

## SOMETHING OLD AND SOMETHING NEW: STRATEGIES FOR WORKING WITH UNDERPREPARED STUDENTS IN THE FIELD OF MATHEMATICS

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## BACKGROUND

- Shippensburg University
  - Public University in South Central PA
  - Approximately 6600 undergraduates and 1000 graduate students
  - Formally teaching Developmental Mathematics since Fall 2003
  - Classes of 20 – 25 students taught by mathematics department faculty and adjuncts

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## BACKGROUND

- Four Units
  - Arithmetic/Fractions
  - Linear Equations/Word Problems
  - Lines and Graphing
  - Polynomials and Factoring
- Pre-Test, [Departmental Unit Exams](#), Final
- Elayn Martin-Gay [Introductory Algebra](#) with MyMathLab

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## BACKGROUND

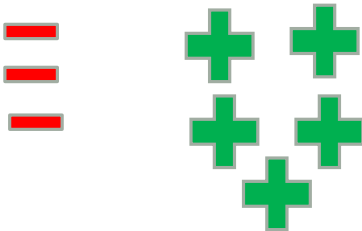
Semester	3-credit		
	n	pass	%
Fall 2007	122	98	80%
Spring 2008	29	23	79%
Fall 2008	185	150	81%
Spring 2009	34	23	68%
Fall 2009	187	145	78%

Pass rates on first attempt only.

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## PICTURES, CHARTS AND OTHER VISUAL AIDS

$$-3 + 5$$



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## PICTURES, CHARTS AND OTHER VISUAL AIDS

- Using a Number Line
- Building a Multiplication Table from Scratch
- Illustrating a Word Problem with a Picture
- Using a Grid for Polynomial Multiplication

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## PICTURES, CHARTS AND OTHER VISUAL AIDS

- It is NOT enough to demonstrate various methods of illustration.
- The first battle is breaking old habits.
- Visual aids will help build number sense over time.

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## INTERVENTION

- Pre-Test Opportunity and Introductory Emails
- Post-Test Interviews
- Advisor Reports
- Pre-Registration for College-Level Math Courses

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## PRE-TEST DATA

Semester	# Passed
Spring 2010 – Start	5
Fall 2009 – Start	10
Spring 2009 - Middle	3
Spring 2009 - Start	1
Fall 2008 - Start	9
Spring 2008 - Middle	4

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## PERCENT OF STUDENTS TAKING A COLLEGE-LEVEL MATH CLASS IN THE SUBSEQUENT SEMESTER

	TOTAL	FIRST %
Fall 2003	34	76%
Spring 2004	102	71%
Summer 2004	21	14%
Fall 2004	21	52%
Spring 2005	69	81%
Summer 2005	20	40%
Fall 2005	46	87%
Spring 2006	80	90%
Fall 2006	154	90%
Spring 2007	20	85%
Fall 2007	99	97%
Spring 2008	24	92%
Fall 2008	137	92%
Spring 2009	27	96%

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## READING SKILLS

Total - cohorts				Total - college-wide			
MAT102	209	105	50%	MAT102	1591	1165	73%
MAT105	260	191	73%	MAT105	605	459	76%
MAT120	280	174	62%	MAT120	605	401	66%
MAT170	203	109	54%	MAT170	339	250	74%
MAT110	116	97	84%	MAT110	531	507	95%

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## READING SKILLS

- Sample Word Problems in Developmental Math
- Alex had \$210 in his bank account at the beginning of the month. During the month, he deposited a check for \$260 from his grandmother, but had to withdraw \$160 to pay for textbooks. How much money was in his account at the end of the month?
- In a math class there are 28 women and 45 men. On the first test 13 women and 4 men scored a passing grade. What percent of the men scored a passing grade? (Round to the nearest whole percent.)

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## READING SKILLS

- Sample Word Problems in Applied Statistics
- A Harvard Medical School study used 22,000 male physicians to test whether aspirin use helped avoid heart attacks. The method of deciding whether a person would receive aspirin or placebo was made by flipping a coin. Eleven thousand of the doctors were assigned to take aspirin and eleven thousand took the placebo. The researchers found that 0.9% of the doctors taking aspirin and 1.7% of the doctors taking the placebo suffered a heart attack during the study. They then used statistical methods to predict that if all male physicians could have participated in this study, the percentage would have been lower for those taking aspirin.
  - Specify the aspect of this study that refers to design.
  - Specify the aspect of this study that refers to description.
  - Specify the aspect of the study that refers to inference.
  - Is this an experiment or an observational study?

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## READING SKILLS

- Deconstructing a Paragraph
- Reading a Math Textbook
- Looking for Key Words
- Noting Key Formulas
- Paying Attention to Units
- What is the question?

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## CLEARLY DEFINE GOALS AND EXPECTATIONS

- Journals
  - Automathography
  - Reading an Article
  - MLK Day Appreciation Assignment
- Mathematics Journals
- Showing Work
- Homework Review/Questions
- Lecture Guides
- If it is IMPORTANT it should be worth SOMETHING

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## LEARNING COMMUNITIES AND GROUP WORK

- Example Assignments
  - [Linear Patterns and Follow-Up](#)
  - [Introduction to Regression](#)
- Cautions
  - Classroom Limitations
  - Student Concerns
  - Flexibility
  - Ability to Moderate Effectively
  - Accountability

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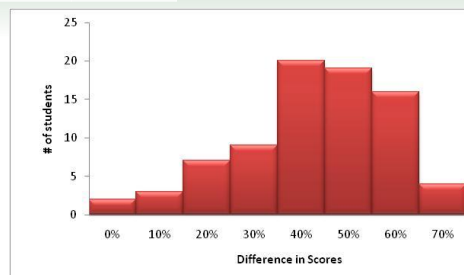
## FREQUENT ASSESSMENTS

- Daily Quizzes
- Online Homework
- Turn-It-In Assignments
- Pre-Test, Unit Exams, Final
- Keeping a Consistent Schedule
- Clearly Denoting Practice versus Graded Assignments

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MIN	2%
MAX	73%
MEAN	47%
MEDIAN	48%

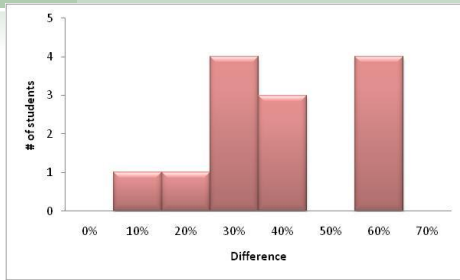
## FALL 2008



Dr. Kimberly Presser - Shippensburg University - January 2010

MIN	15%
MAX	68%
MEAN	45%
MEDIAN	40%

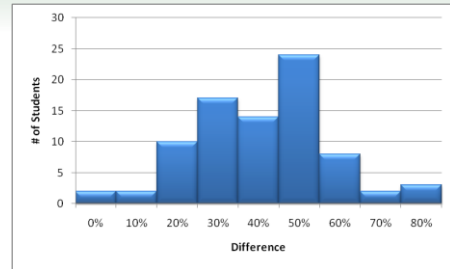
## SPRING 2009



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MIN	5%
MAX	88%
MEAN	43%
MEDIAN	43%

## FALL 2009



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## MASTERY LEARNING

- Mastery Learning vs. Self- Paced
- Setting a Time Frame for Mastery
  - Two Weeks of Retakes
- Daily Goals
  - Attendance/Daily Quizzes
- Opportunities for Recovery
  - Final Exam

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## “IS IT REASONABLE?”

- Making an Initial Estimation
- Multiple Approaches
- Checking the Solution
- Polya Problem Solving

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## BENEFITS TO MEMORIZATION

- And inefficient rather rapidly blends into ineffective, because when it takes you too long and uses too much working memory to do the basic skills, you can't keep track of the higher skills you're supposed to be learning in your current grade.

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Aimee Yermish, "Why Memorize Math Facts"

## BENEFITS TO MEMORIZATION

- The ability to instantly recall basic number facts is an essential preskill, necessary to free up the mind, first for mastery of the standard algorithms of multidigit computation, and next for mastery of fractions. Then, once this knowledge is also instantly available in memory, the mind is again free to focus on the next level, algebra.

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Bill Quirk, "The Truth about the Revised NCTM Standards"

## BENEFITS TO MEMORIZATION

- Students who leave eighth grade not knowing how to compute with fractions enter high school as remedial math students. Students who leave high school lacking proficiency with fractions are inadequately prepared for college mathematics. On the most recent trend NAEP, both age groups were less proficient at computing with fractions than in 1982, twenty years ago.
- The lack of progress in computation skills has disproportionately affected African-American students.

Tom Loveless, "Trends in Math Achievement: The Importance of Basic Skills"

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## VARIED LEARNING STYLES AND TEACHING MODES

- Learning Styles  
(<http://www.ldpride.net/learningstyles.MI.htm>)
  - Visual Learners
  - Auditory Learners
  - Tactile/Kinesthetic Learners
- Help Students to Self-Reflect
- Be Honest about Subsequent Courses

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## FOSTER IN CLASS PARTICIPATION

- Paired Boardwork
- Turning Technologies Clickers
- Regular Q & A
- Being Available for One on One Questions During Class

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## EFFECTIVELY USING TECHNOLOGY

- Standard Calculators
- Graphing Calculators
- Online Assessment

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## ANY QUESTIONS OR COMMENTS?

- Contact me for more information:

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