Moving Students from Arithmetic to Algebra…one step at a time

Instructor: Max Ray

In this course we will examine a continuum of student work from the Math Forum's Problems of the Week archive. Selected work will include a range of examples from "not knowing how to start" to "It's perfect. What could I possibly say to her?" We will consider specific ways to move students' thinking along this continuum. We will experience assisting students in:

- Analyzing a problem quantitatively
- Using mathematical representations
- Recognizing generalization in these representations

Course Goals

We hope this course helps you:

- Enhance your enjoyment of problem solving
- Develop an awareness of the rich mathematical possibilities in contextualized problems
- Learn more about the continuum from arithmetic to algebra
- Expand your experiences with student thinking
- Participate in an ongoing community of problem solving teachers

Course Requirements

The course will take place online using Blackboard. Participants will need to have:

- Computer with Internet access

The course will consist of six one-week sessions that each begin on Wednesday morning and end Tuesday night. It will cover the cycle of three pre-algebra problems. Participants will have some flexibility within each week but are expected to complete the initial round of activities by Saturday midnight of each week and the responsive activities by Tuesday midnight. The schedule was created so that all work could be done on the weekend of the traditional American work week (*Saturday* for the Saturday deadline and *Sunday* for the Tuesday deadline). The responsive portion is dependent on everyone posting by Saturday night. The Tuesday night is more flexible. We can make arrangements for anyone not following the traditional American work week. AND, of course, those who are able to logon daily always get a little more out of the course.

Initial work: Much of the value of the course will come from sharing ideas among the group. On odd numbered weeks, you will be presented with a mathematical problem. You will be asked to:

- Share all the things you notice about the given scenario.
- Ask clarifying questions you have about the scenario.
- Attempt to solve the problem--list any assumptions you need to make to solve the problem

On even numbered weeks, you will be presented with archived student solutions to the same problem scenario. You will be asked to:

- State what you think the student understands
- State something you think the student does NOT understand
- Create a question that might provide more information about their thinking
- Create a question that might help the student to learn something past what s/he already knows.

Responsive Work: During this time, we will work as a group to consider all the different mathematical observations, strategies, and representations created by our classmates as well as the things we notice and questions we create for students. This is the time in the course where we make connections among the mathematical topics and glean the richness of the problems.

Credit

Participants who successfully complete the course activities will receive a Certificate of Completion from the Drexel University School of Education indicating they have completed 15 hours of Professional Development.

Course Outline

Week 1 – Focusing on the mathematics.

Activities:

- *Horsin' Around* Problem
- Read "Focusing on the Mathematics"
- "Focusing on the Mathematics" discussion
- Review *Horsin' Around* thinking
- Revising our thinking around *Horsin' Around* Problem

Week 2 – Focusing on the mathematics of the students.

Activities:

- Analyzing student thinking to *Horsin' Around* Problem
- "Focusing on the Mathematics" discussion continued
- Review analysis of student thinking to *Horsin' Around* Problem
- Revising our analysis of student thinking to *Horsin' Around* Problem

Week 3 – Initial Thoughts to Mathematical Representations

Activities:

- *Peeling Potatoes* Problem
- Read "Initial Thoughts to Mathematical Representations"
- "Initial Thoughts to Mathematical Representations" discussion
- Review *Peeling Potatoes* thinking
- Revising our thinking around *Peeling Potatoes* Problem

Week 4 – Initial Thoughts to Mathematical Representations in Student Thinking

Activities:

- Analyzing student thinking to *Peeling Potatoes* Problem
- "Initial Thoughts to Mathematical Representations" discussion continued
- Review analysis of student thinking to *Peeling Potatoes* Problem
- Revising our analysis of student thinking to *Peeling Potatoes* Problem

Week 5 – Moving Toward Abstraction

Activities:

Pumpkin Carving for Charity Problem
Read "Moving Toward Abstraction"
"Moving Toward Abstraction" discussion
Review *Pumpkin Carving for Charity* thinking
Revising our thinking around *Pumpkin Carving for Charity* Problem

Week 6 – Moving Toward Abstraction in Students Thinking

Activities:

- Analyzing student thinking to *Pumpkin Carving for Charity* Problem
- "Moving Toward Abstraction" discussion continued
- Review analysis of student thinking to *Pumpkin Carving for Charity* Problem
- Revising our analysis of student thinking to *Pumpkin Carving for Charity* Problem

In addition to these activities, there are always discussions that emerge from the work of the individual group in the course. There will be flexibility to delve into issues that are brought forth and elicit high levels of interest.