



# **“USING EXPERIMENTS TO TEACH MODELING AND PROBLEM SOLVING”**

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

***41<sup>ST</sup> ANNUAL CONFERENCE  
NEW ORLEANS, LA***

**ED GALLO**

**SINCLAIR COMMUNITY COLLEGE  
DAYTON, OH**

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**NOVEMBER 19, 2015**



# OVERVIEW

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- **BACKGROUND**  
**SINCLAIR AND COURSES**

- **WHY EXPERIMENTS**



- **COMMON CORE**  
**STANDARDS FOR**  
**MATHEMATICAL PRACTICE**

- **MODELS**  
**LINEAR**  
**QUADRATIC**



- **Q & A**



# BACKGROUND

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

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

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***FOR PRE-SERVICE, ELEMENTARY SCHOOL TEACHERS***

- **MAT 1410 NUMERICAL CONCEPTS**
- **MAT 1420 PROBABILITY/STATISTICS**
- **MAT 1430 GEOMETRY/MEAS.**



# THE TEACHER PREP MATH COURSES

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## 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.**



# **THE TEACHER PREP MATH COURSES**

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## **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.**



# THE TEACHER PREP MATH COURSES

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## 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

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**4 SEMESTER HOURS**  
**(DISCUSSION/ACTIVITIES)**

**SCHEDULE**  
**TUE./THURS.**

**10 TO 25 STUDENTS PER**  
**SECTION**

# WHY USE EXPERIMENTS ?

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## ➤ ACTIVE LEARNING



## ➤ REINFORCES MATERIAL COVERED IN DISCUSSION





COMMON CORE  
STANDARDS FOR  
MATHEMATICAL PRACTICE

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



# STANDARDS FOR MATHEMATICAL PRACTICE

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**MP1) MAKE SENSE OF PROBLEMS AND  
PERSIST IN SOLVING THEM.**

**MP2) REASON ABSTRACTLY AND  
QUANTITATIVELY.**

**MP3) CONSTRUCT VIABLE ARGUMENTS  
AND CRITIQUE THE REASONING OF  
OTHERS.**



# STANDARDS FOR MATHEMATICAL PRACTICE

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**MP4) MODEL WITH MATHEMATICS.**

**MP5) USE APPROPRIATE TOOLS  
STRATEGICALLY.**

**MP6) ATTEND TO PRECISION.**



# STANDARDS FOR MATHEMATICAL PRACTICE

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**MP7) LOOK FOR AND MAKE USE OF  
STRUCTURE.**

**MP8) LOOK FOR AND EXPRESS  
REGULARITY IN REPEATED  
REASONING.**



## **MP1) MAKE SENSE OF PROBLEMS AND PERSIST IN SOLVING THEM**

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- **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

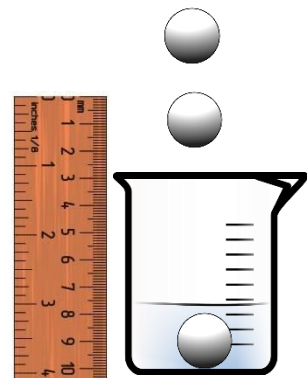
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- APPLY MATH TO SOLVE EVERYDAY PROBLEMS.
- WRITE AN EQUATION TO DESCRIBE A SITUATION.
- MAKE ASSUMPTIONS AND APPROXIMATIONS TO SIMPLIFY A COMPLICATED SITUATION.
- INTERPRET THEIR MATHEMATICAL RESULTS.
- REFLECT ON WHETHER RESULTS MAKE SENSE.
- IMPROVE 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

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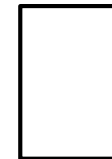
## HOW BIG DOES IT GET?

-- ANALYZE THE PROBLEM



-- MAKE A CONJECTURE

-- COLLECT DATA



-- COMPARE WITH CONJECTURE



-- DEVELOP A QUADRATIC EQUATION

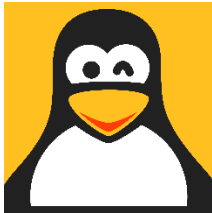
-- COMPARE WITH OTHER GROUPS

-- EXPLAIN WHAT YOU LEARNED



# USING EXPERIMENTS

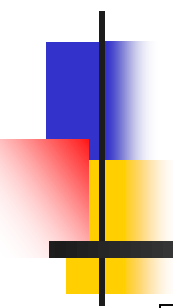
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## SUMMARY

## QUESTIONS





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