PROBLEM-BASED LEARNING: A TRANSFORMED PERSPECTIVE FOR STANDARDS-BASED GEOMETRY

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Common Core Standards for Mathematical Practice

Eight Standards for Mathematical Practice
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.

http://www.corestandards.org/the-standards/mathematics/introduction/standards-for-mathematical-practice/

Definition of Problem-Based Learning

An approach to curriculum and pedagogy where student learning and content material are (co)-constructed by students and teachers through contextually-based problems in a discussion-based classroom where student voice, experience, and prior knowledge are valued in a non-hierarchical environment.

(Schettino, 2010)

The Classroom and Curriculum

- Physical Set Up of Room
- Student Presentation of Problems
  - Variety of methods
- Discussion of Solutions and Alternate Solutions
  - Keeping in Mind Classroom Values
  - Fostering the practice of Common Core Standards
- Technology Labs for Discovery or Enrichment
- Teacher Scaffolding of Learning Objectives

Why is this different?

- Problem-Based
- Discourse Driven by Students
- Spiraled and Parallel Topics
- Built on Prior Knowledge
- Student Construction of New Knowledge
- Multiple Representations
- Assessment Variations
- Ownership of New Knowledge via Journaling

Problem Purposes

- reviewing material from past courses
- triggering prior knowledge for an upcoming problem
- inspiring construction of new knowledge
- introducing new terminology
- practicing a new skill
- challenging the more able students (differentiated instruction)
- seeing the same new idea from a different representation

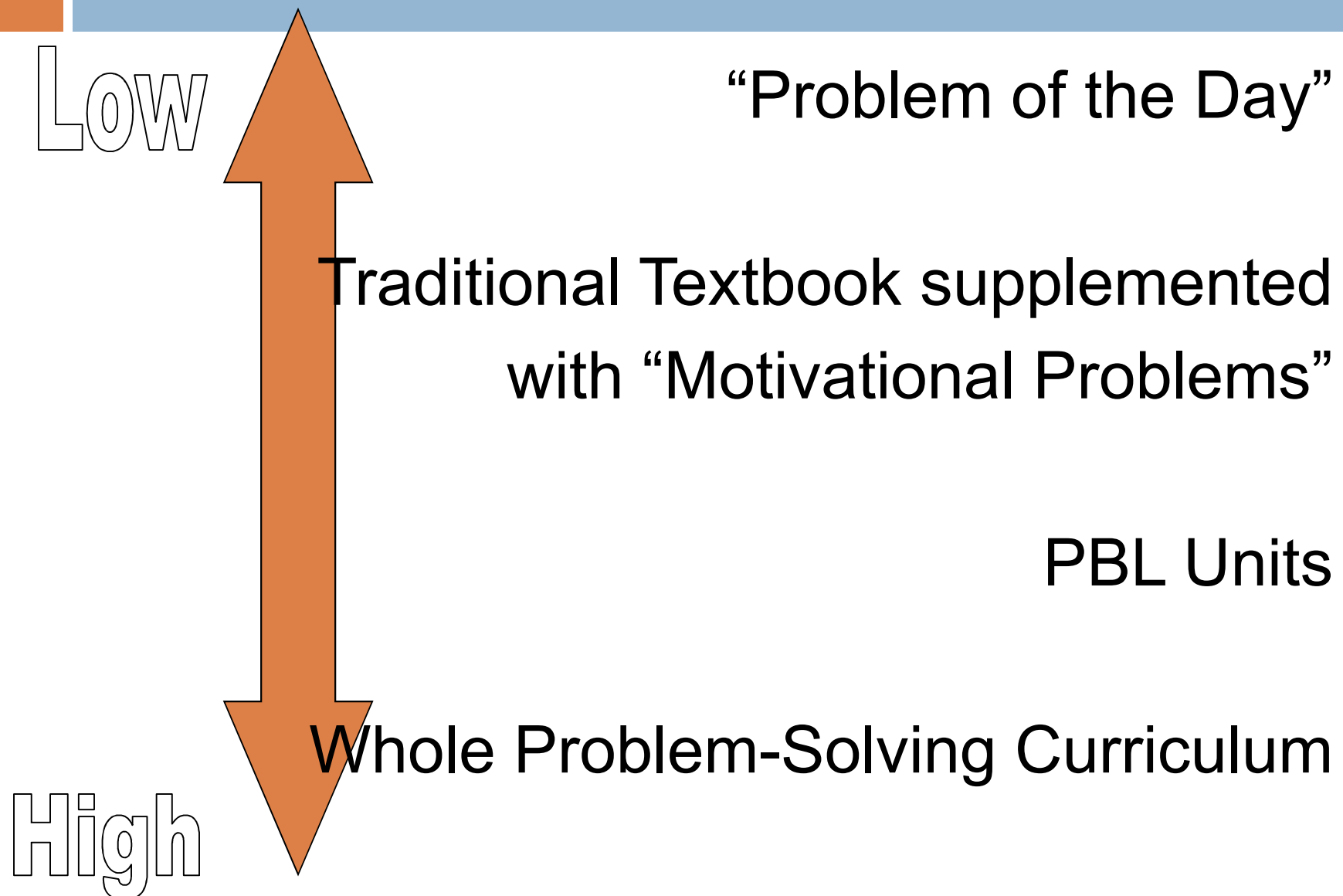# Right Triangle Trig – Multiple Perspectives

To the nearest tenth of a degree, how large are the congruent angles of an isosceles triangle that is exactly as tall as it is wide?

Right Angles – Multiple Perspectives

Let $A = (3, 2)$, $B = (1, 5)$, and $P = (x, y)$. Find x- and y-values that make ABP a right angle. Describe the configuration of all such points P.

Find coordinates for the vertices of a *lattice rectangle* that is three times as long as it is wide with none of the sides horizontal.

Integrating PBL in your Classroom

Low

High

"Problem of the Day"

Traditional Textbook supplemented with "Motivational Problems"

PBL Units

Whole Problem-Solving Curriculum

Proof

Given regular hexagon BAGELS, show that SEA is an equilateral triangle.

If the diagonals of a quadrilateral bisect each other, then the figure is a parallelogram. Prove that this is so. What about the converse statement?

The diagonals of a parallelogram always bisect each other. Is it possible for the diagonals of a trapezoid to bisect each other? Explain.

References

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- Solar, C. (1995). An inclusive pedagogy in mathematics education. *Educational Studies in Mathematics, 28*(4), 311-333.

- Our Curriculum can be accessed at my website at www.carmelschettino.org and at a geometry course link http://community.emmawillard.org/Math/Schettino/index.htm or directly by using this url **http://tinyurl.com/2djncvb**