Modular Math 115 (Elementary Algebra) Course Redesign

Motivation for Course Redesign

- Many students come into Math 115 knowing a little algebra. The course may move too slowly for them at first, giving them a false sense of confidence and fostering casual study habits.

- On the other hand, our 15-week elementary algebra course moves too quickly for many students, who may have failed a yearlong algebra course several times in high school.

- Research shows that only 10% of students who get a C in a developmental course ever pass the next course, and only 40% of those who get a B.

- "Increasing the amount and frequency of feedback to students is a well-documented pedagogical technique that leads to increased learning. … Students learn math by doing math, not by listening to someone talk about doing math." (National Center for Academic Transformation-NCAT http://www.center.rpi.edu)

- "Any large introductory course taught by multiple instructors faces the problem of "course drift," especially when the instructors are adjunct faculty members." (NCAT)

Redesign Plan

Our plan is based on the Emporium model developed at the University of Virginia and implemented successfully at a variety of institutions nationwide, and specifically at Foothill College in Los Altos. (Attached see a description of the Emporium model from NCAT, the course description from Foothill, and an endorsement of the redesigned course at Foothill from their Dean, Peter Murray.)

We plan to break the course into small pieces, or modules, that students can cover at their own pace (with plenty of guidance and a detailed suggested schedule for successful completion in one semester.)

The modular format is designed for active learning. "Lectures…are replaced with an array of interactive materials and activities that move students from a passive note-taking role to an active-learning orientation." (NCAT) This format should also give students more control over the pace at which they cover the material, and encourage them to take more responsibility for their own learning. If students cannot finish the course in one semester, but do complete a specified number of modules, they could opt for an Incomplete and continue the following semester.

Course Structure

We are organizing the material into approximately ten modules (see preliminary table of contents attached.) A module would consist of a pretest, four or five lessons with worksheets for in-class practice, a sample test, and a suggested schedule. There would also be homework problems delivered and graded by computer. We will prepare the modules, which students can purchase at the Bookstore at cost. They will not need to purchase a textbook.

Study skills will be incorporated into lessons as part of the course. We will base the study skills activities on the lessons designed by the department and already in use in our Learning Communities and the ASAP algebra course. We are asking that students enroll concurrently in a 1-unit study skills class, and to extend the class-meeting time from our 5-unit schedule to fill the entire time block for a total of 6 units.
When students finish the assignments in the module, they take a sample test on the computer, and if they pass the sample test, are given a ticket allowing them to take the in-class module test. These tests would require mastery at 80 or 85%.

Students who do not pass the module test would be required to complete a second set of worksheets and computer drill problems before attempting the module test again. Perhaps every third module test could be cumulative, and serve as a midterm.

Because Pierce does not have a testing center to accommodate self-paced courses, we plan to handle testing as follows. Module tests would be offered twice weekly, on Tuesdays and Thursdays, with one or more of the modular classrooms used as the test room, and one of the modular team serving as proctor. All students who are eligible to take a module test would report to the test room and be given the appropriate module test. Tests would be returned to the respective instructor of record for grading. Students who don't wish to take a test on that day would report to one of the remaining classrooms for class as usual.

Delivery
The course is team taught by five instructors. Each instructor is responsible for the grading and record keeping for the students on his or her roster. However, all modular sections meet at the same time in adjacent rooms, and students may attend class in any of those rooms, depending on which module they are studying.

Class meetings concentrate on group work, practicing the skills on the modular worksheets. Instructors may also offer short mini-lectures as needed. At least one classroom will keep to a schedule that allows students to finish the course in one semester, but others will work ahead or behind to accommodate different students. Students working on the same module could be formed into groups if they wish. Obviously, daily coordination between the modular team instructors will be necessary to plan scheduling and room allocation.

To facilitate active learning, we are asking for a student tutor for each classroom. Tutors help instructors interact with students individually or in small groups and assist with organization and logistics, as students move from one setting to another. "Students need human contact…to assure them that they are on the right learning path. An expanded support system…is critical to persistence, learning, and satisfaction." Tutors are also crucial for checking the steady stream of worksheets and quizzes that provide students with immediate feedback. "Shifting the traditional assessment approach toward continuous assessment is an essential pedagogical strategy. … Low-stakes quizzes motivate students to keep on top of the course material, structure how they study, and encourage them to spend more time on task."

Timeline
The modularized Math 115 course serves as the elementary algebra component of our departmental MAP (Mediated Algebra Project). We hope to create a smooth transition from Math 115 to Math 125 (Intermediate Algebra). We will be class-testing the MAP Math 125 with its computer component for the first time in Fall semester, 2009, and are eager to prepare a suitable prerequisite course in Math 115. Because the developmental math courses are heavily sequential, we can assess the success of our efforts more precisely by monitoring both courses. In addition, preparing all students adequately to tackle the new graduation requirement of Math 125 is a pressing concern.
We have a team of instructors ready to implement a pilot version of Modular Math 115 in Fall semester 2009. We will be writing the materials and fine-tuning our plan during the preceding spring and summer.

**Preliminary Table of Contents**

**Module 1  Quantitative Literacy**
- Lesson 1  Place Value and Rounding
- Lesson 2  Decimals and Percents
- Lesson 3  Fractions
- Lesson 4  Unit Analysis

**Module 2  Algebraic Expressions**
- Lesson 1  Operations on Signed Numbers
- Lesson 2  Expressions with One Operation
- Lesson 3  Order of Operations
- Lesson 4  Expressions with Two Operations

**Module 3  Linear Equations**
- Lesson 1  Linear Equations and Inequalities
- Lesson 2  Like Terms and the Distributive Law
- Lesson 3  Linear Models
- Lesson 4  Ratio and Proportion

**Module 4  Graphing**
- Lesson 1  Intercepts
- Lesson 2  Slope
- Lesson 3  Slope-Intercept Form
- Lesson 4  Point-Slope Form

**Module 5  Linear Systems**
- Lesson 1  Solution by Graphing
- Lesson 2  Substitution and Elimination
- Lesson 3  Applied Problems
- Lesson 4  Parallel and Perpendicular Lines

**Module 6  Exponents and Roots**
- Lesson 1  Exponents
- Lesson 2  Roots
- Lesson 3  Using Formulas
- Lesson 4  Laws of Exponents

**Module 7  Products and Factors**
- Lesson 1  Binomial Products
- Lesson 2  Easy Factoring
Lesson 3  Special Products and Factors
Lesson 4  Harder Factoring

Module 8  Quadratic Equations
Lesson 1  Extracting Roots
Lesson 2  Solution by Factoring
Lesson 3  Quadratic Formula
Lesson 4  Graphing Parabolas

Module 9  Algebraic Fractions
Lesson 1  Multiplying and Dividing
Lesson 2  Adding and Subtracting
Lesson 3  Equations with Fractions
Lesson 4  Negative Exponents, Scientific Notation

Module 10  Radicals
Lesson 1  Simplifying
Lesson 2  Adding and Subtracting
Lesson 3  Multiplying and Dividing
Lesson 4  Equations with Radicals