, Vogt, & Short (2005), on average, teachers ask 80,000 questions.

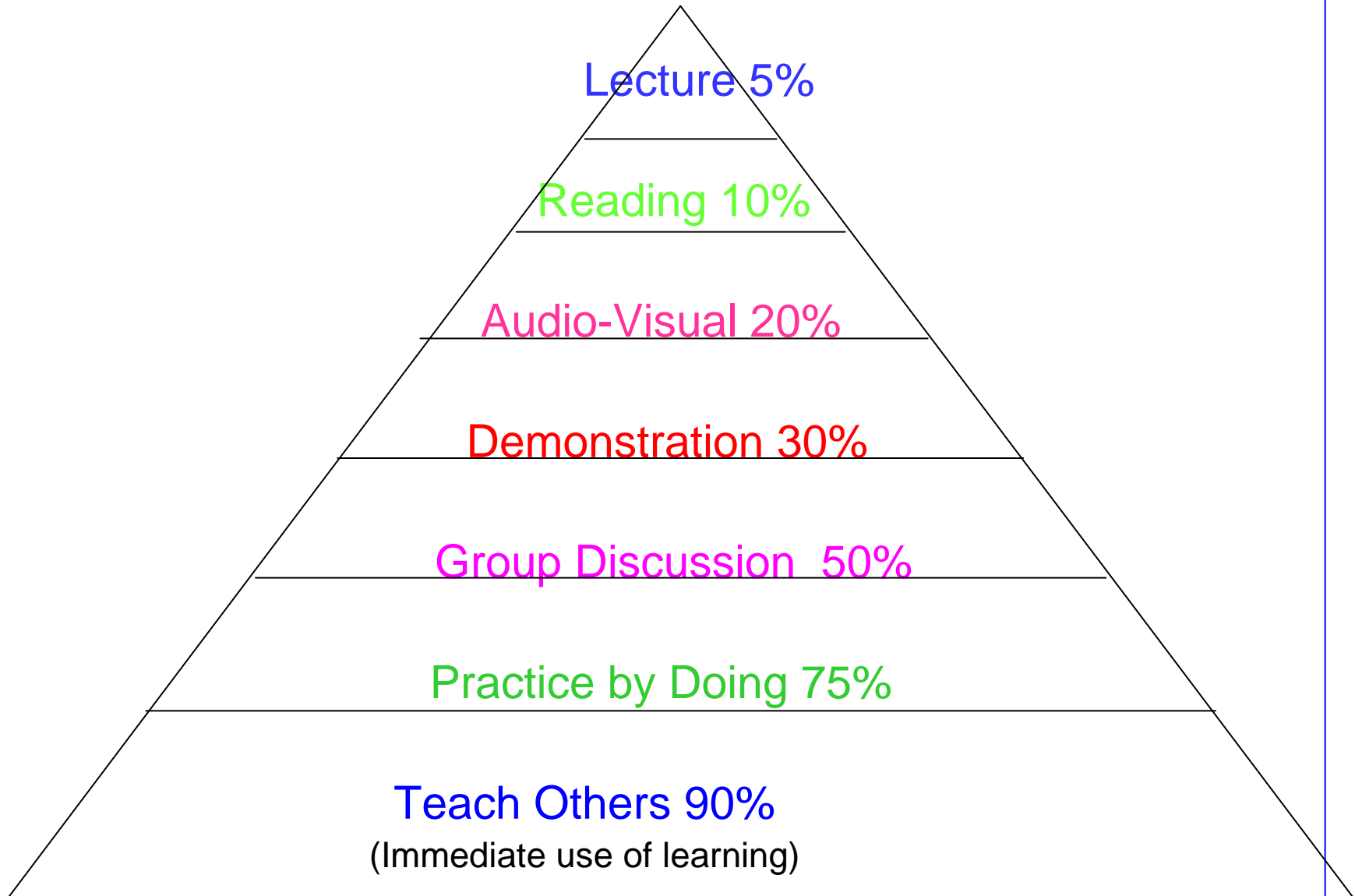
- 80% are at the **knowledge** level
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Reduce language demands and still ask higher-order questions

a.) Which of 3 shapes will be good for tiling your kitchen? Why?

b.) Can we use circular shapes for tiling?

The Learning Pyramid



Closing Statement

*"We owe our students (e.g., ELLs) **nothing less than** a high degree of quantitative literacy and mathematical knowledge that prepares them for citizenship, work, and further study."*

(NCTM, 2000, p. 289)

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