

## Los Medanos College

### Measuring the Impact of Professional Development: Two Case Studies

#### Common aspects of professional development:

Teaching Communities in Elementary and Intermediate Algebra met weekly for a year with similar focus:

- Design backwards from Student Learning Outcomes
- Develop common final exam questions aligned with SLOs
- Develop learning activities to foster achievement of SLOs

#### Contrasting aspects of the professional development:

	Elementary Algebra	Intermediate Algebra
<b>Development and use of learning activities</b>	Individual instructors developed and shared activities; participants used what appealed to them; activities posted on Bb	Instructors identified gaps in their texts relative to SLOs, individual instructors wrote problems to address SLOs, editor pulled problems into an activity that was used by all; a coherent packet of 27 activities
<b>Follow-up</b>	Well-attended monthly retreats; instructors chose focus for the semester, e.g. CAI, discussion of NRC's How Students Learn Math in the Classroom, mastery quizzes	Pre-semester assessment of final exams with instructors who had just taught the course and those planning to teach the course; revision of activities based on assessment results and instructor feedback; production of a packet for sale in the bookstore.

#### Impact on learning:

Based on an analysis of a random sample of final exams across sections

Percent proficient or better		
	FA 03 N=23	FA 06 N=36
Communication	57%	39%
Problem-solving	39%	39%
Multiple-Reps	61%	32%

Percent proficient or better				
	FA 04 N=32	SP 05 N=30	FA 05 N=32	SP 06 N=28
Communication	81%	77%	83%	82%
Problem-solving	69%	73%	90%	89%
Multiple Reps	59%	80%	80%	82%

#### Plausible factors contributing to improvements or declines in learning:

	Elementary Algebra	Intermediate Algebra
<b>Planning</b> Analysis of activities; % of instructors using activities or other materials aligned with SLOs	75% of TC activities focused on Skills SLO. FA 06 assessment: 33% of instructors submitting student work used TC activities; weak alignment of other instructional materials with these 3 SLOs	Communication, PS, and MR integrated throughout all activities. For each final exam assessment 100% of instructors submitting student work used TC activities; strong alignment of texts/CAI with these 3 SLOs
<b>Teaching</b> Analysis of exams; Instructor reflection	Weak alignment of exams with SLOs; only a few instructors using TC exams. Instructors reported not knowing how to incorporate TC activities into their class.	Instructors reported in each assessment that at least 50% of class time devoted to TC activities

#### Next steps:

SP 07: Retreats for Elementary Algebra instructors focused on pedagogy that promotes problem-solving  
 SU 07 : Feedback from recent Elementary Algebra retreats and assessment results used to develop a new set of class activities with an accompanying instructors' manual

FA 07: "Users" group will meet weekly to conduct a pared-down version of the Japanese Lesson Study

**Los Medanos College  
Developmental Math Program's Student Learning Outcomes**

1. **Communication Outcome:** Students will read, write, listen to, and speak mathematics with understanding:
2. **Problem Solving Outcome:** Students will use mathematical reasoning to solve problems and a generalized problem solving process to work word problems.
3. **Multiple Representations Outcome:** Students will demonstrate the ability to use verbal, graphical, numerical, and symbolic representations of mathematical ideas.
4. **Applications Outcome:** Students will recognize and apply math concepts in a variety of relevant settings and demonstrate the math skills and knowledge necessary to succeed in subsequent courses.
5. **Effective Learner Outcome:** Students will demonstrate the characteristics of an effective learner.

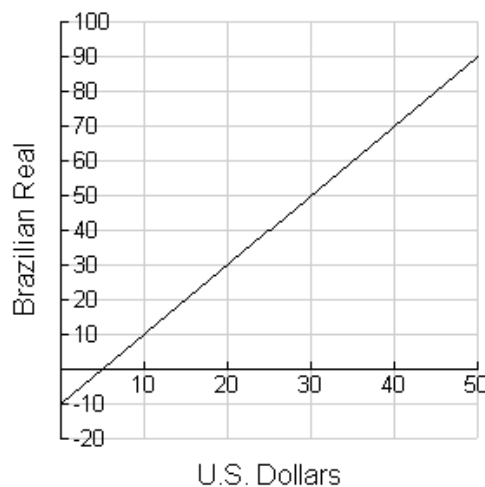
**Sample problems aligned with these SLOs 1-3 above:**

**Elementary Algebra**

1. On January 1, 2008, the minimum wage in California is increasing to \$8.00 an hour. The federal government defines a family of four as “low income” if they make \$30,975 or less a year. A man and a woman living in California with two children both earn this new minimum wage and work full-time. Are they considered “low income” by the federal government? Support your answer with clear mathematical reasoning. (If you don't have all of the information you need, describe assumptions you are making in order to work the problem.)

2. This graph shows the currency exchange that Scott received at a local bank on his trip to Brazil in spring of 2007.

- a. What is the slope of the line?
- b. What does the slope mean in this context?
- c. Did the bank charge a fee for exchanging Scott's money? If so, how much? How do you know?
- d. Find an equation that models this situation. Clearly define your variables.
- e. Scott sets up the proportion show below to figure out how many Real he will get if he exchanges \$50. Show that the proportion does not give the right answer. Then explain WHY it doesn't work.



$$\frac{\$50}{x \text{ Real}} = \frac{\$25}{40 \text{ Real}}$$

## Intermediate Algebra

1. Recall the problem on Thomas Malthus, the British economist and clergyman who hypothesized that as the British population exceeded the food supply, mass starvation would occur.

The table below is based on Malthus' calculations with years from 1800.

Year	0	5	10	15	20	25	30	35
Population of England in millions	7	8.04	9.23	10.59	12.16	13.96	16.03	18.4

- According to Malthus' calculations, how long does it take the population of England to double? Based on your answer, write an algebraic model using fractional exponents for the population of England. Define the variables.
- By what percent does the population of England grow every 5 years? Based on your answer, write another algebraic model using fractional exponents for the population of England. Define the variables.
- Find a regression model for this data. Define your variables. What is the yearly percent growth in your regression model?
- Use what you have learned today to reconcile these models. In other words, explain why these models are equivalent or not equivalent.

2. You are the head of the marketing division of a large company. Marketing research has shown that the company's annual profit,  $P$  in thousands of dollars, is related to the amount spent on advertising,  $x$  in hundreds of thousands of dollars, by the quadratic function  $P = f(x) = 230 + 20x - 0.5x^2$ . The CEO of the company is willing to spend up to four million dollars on advertising this year. What advice do you have for the CEO? This CEO likes very precise information. He always wants very succinct advice, but he is also interested in the "whole picture". While he may not be interested in the details of your analysis, he insists on full documentation in case he later wants to review the facts. Write a report that gives clear advice for the CEO and fits the above specifications.