“USING EXPERIMENTS TO TEACH MODELING AND PROBLEM SOLVING”

THE AMERICAN MATHEMATICAL ASSOCIATION OF TWO-YEAR COLLEGES (AMATYC)

41st ANNUAL CONFERENCE
NEW ORLEANS, LA

ED GALLO

SINCLAIR COMMUNITY COLLEGE
DAYTON, OH

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NOVEMBER 19, 2015
OVERVIEW

- BACKGROUND
  SINCLAIR AND COURSES

- WHY EXPERIMENTS

- COMMON CORE STANDARDS FOR MATHEMATICAL PRACTICE

- MODELS
  LINEAR
  QUADRATIC

- Q & A
BACKGROUND

- SINCLAIR COMMUNITY COLLEGE, DAYTON, OH (23,000+ STUDENTS)

- DEV 0020/0022 BASIC MATH I/II
- DEV 0024/0026 INTRO TO ALG.
- MAT 1270 ELEMENTARY ALG.
- MAT 1370 INTERMEDIATE ALG.

FOR PRE-SERVICE, ELEMENTARY SCHOOL TEACHERS

- MAT 1410 NUMERICAL CONCEPTS
- MAT 1420 PROBABILITY/STATISTICS
- MAT 1430 GEOMETRY/MEAS.
THE TEACHER PREP MATH COURSES

MAT 1410
Numerical Concepts for Teachers
(4 sem. cr. hrs.)

Problem solving, sets, functions, numeration systems, whole numbers, basic number theory, integers, rational numbers, and real numbers.
MAT 1420
Algebra and Data Analysis for Teachers
(4 sem. cr. hrs.)

Linear and quadratic functions, linear inequalities, modeling data with functions, probability concepts, descriptive statistics, and basic inferential statistics.
MAT 1430
Geometry and Measurement for Teachers
(4 sem. cr. hrs.)

Basic two -and three-dimension geometric concepts, basic constructions, congruence, similarity, concepts of measuring lengths, areas, and volumes, transformations of two-dimensional figures, and symmetries
THE TEACHER PREP MATH COURSES

4 SEMESTER HOURS
(DISCUSSION/ACTIVITIES)

SCHEDULE
TUE./THURS.

10 TO 25 STUDENTS PER SECTION
WHY USE EXPERIMENTS?

- ACTIVE LEARNING
- REINFORCES MATERIAL COVERED IN DISCUSSION
COMMON CORE STANDARDS FOR MATHEMATICAL PRACTICE

THE STANDARDS FOR MATHEMATICAL PRACTICE DESCRIBES VARIETIES OF EXPERTISE THAT MATH EDUCATORS SHOULD SEEK TO DEVELOP IN THEIR STUDENTS
STANDARDS FOR MATHEMATICAL PRACTICE

MP1) MAKE SENSE OF PROBLEMS AND PERSEVERE IN SOLVING THEM.

MP2) REASON ABSTRACTLY AND QUANTITATIVELY.

MP3) CONSTRUCT VIABLE ARGUMENTS AND CRITIQUE THE REASONING OF OTHERS.
STANDARDS FOR MATHEMATICAL PRACTICE

MP4) **MODEL** WITH MATHEMATICS.

MP5) **USE APPROPRIATE TOOLS STRATEGICALLY.**

MP6) **ATTEND TO PRECISION.**
STANDARDS FOR MATHEMATICAL PRACTICE

MP7) LOOK FOR AND MAKE USE OF STRUCTURE.

MP8) LOOK FOR AND EXPRESS REGULARITY IN REPEATED REASONING.
MP1) MAKE SENSE OF PROBLEMS AND PERSEVERE IN SOLVING THEM

-- EXPLAIN MEANING OF THE PROBLEM.

-- ANALYZE GIVENS, CONSTRAINTS, RELATIONSHIPS, AND GOALS.

-- PLAN A SOLUTION PATHWAY.

-- TRY SIMPLER FORMS OF THE ORIGINAL PROBLEM.

-- MONITOR AND EVALUATE PROGRESS.

-- CHECK ANSWERS BY USING A DIFFERENT METHOD.

--ASKING - DOES THIS MAKE SENSE?
MP4) MODEL WITH MATHEMATICS

-- **APPLY MATH** TO SOLVE EVERYDAY PROBLEMS.

-- **WRITE AN EQUATION** TO DESCRIBE A SITUATION.

-- **MAKE ASSUMPTIONS AND APPROXIMATIONS** TO SIMPLIFY A COMPLICATED SITUATION.

-- **INTERPRET** THEIR MATHEMATICAL RESULTS.

-- **REFLECT** ON WHETHER RESULTS MAKE SENSE.

-- **IMPROVE THEIR MODEL** IF NECESSARY.
USING EXPERIMENTS

HOW HIGH DOES IT GO?

-- ANALYZE THE PROBLEM
-- MAKE A CONJECTURE
-- COLLECT DATA
-- COMPARE WITH CONJECTURE
-- DEVELOP A LINEAR EQUATION
-- COMPARE WITH OTHER GROUPS
-- EXPLAIN WHAT YOU LEARNED
USING EXPERIMENTS

HOW BIG DOES IT GET?

-- ANALYZE THE PROBLEM
-- MAKE A CONJECTURE
-- COLLECT DATA
-- COMPARE WITH CONJECTURE
-- DEVELOP A QUADRATIC EQUATION
-- COMPARE WITH OTHER GROUPS
-- EXPLAIN WHAT YOU LEARNED
USING EXPERIMENTS

SUMMARY

QUESTIONS
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