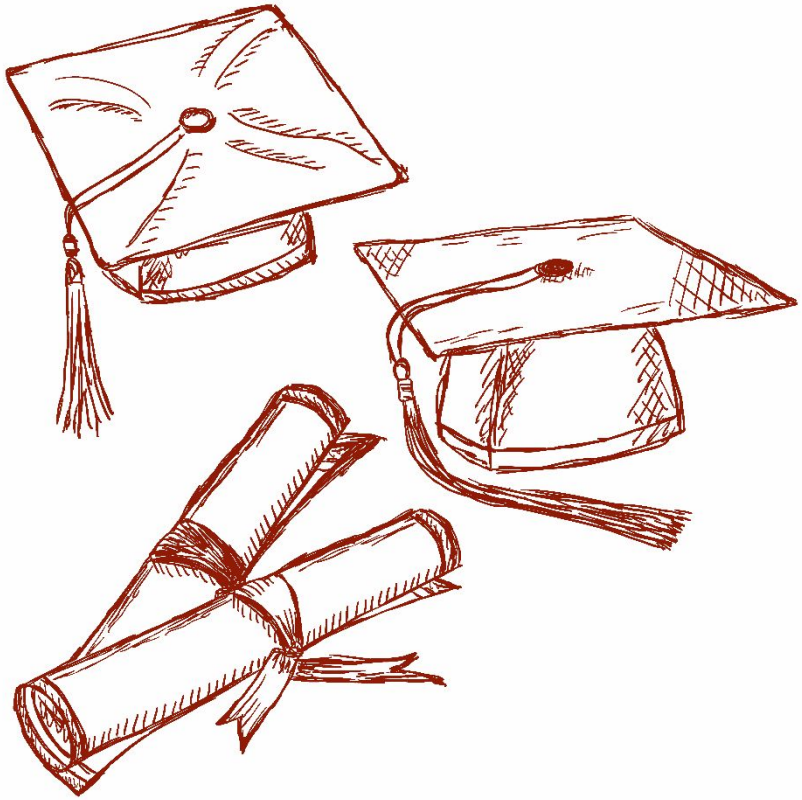

Improving College-Readiness Through a Mathematical Modeling Based Course for Seniors

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Strand: Building on Students' Strengths: Practices That Challenge, Engage, and Empower

Session Outcomes

This session will help participants to:

- Use mathematical modeling to engage college-bound seniors who are not yet ready for college-level math.
- Support productive discourse in the classroom.
- Empower students to identify themselves as math thinkers and learners

Who's in the Room?

(Stand if...)

What course options do seniors have?

Who Transition to College Level Math (our course) Serves

Based on state standardized tests, most students are not considered ready for college-level math after 11th grade.

	California	Monterey County
College Ready	13%	6%
Conditionally Ready	19%	16%
Not Yet Ready/Not Ready	68%	78%

However, these students often opt to take no math class senior year.

Our Approach

- Develop a course for students who have completed Algebra 2/Math 3, but are not yet "college-ready"
- Support teachers through county-wide professional development
- Bring stakeholders together to address college readiness in Monterey County

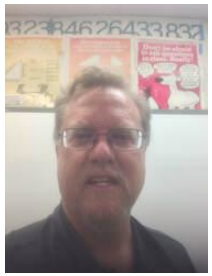
Monterey County Consortium for Math Readiness

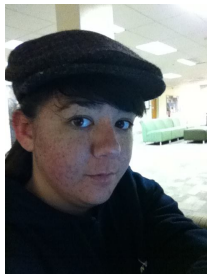
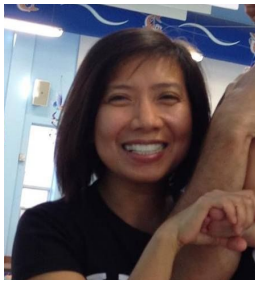
- Staff
  - Dr. Joanne Lieberman, CSU-Monterey Bay, PI
  - Dr. Alison Lynch, CSU-Monterey Bay
  - Dr. Lipika Deka , CSU-Monterey Bay
  - Dr. Dennis Kombe, CSU-Monterey Bay
  - Dr. Joanne Rossi Becker, San José State
  - Dr. Mohammed Yahdi, Hartnell College
  - Denise Green, Monterey County Office of Education

- Funding: CDE Improving Teacher Quality grant

Our Teachers



Over two years:

- 5 districts
- 11 teachers
- 23 classes
- 587 students

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About the Course

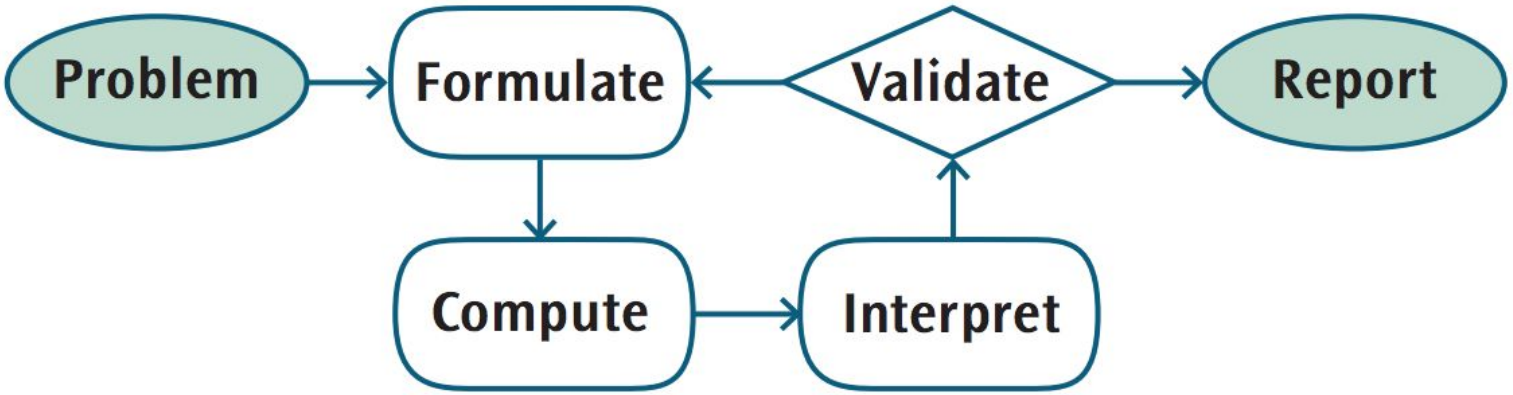
Transition to College Level Mathematics

- Uses mathematical modeling as framework
- Builds on and reinforces students' previous skills/concepts
- Introduces new areas of mathematics (e.g. voting theory, graph theory, informatics)

Math Modeling

"The goal of mathematical modeling is to answer a question, solve a problem, understand a situation, design or improve a product or plan, or make a decision."

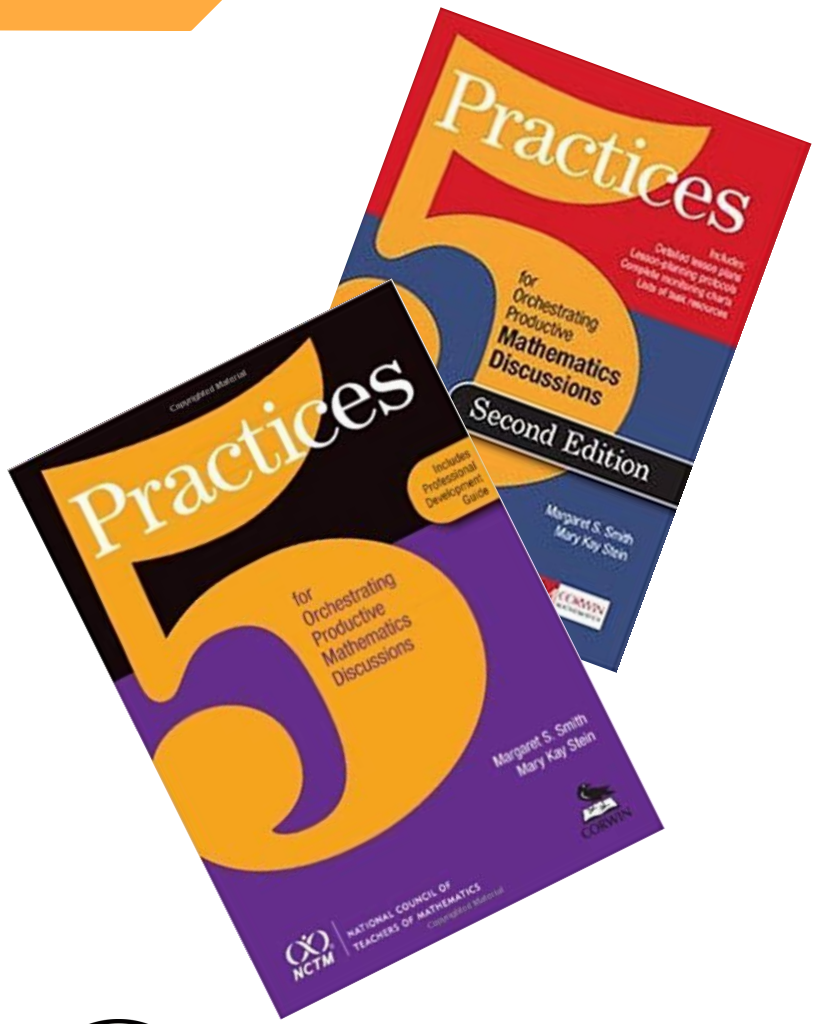
p 806, California Mathematics Framework, Appendix B



Course Outline

SECTIONS	UNITS
Data	Modeling Change with Functions
	Interpreting Categorical Data
	Statistical Inference
Decision Making	Financial and Business Decision Making
	Voting and Apportionment
Computing	Counting Methods
	Graph Theory
	Informatics
Geometry	3-D Representations
	Symmetries and Tessellations

Facilitating Discourse



"The five practices were designed to help teachers to use students' responses to advance the mathematical understanding of the class as a whole by providing teachers with some control over what is likely to happen in the discussion as well as more time to make instruction decision by shifting some of the decision making to the planning phase of the lesson." (p. 7)

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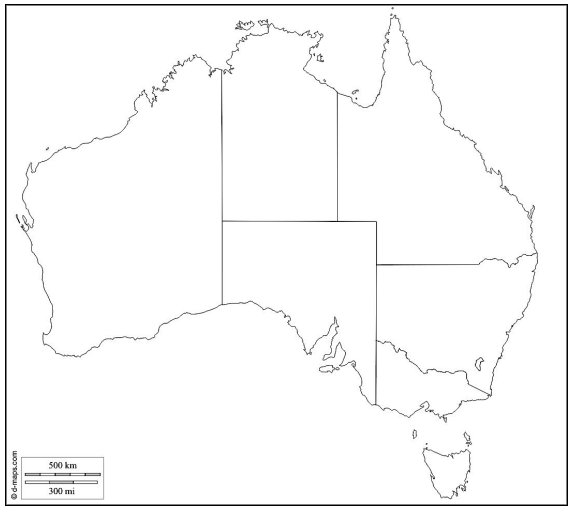
Unit 7: Graph Theory

Helping the Aussies

Australia is a continent comprised of eight territories. In an effort to save money when making maps of Australia, a mapmaker wants to know the minimum number of colors needed to color the map in such a way that no two neighboring territories have the same color. (Two territories are said to neighbor each other if they share a border longer than just a single point)

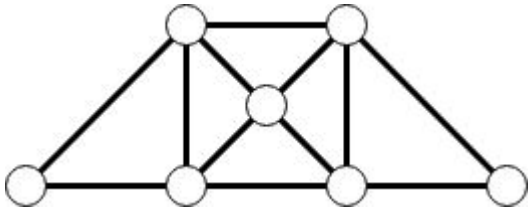


What is the least number of colors needed?

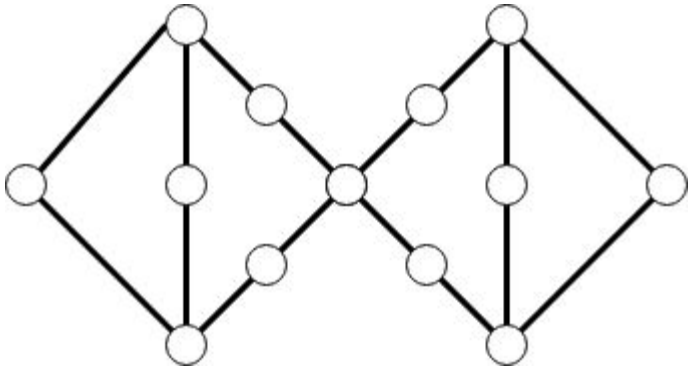
How do you know that you cannot color the map using fewer colors?

Unit 7: Graph Theory

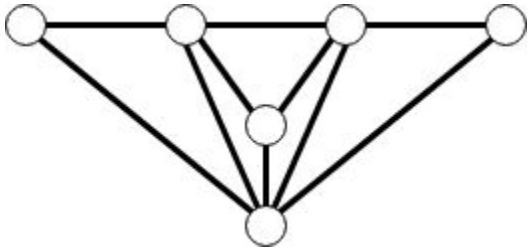
Roses are Red, Violets are Blue
Max the Landscaper has a new contract for a flower garden at the new city library.



The city planner is looking to keep costs down, so they asked Max to present to them a selection of designs for the flower garden with the minimum number of different flowers. The city planner wanted a variety of colors however, no two colors could be next to each other.



Max came up with three possible patterns. What is the minimum number of colors could Max use in each design?



Unit 7: Graph Theory

Roses are Red, Violets are Blue

The city planner likes what she sees in Max's ideas, so she's asked Max to design a few more flower garden options but this time with more flower pots.

Max needs your help to finish his proposal for the city planner. The city planner wants plans for 12 flower pots.

Design a flower garden that requires 2 colors, one that requires 3 colors, and one that requires 4 colors.

Can you design one that requires more than 4 colors?

Share Solutions

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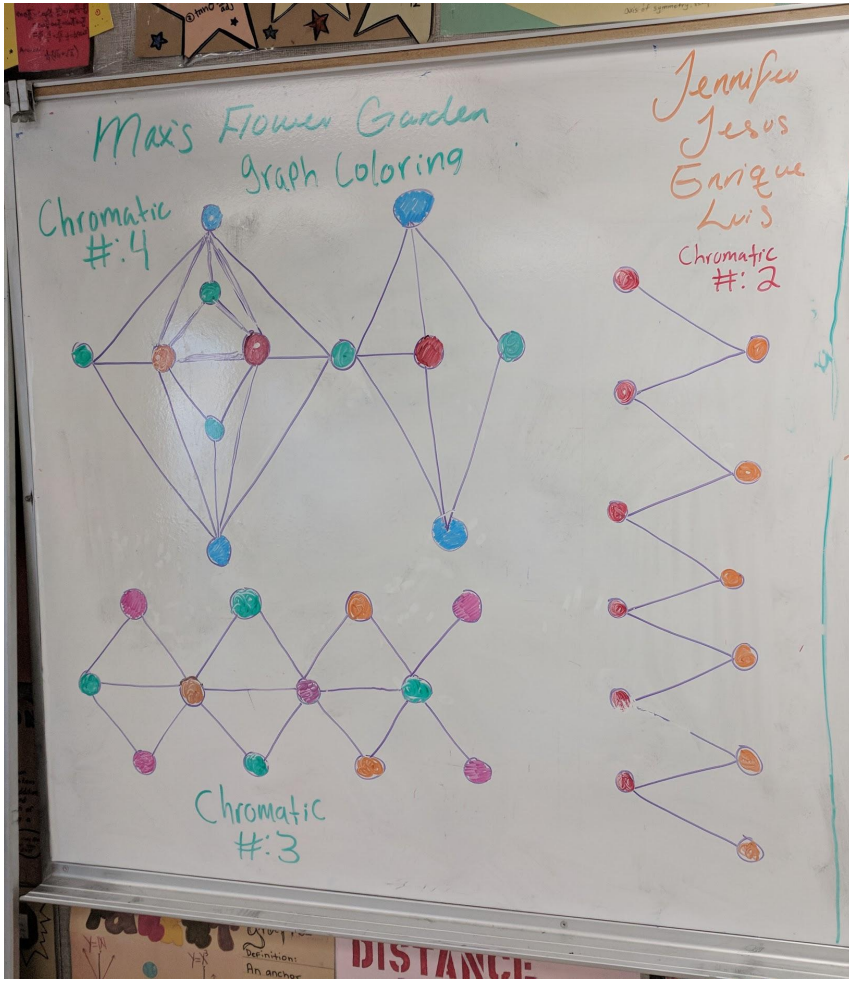
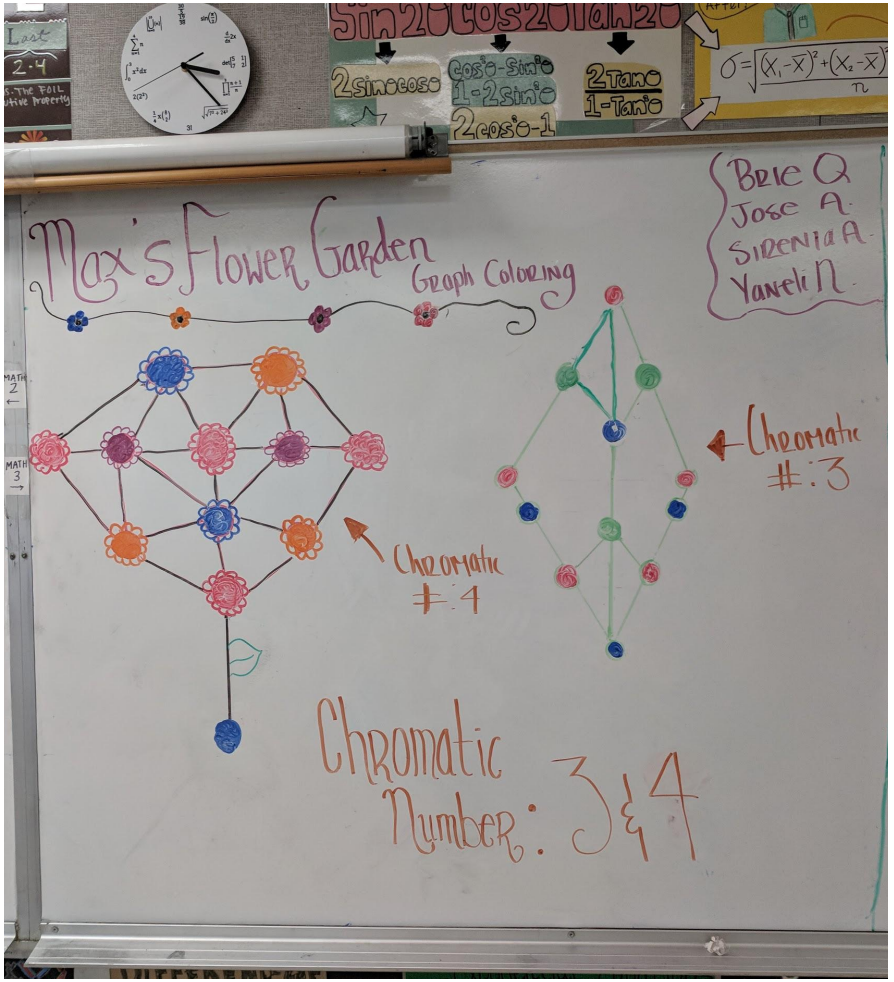
Facilitating Discourse: Reflection

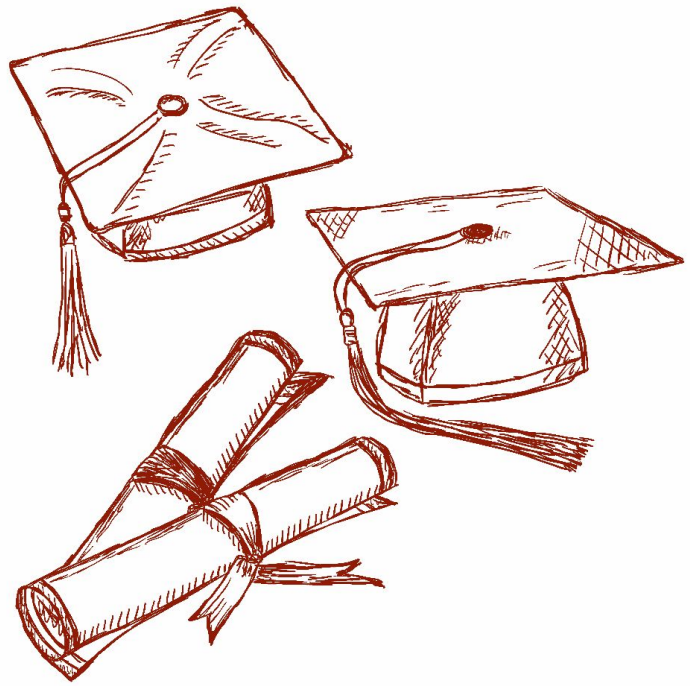
- What about the **task** limited or encouraged discourse?
- What **teacher** moves limited or encouraged discourse?

Student Work Samples





Student Feedback



Student Survey Results
What students liked about course:

Count	Theme
21	Group work, teamwork, cooperation, team problem solving, and interaction in course
19	Conceptual learning, **expand thinking, deep understanding**, new ways to solve problems
18	Diversity of topics, projects, and hands-on activities in the curriculum
17	Interesting and **very challenging** activities, fun activities, non-traditional learning approaches
14	Refresh knowledge in math, preparation for college math, preparation for college exams
13	Caesar Wheel, Cyphers, coding, graph theory, games
11	Pace of units/material

Sample Quotes: What students like about course:

This course allowed me to expand my thinking…our teacher continuously encouraged us to dig deeper in our understanding.

…it involves learning diverse mathematics subjects and that we were able to understand a variety of methods of how to do math.

This course gave me the opportunity to challenge myself more than other years. It gave me valuable information to succeed in school and my personal life.

I also enjoyed that we collaborated with different people we'd never collaborate with outside of class.

What I liked is learning to have conceptual understanding about the different math branches.

Student Survey Results:
What Students Don't Like about Course:

Count	Theme
35	Content too challenging, don't have the prerequisites, problems hard to understand/confusing, too many tasks/problems, too much work
22	Nothing
5	Problems too simple, not challenging, too slow for me

Preparation for College

- Course can feed into a variety of college courses
  - Finite Math, Pre-calculus, Statistics, Quantitative Literacy
- Students report higher scores on the SAT
- So far, only have anecdotal data on student outcomes in college

Summary and Questions

- **Websites:**

https://csumb.edu/math/transition-college-level-mathematics

http://cmrci.csu-eppsp.org/mccmr

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