


MONTGOMERY HIGH SCHOOL
Report from the Mathematics
Collaborative Learning Team (CLT)

June 28, 2010
Connect-Ed Meeting
Rider University



Composition of the PLC

Dan Fishman	10 yrs. teaching high school, 13 years in applied research
John Moran	14 yrs. teaching high school, 20 years in software devpt.
Cathy McCusker	11 yrs. teaching high school, 20 years on tech. staff and mgt. staff in corporate setting
Stacey Wang	2 yrs. teaching high school, 7 years in applied research

Geometric Construct **Linear Relations**

Graphs of Lines **Notion of Slope**

Notion of Rate

Modeling **Linear Functions**

- **Results of Study**
 - Focus Topic: Everything Related to Lines
 - Data: Algebra II Tests, Teacher Surveys
 - The Product: Did we reach our goal?
- **Process**
 - What did the experience teach us?
 - What factors gave us a chance to succeed?

We Created Knowledge Categories

Date: 11/02/09


I. Writing equations (in either Slope-Intercept, Standard or Point-Slope forms)

- Given a point and the slope
- Given a point and parallel to a given line
- Given a point and perpendicular to a given line
- Given 2 points
- for an Application:
 - Write the linear equation
 - Use that equation to predict

II. Graph equations whose slopes are either: $+/-$, 0 or undefined.

III. Given a linear equation or equations:


- Find the slope, the x-intercept and the y-intercept
- are the pair of lines parallel, perpendicular or neither?



After Much Revision:

Date: 12/16/09

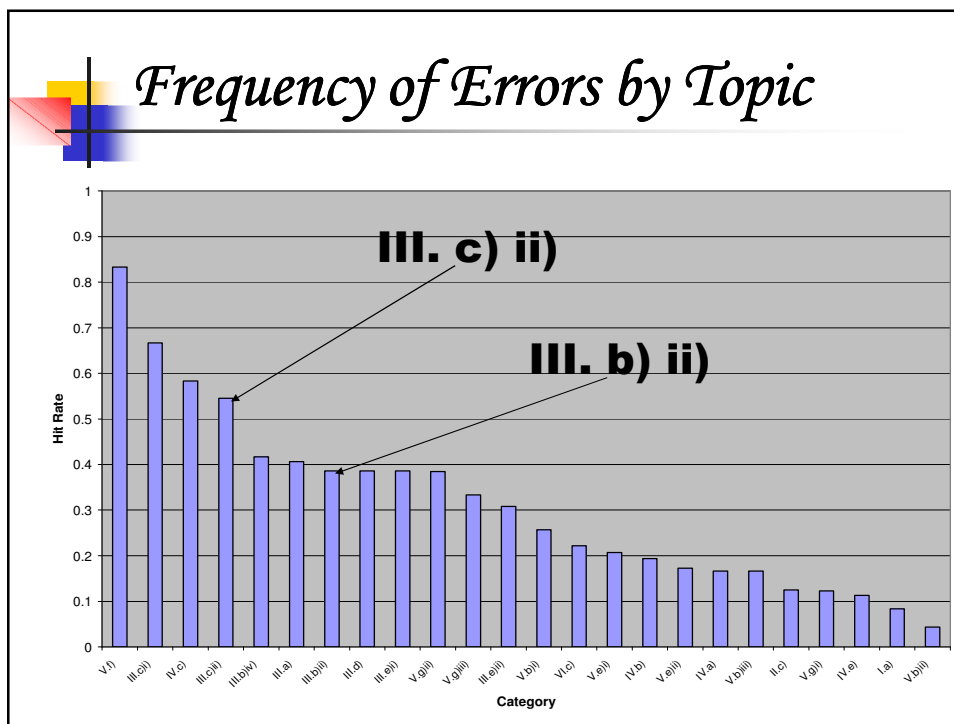
- I. Understand the concept of a line:
 - a) Determine if the equation is linear or non-linear
- II. Understand the concept of Slope:
 - a) "Rise over Run"
 - b) Change in Y over Change in x"
 - c) Formula, given 2 points
 - d) Understand steepness of a line
 - e) Rate of Change
- III. Writing equations:
 - a) Given a point and the slope
 - b) Given a point and parallel to a given line in:
 - i) Slope-Intercept form
 - ii) Standard form
 - iii) $X=c$
 - iv) $Y=c$
 - v) No Set form
 - c) Given a point and perpendicular to a given line in:
 - i) Slope-Intercept form
 - ii) Standard form
 - iii) $X=c$
 - iv) $Y=c$
 - v) No Set form
 - d) Given 2 points
 - e) For an application:
 - i) Write the linear equation
 - ii) Use that equation to predict
 - f) Given a graph:
 - i) Slope-Intercept form
 - ii) Standard form
 - iii) $X=c$
 - iv) $Y=c$
 - v) No Set form
- IV. Graph equations whose slopes are either: $+/$, 0 or undefined.
 - a) Slope-Intercept form
 - b) Standard form
 - c) $X=c$
 - d) $Y=c$
 - e) No Set form
- V. Given a linear equation or equations:
 - a) in Slope-Intercept form, find the:
 - i) slope
 - ii) y-intercept
 - iii) x-intercept
 - b) in Standard form, find the:
 - i) slope
 - ii) y-intercept
 - iii) x-intercept
 - c) in $X=c$ form, find the:
 - i) slope
 - ii) y-intercept (none exists)
 - iii) x-intercept
 - d) in $Y=c$ form, find the:
 - i) slope
 - ii) y-intercept
 - iii) x-intercept (none exists)
 - e) in No Set form, find the:
 - i) slope
 - ii) y-intercept
 - iii) x-intercept
 - f) Are the pair of lines parallel, perpendicular or neither?
 - g) Write an equation of a line in a particular form:
 - i) Final answer in Slope-Intercept form
 - ii) Final answer in Standard form
 - iii) Final answer in Point-Slope form
- VI. Interpret the graph of a line:
 - a) Find the slope, the x-intercept and the y-intercept
 - b) Are the pair of lines parallel, perpendicular or neither?
 - c) Name point(s) on the line



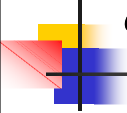
Sample

III. Writing equations:

- a) Given a point and the slope
- b) Given a point and parallel to a given line in:
 - i) Slope-Intercept form
 - ii) Standard form
 - iii) $X=c$
 - iv) $Y=c$
 - v) No Set form
- c) Given a point and perpendicular to a given line in:
 - i) Slope-Intercept form
 - ii) Standard form



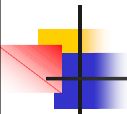
- ### Findings:
- Out of 24 bars, **10 out of the top 12** with the most errors capture the student errors on writing equations
 - **Error rates were approximately 55% on perpendicular and 40% on parallel.**
 - Underlying factors associated with the above bullet items include fractions, arithmetic (especially negative signs), and algebraic concepts (e.g. substitution).



Transcending Lines:

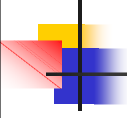
Lines are:

- A model
- A motivation
- A starting point



A First Year Collaborative Learning Team (PLC) at Montgomery High School

- **Results of Study**
 - Focus Topic: Everything Related to Lines
 - Data: Algebra II Tests, Teacher Surveys
 - The Product: Did we reach our goal?
- **Process**
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How to Choose a Line of Work for your PLC

- Brainstorm ideas as if you were sitting around the lunch table
- Be encouraged to choose for yourself what you will explore
- Know that everyone around you has the same high commitment level that you have




Brainstorming - Concerns for Math Students

- Why students don't retain certain skills year to year?
- Students' levels of preparedness for a particular course
- Students' misconceptions that are difficult to overturn
- Students' negative attitude toward school, in general, and toward math, in particular
- Use of rote learning and the use of conceptual learning
- How to improve the way that numerous specific ideas are conveyed to students
- Technology, including whether there is misuse or overuse of calculators
- Overloaded and misguided curricula
- State standards and standardized tests, and whether they are well thought-out




*Motivation -
Why did we choose Equations of Lines?*

- 1) Lines are covered in many math courses, ranging from freshman to senior courses;
- 2) The concepts involved with lines are important in a wide range of applications found not only in math classes, but also in science classes and many social studies classes;
- 3) The concepts involved with lines are implicated in many of the anecdotes we hear in which teachers are frustrated with the students' foundational readiness.




Factors That Helped Us Succeed

- Team Attributes
- Norms
- Meeting Procedures
- Culture in the Math Department
- Administrative Support



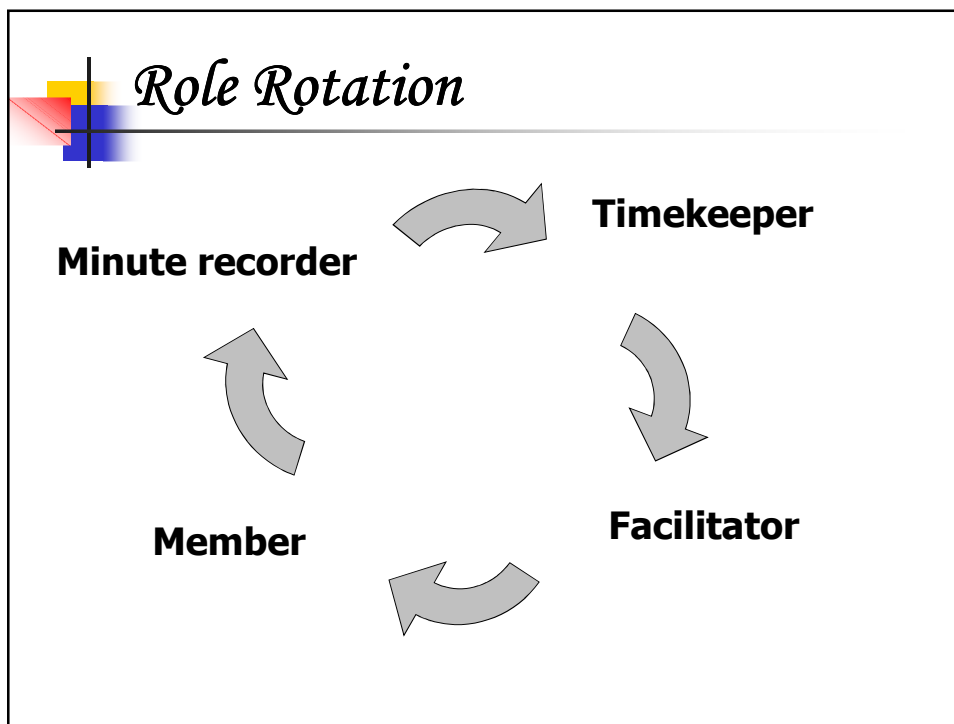
Team Attributes

- Voluntary assignment
- High commitment level
- Mutual respect and support
- Skill sets:
Detailed data analysis skill, spreadsheet manipulations, word processing, and detail vs. big picture views.




Our Norms listed on 9/16/09

- "Assume the Best"—Benefit of the Doubt
- No personal put-downs—Disagree with point
- Let person finish their thought
- Stay on task
- Punctuality, preparedness, end on time
- Be responsible to catch up (if you miss a meeting)
- Don't walk away—call time-out if you need a minute
- Check your rank at the door
- Seek to understand before you comment
- Honesty, forthrightness
- Flexibility to address new issues
- Flexibility in protocol of data collection
- Frequent reporting out to department and feedback
- License to make incremental modifications to curriculum
- Table an issue when no consensus reached
- Respect someone's call for a "time-out", and move on to next topic.




Divide and Conquer

Certain tasks require us to work collaboratively as a team (all four members), others are better solved individually (e.g. test analysis) and others need to be handled by two sub teams (e.g. final report vs. bar chart analysis.)



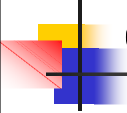
Culture

- Our math department chair had mentored and nurtured us all over many years
- Our mathematics director provided us with feedback and validation of our work repeatedly



Administrative Support

- Engaged, motivated and guided us with education they received in a summer workshop
- Principal, 3 Vice-Principals, Math Director and Math Chair conducted the first five meetings
- Right amount of time spent with us
- Right amount of educational resources
- 100% trust and support:
 - Two periods a week to be exempted from duty
 - Flexibility of scheduling
 - Freedom to choose our own topic of study
 - Freedom to run the team (lack of micromanagement)



Closure

Kathy asked us to come here to accomplish two goals:

- Let audience act as “Fly on the wall” during our CLT meeting
- To share why we thought we were successful as a CLT