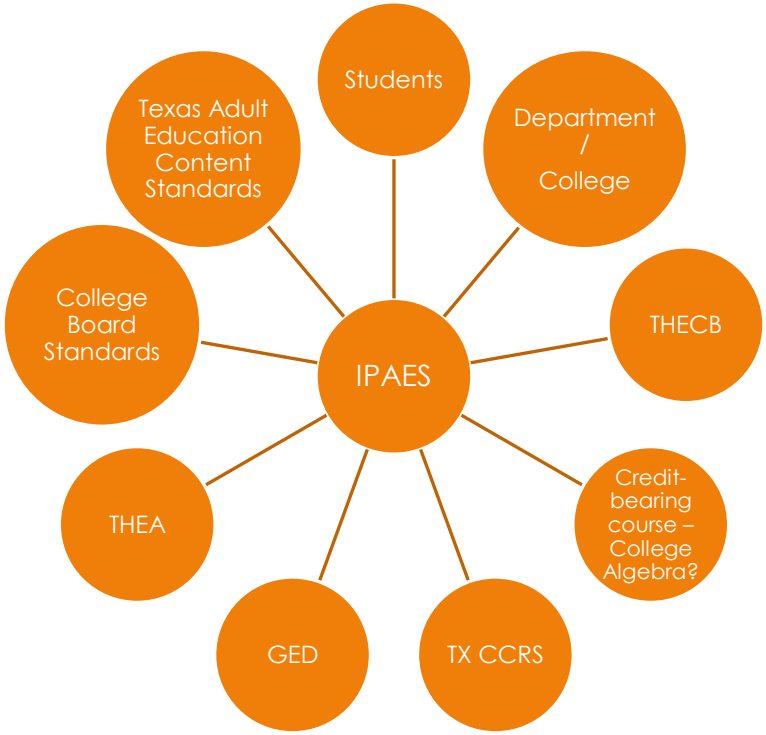
THECB IPAES Mathematics

Dr. Selina Vásquez Mireles
Texas State University – San Marcos

Agenda

- Review "Rock and a Hard Place" and "Diamond in the Rough"
- Revisit Texas CCRS – Math Alignment Charts
- Discuss Bloom's Taxonomy
- Investigate Texas CCRS – Math from a Bloom's perspective
- Discuss instructional models that address emerging themes
- Discuss a sample course outline
- Conduct sample lessons

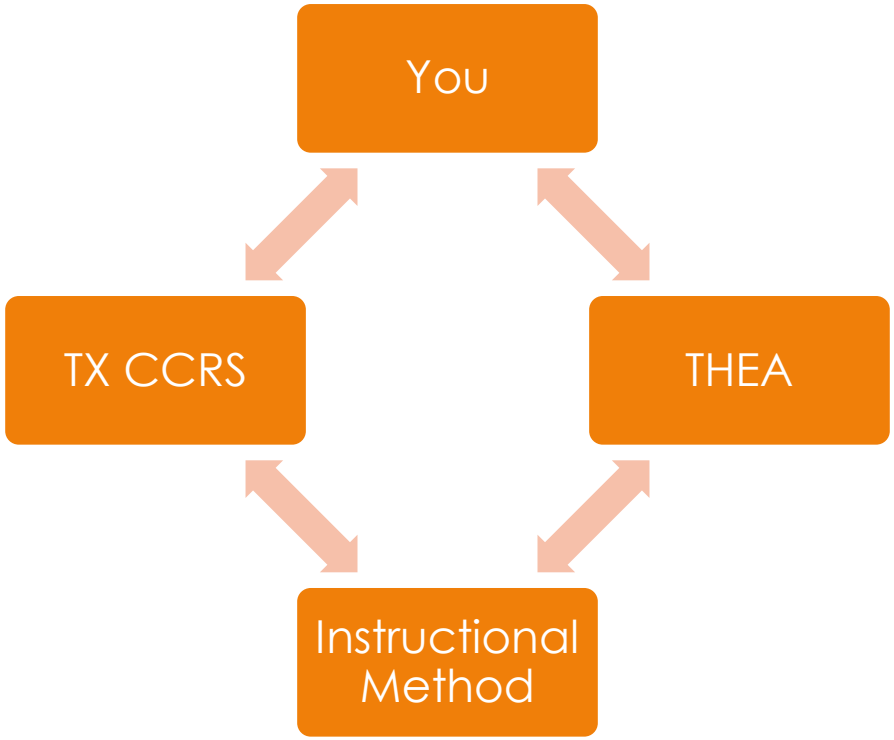
Rock and a Hard Place



Rock and a Hard Place

- Students
- Department/College
- THECB Definition
- AMATYC Crossroads
- Credit-Bearing Course – College Algebra?
- Texas College and Career Readiness Standards
- GED
- THEA
- College Board Standards
- Texas Adult Education Content Standards and Benchmarks for ABE/ASE and ESL Learners

Diamond in the Rough



Intensive Program for Adult Education Students Alignment to Texas College and Career Readiness Standards

Tx CCRS Alignment 1-4-2012.docx

Bloom's Taxonomy

- Verbs added later
- Domains: cognitive, affective, & psychomotor
- Lower: knowledge; higher: comprehension, application, analysis, synthesis

- http://www.llcc.edu/LinkClick.aspx?fileticket=%2F0BA4qIDaAE%3D&tabid=3938

Bloom's Taxonomy Activity

- TX CCRS Digital Key.xlsx

Instructional Models

- Reasoning
  - Concrete, Representational, Abstract
- Connections
  - Cultural Relevance Rubric
  - Math & Literacy
- Problem Solving
  - Algorithmic Instructional Technique

Concrete → Representational → Abstract

Numerical → Expressions → Equations → Functions

$\frac{1}{2}$ $\frac{1}{X}$ $\frac{1}{X} = 5$ $f(x) = \frac{1}{X}$

[1] Mireles, S. V., Rahrovi, S. R., & Vásquez, F. (2010). Culturally relevant mathematics. In S. Mayo & P. J. Larke (Eds.), *Integrating multiculturalism into the curriculum: From the liberal arts to the sciences*. Manuscript submitted for publication.

Curriculum Choices

Cultural relevance

Cultural Relevance	Types	Excellent	Good	Satisfactory	Unsatisfactory	Absent
Typical	History					
	Applications					
Suggestions	Exploit the idea that science provides the cultural disciplinary context for mathematics					
	Aim for conceptual connections					
	Frame concepts in a real-world context					
	Diversify the diversity through multiple cultural ties					
Personalization	Experiential					
	Responsive					
Mathematics Culture						

Math & Literacy

- Notation
- Symbol
- Lemmas/Theorems/Corollaries/Axioms/ Postulates/Definitions
- Proofs
- Solutions
- Word Problems

Instructional techniques Algorithmic Instructional technique

Four Phase Algorithmic Instructional Technique

Modeling

- The instructor models the creation and use of algorithms, including various algorithms for one problem. The instructor stresses that algorithms may be unique while still conveying the same underlying concept. The instructor also notes that algorithms are not a “cookbook” approach to mathematics; algorithms are a product of observation, inductive reasoning, and investigation among others.

- Discuss scientific and standard notation. Show examples of scientific notation and standard notation and discuss how to get from one to the other. Derive the algorithms using their conjectures. Discuss the reversibility of these algorithms. Apply the algorithms to real-world practice problems.

Instructional techniques Algorithmic Instructional technique

Four Phase Algorithmic Instructional Technique

Practice

- The instructor provides several opportunities for the students to get guided practice in creating and implementing algorithms. This includes group work, board work, and handouts.

- Discuss distance of a number from zero using a number line. Introduce absolute value notation. Use whole-class discussion to investigate these types of absolute value equations and decide on an algorithm. Apply the algorithm to real-world practice problems. Pose the question of representing distance between any two numbers on the number line and use it to fuel an additional lesson similar in structure.

Instructional techniques Algorithmic Instructional technique

Four Phase Algorithmic Instructional Technique

Transition

- The instructor continuously relinquishes responsibility to the student. The instructor's role becomes that of a facilitator. Feedback is still provided but not until students produce a final product or at least make several attempts at creating and implementing algorithms. Group work is an important element of this phase.

- Students form four groups. Each group is assigned a specific probability problem that provides a shell for inductive reasoning that results in the development of an algorithm. One member from each group forms a new group; each member of the new group presents his/her problem, explains his/her reasoning, and discusses the algorithm. Apply the algorithms to real-world practice problems.

Instructional techniques Algorithmic Instructional technique

Four Phase Algorithmic Instructional Technique

Independence

- The instructor provides the students with many opportunities to illustrate their algorithmic capabilities. The instructor provides a supportive environment. All aspects of problem solving such as strategies, real-world applicability, and an integrated curriculum are heavily emphasized.

- From real-world problems involving addition, subtraction, multiplication, and division, calculate both an exact and estimated solution. Discuss the relationship between both results. Apply rounding to the exact solution. Compare and contrast estimating and rounding. Develop strategies for identifying when and how to use previously developed and used estimation algorithms including term identification such as “about” and “approximate” and types such as using nice numbers, and using compatible numbers, averaging, and front-ending.

Course Outline

- Sample

Sample Lessons

Last Updated: 12/05/2011