

Modeling With Mathematics in Co-requisite College Algebra

California State University, Chico

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Co-Requisite College Algebra

Prerequisite Knowledge

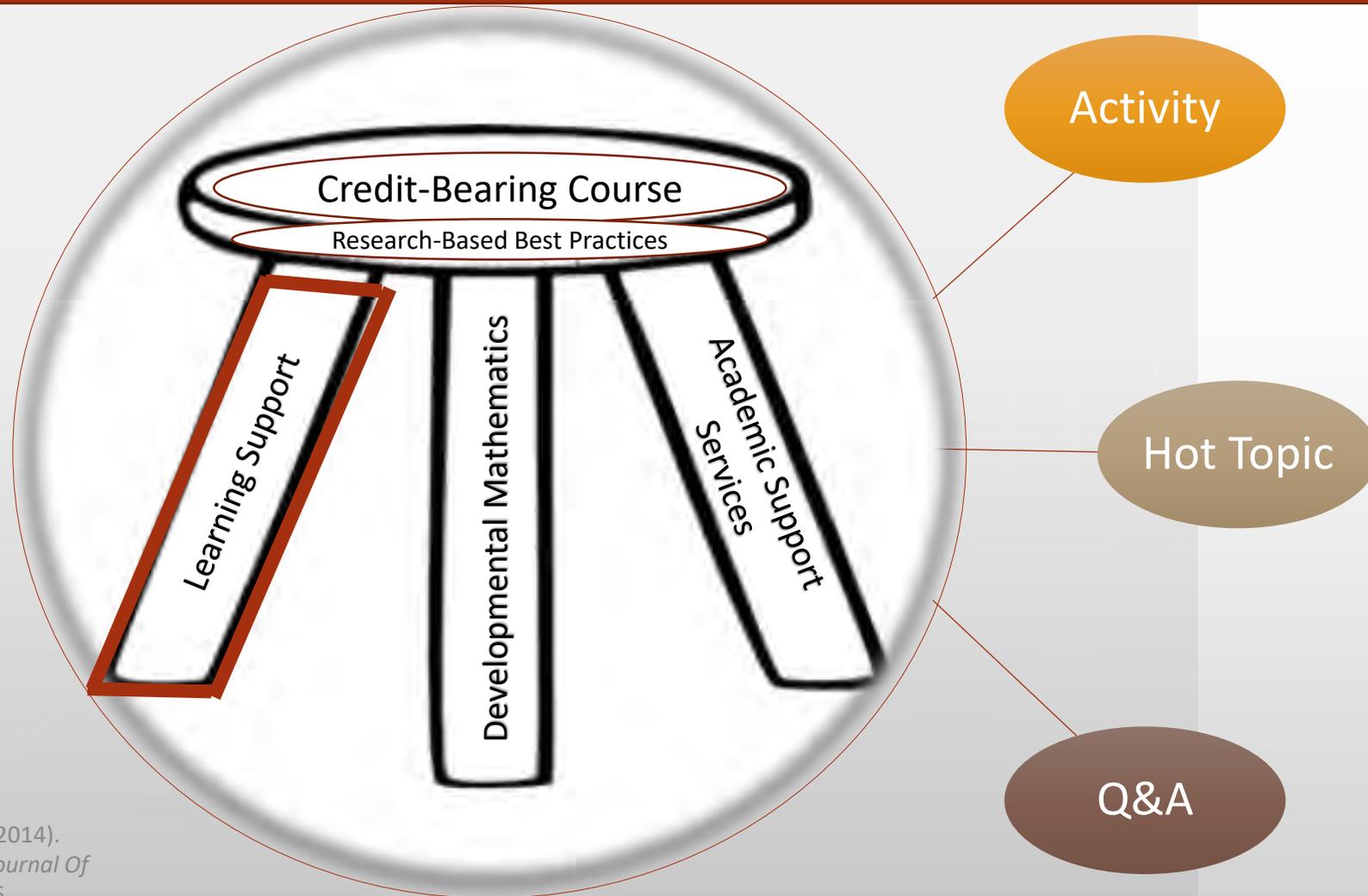


G.E. Content

Cohesive Learning Experience

- Student Centered
- Mathematically Rigorous
- Worthwhile Mathematical Experience

Fundamentals of Conceptual Understanding and Success



Standards for Mathematical Practices

Reasoning & Explaining

2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others

Problem Solving & Precision

1. Make sense of problems and persevere in solving them
6. Attend to precision

Mathematical Practices

Modeling & Using Tools

4. Model with Mathematics
5. Use appropriate tools strategically

Seeing Structure & Generalizing

7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

Mathematical Modeling

Mathematical modeling is a process that uses mathematics to represent, analyze, make predictions or otherwise provide insight into real-world phenomena.

Most short definitions we find emphasize this most important aspect, namely the relation between modeling and the world around us.

- Using the language of mathematics to quantify real-world phenomena and analyze behaviors.
- Using math to explore and develop our understanding of real world problems.
- An iterative problem solving process in which mathematics is used to investigate and develop deeper understanding.

-GAIMME Report, 2016

Mathematical Modeling

“An application problem may be modified to become a modeling problem. A modeling problem is open-ended, giving students autonomy throughout the modeling process as they define the problem, make assumptions, find data, develop a model, test the model, use the model, analyze the solutions, draw conclusions, and report their findings. However, the level of autonomy can be restricted such that students are able to experience many aspects of the modeling process while still addressing a particular mathematical skill.”

-GAIMME Report, 2016

Poll Question

Do you plan to integrate modeling with mathematics into your co-requisite college algebra course?

- Yes, we already have integrated modeling with mathematics in our college algebra course and plan to build more mathematical modeling activities
- Yes, but we have limited experience integrating modeling with mathematics
- We are undecided
- We are just now learning about modeling with mathematics

The Rolling Car

Model Type

- Linear Model

Learning Objectives

- Fit a linear model to data
- Make sense of the intercepts, rate of change, and the relationship
- Use the linear model to make predictions

STEM Context

- Measuring and Calculating Speed

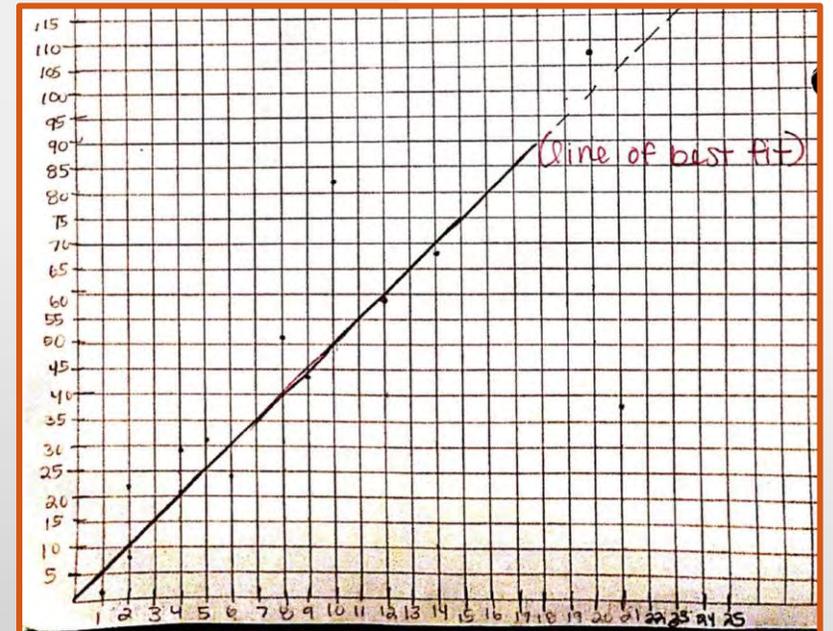
Adapt

- Adapted From:
[www.k12.wa.us/Mathematics/Modules/week4/THE ROLLINGCAR.doc](http://www.k12.wa.us/Mathematics/Modules/week4/THE%20ROLLINGCAR.doc)

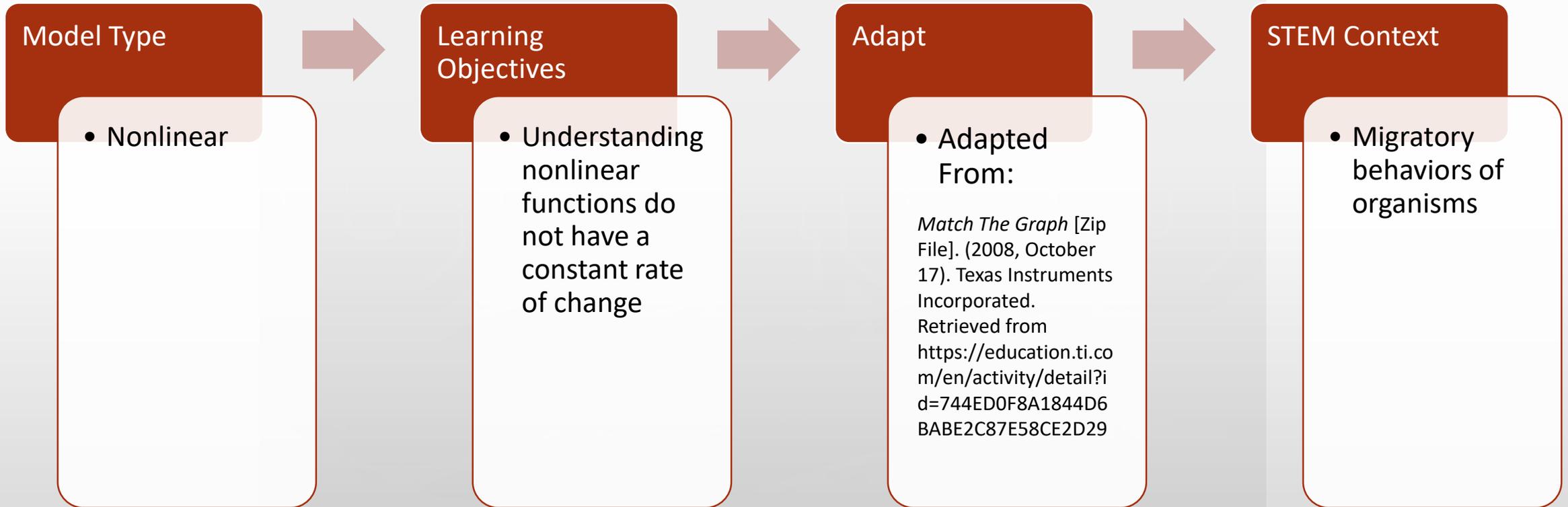
The Rolling Car



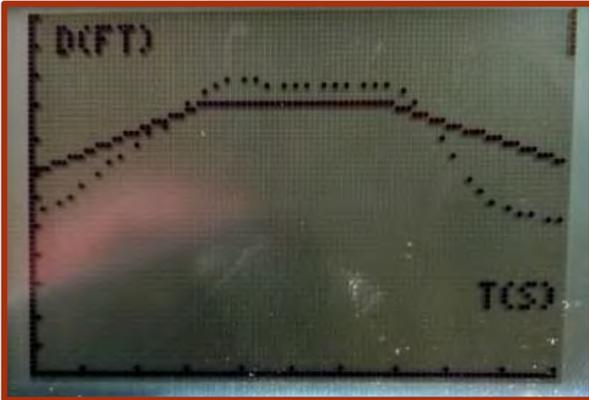
Height of Ramp (cm)	Average Speed (cm/sec)
21	37.2
2	8.6
12	58
4	21
1	1.6
9	48.1
14	67.4
5	31.3
8	51.1
20	107.7
2	23.3
10	83.1
4	29.61
12	58.1
6	24
15	199
6.5	38.97
29	97.7



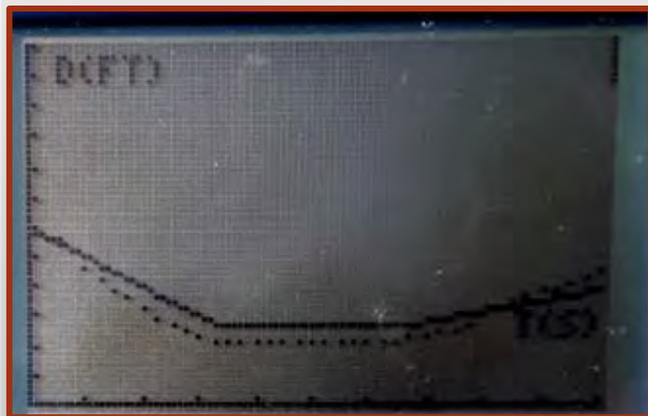
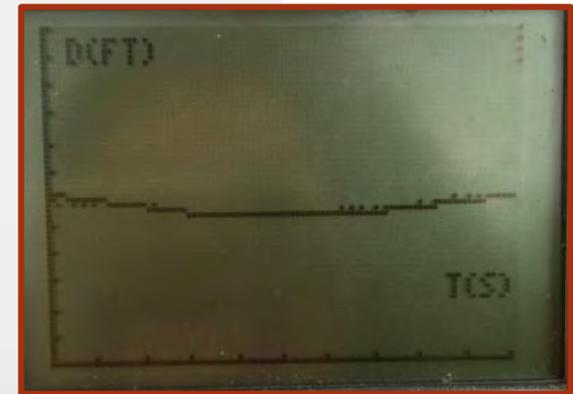
The Migrating Sea Turtle



The Migrating Sea Turtle

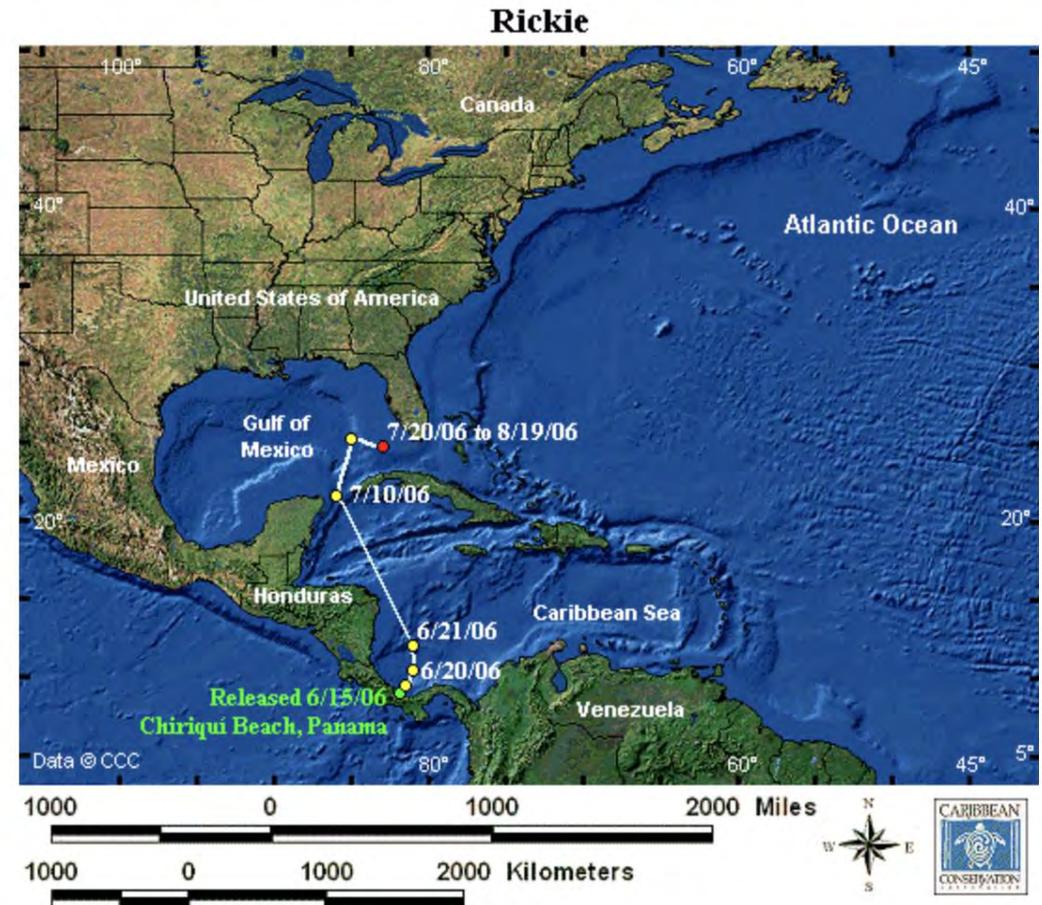


Match The Graph



The Migrating Sea Turtle

Research into where and how sea turtles migrate has been a focus of scientists for decades. The information collected is vital to the development of conservation strategies for the species. [The Sea Turtle Migration-Tracking Education Program website](#), provides the free educational service that allows people to view regularly updated maps showing the migratory movements of endangered sea turtles being tracked by satellite. When visiting the website, you can see that the sea turtles travel from location to location at different rates of changes. For instance, the sea turtle Rickie moved quickly north from her nesting beach to the eastern Gulf of Mexico near Key West, Florida (pictured right). Rickie traveled a cumulative distance of 1,352 miles during the summer of 2016.



The Migrating Sea Turtle

Sea turtles travel large distances (hundreds to thousands of miles) from feeding grounds to nesting beaches.

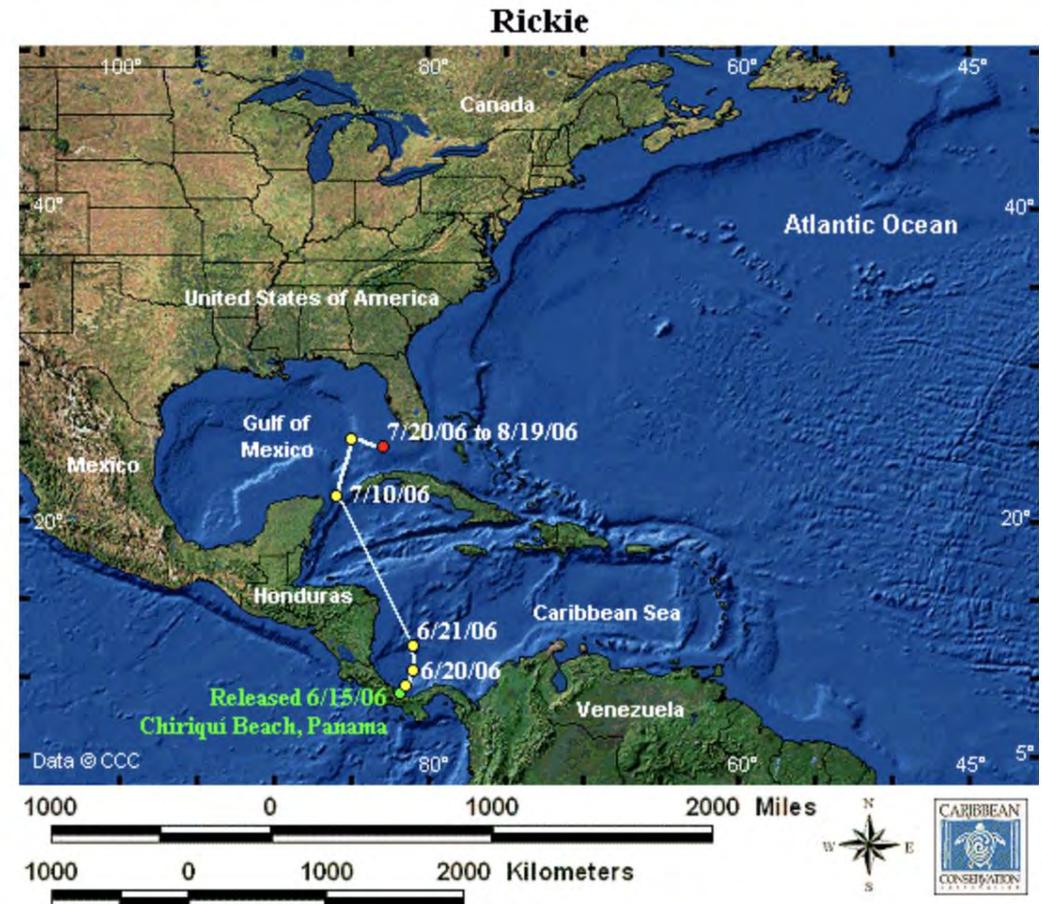
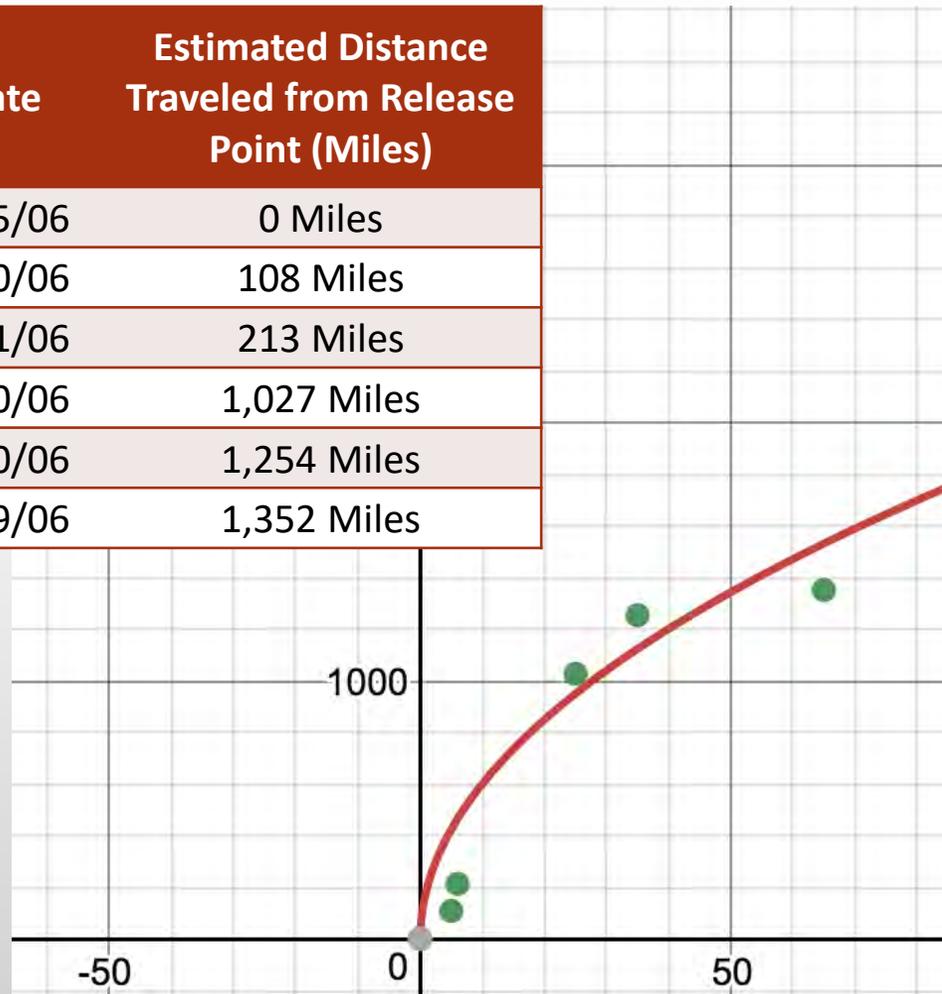
Female sea turtles will return to the beach where they were born every year to nest.

It is valuable to study the migration patterns of sea turtles because the majority of research has focused on nesting beaches, but that only accounts for 10% of the sea turtle's life.

One current theory on sea turtle navigation states that turtles can detect slight changes in the angle and intensity of Earth's magnetic field.

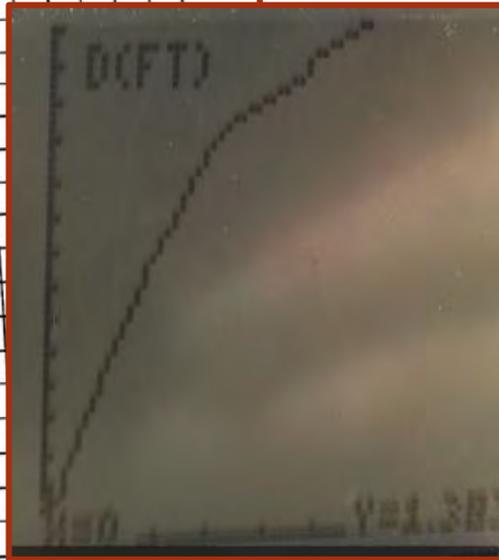
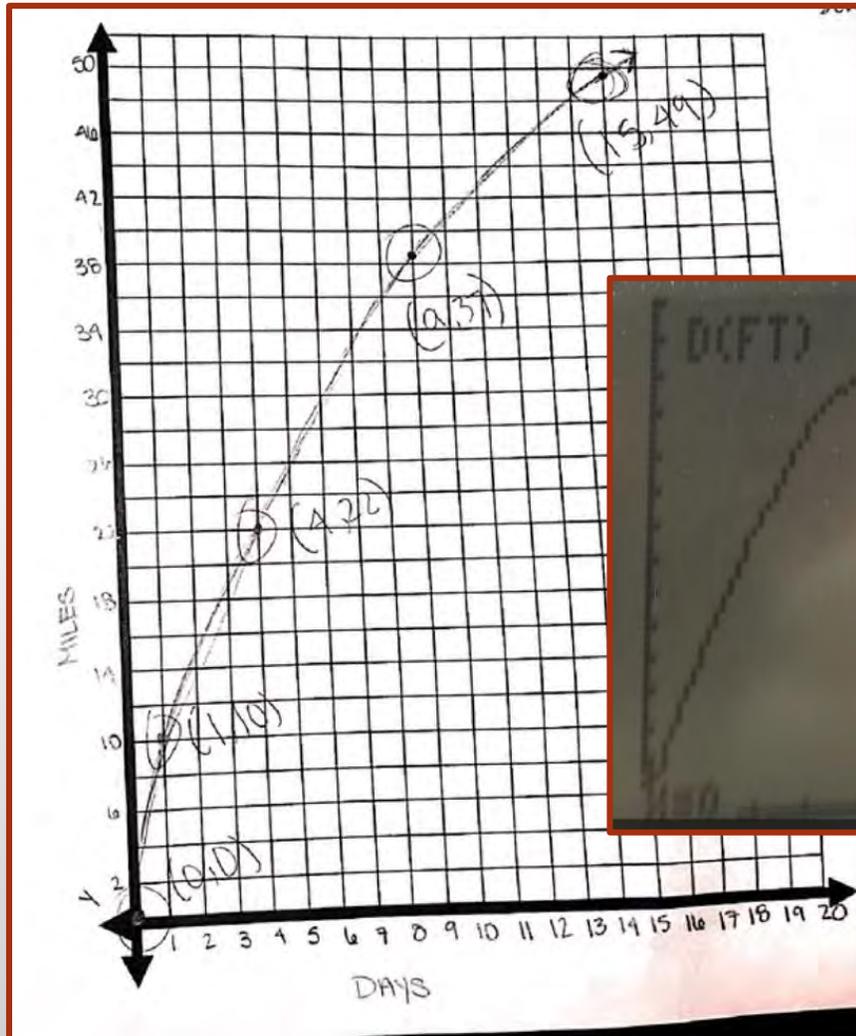
The Migrating Sea Turtle

Date	Estimated Distance Traveled from Release Point (Miles)
6/15/06	0 Miles
6/20/06	108 Miles
6/21/06	213 Miles
7/10/06	1,027 Miles
7/20/06	1,254 Miles
8/19/06	1,352 Miles



Map does not constitute publication of data, researchers who contributed this data retain all intellectual property rights.

The Migrating Sea Turtle



Day	Miles	Interval	Rate
0	0M		
1	10M	10M / 1dy	= 10mpd
4	22M	12M / 3dy	= 4mpd
9	37M	15M / 5dy	= 3mpd
15	49M	12M / 6dy	= 2mpd

a.) Day 0 → Day 1 10M / 1dy = 10mpd
 b.) Day 1 → Day 4 12M / 3dy = 4mpd
 c.) Day 4 → Day 9 15M / 5dy = 3mpd
 d.) Day 9 → Day 15 12M / 6dy = 2mpd.

Poll Question

What kinds of activities do you use to expose your students to nonlinear models? Or how would you adapt our sea turtle activity to meet the needs of your course?

Challenges

Time

- Ensuring that enough time has been allocated for both requisite math and contextualized STEM experience

Resources

- Finding and securing materials for contextualized STEM experiences

Planning

- Coordinating our schedules
- Finding appropriate and effective contextualized STEM experiences

Poll Question

What other aspects do you anticipate to be challenges when integrating modeling with mathematics into your co-requisite course?

Poll Question

What tools and resources are you aware of that can support your modeling with mathematics activities?

Thank you!

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Math/QR Professional Development Calendar

The screenshot shows a web interface for a professional development calendar. At the top, it says "Calendar" and "Use the drop down menus below to filter the results by Category and Date." There are two filter sections: "Filter By Month" with a dropdown menu set to "All" and a red "Go" button, and "Filter By Category" with a dropdown menu set to "All" and a red "Go" button. Below these is a link "Use this calendar's archive to view events that have passed." with a red "Calendar Archive" button. The main content area is titled "February 2018" and features a list of events. The first event is a "Live Webcast" on Wednesday, February 7, 2018, from 10:00AM to 11:00AM. It includes a thumbnail image of a person at a chalkboard with the text "How CSU Fullerton is Stretching Traditional College Algebra". The description states that Dr. Cherie Ichinose will share plans for transforming a traditional College Algebra course into a two-semester Stretch Algebra course sequence. A "More Information" link points to Emily Magruder and Zee Cline. The category is "Mathematics/Quantitative Reasoning" and there is a red "Join" button.

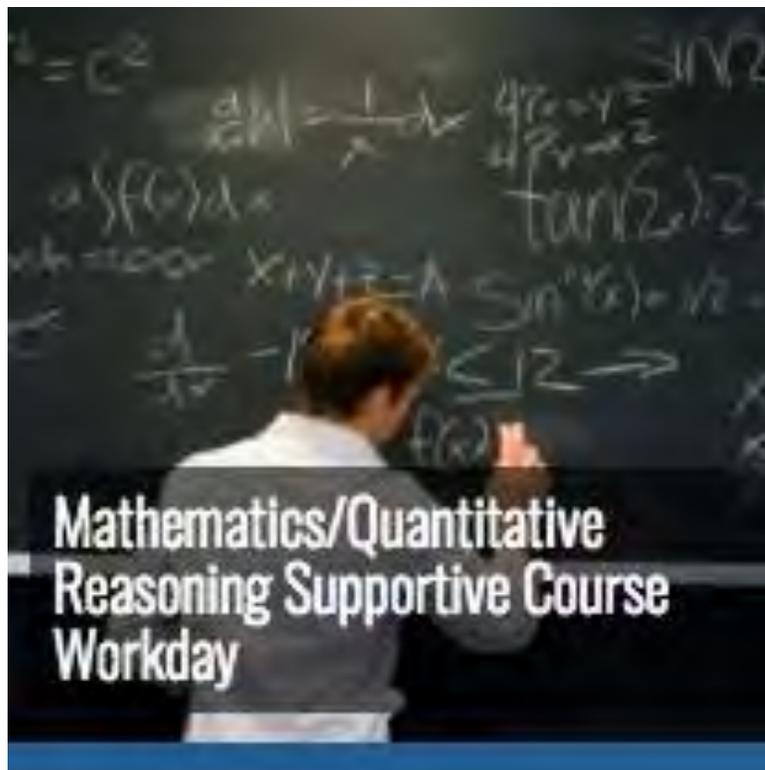
Next Webcast

April 12, 2PM

Just-in-Time Co-Requisite Support for
Statistics

Mori Jamshidian and Dwight Wynne

<http://www.calstate.edu/professional-development-calendar>



Mathematics/Quantitative
Reasoning Supportive Course
Workday

Mathematics/Quantitative Reasoning Supportive Course *Workday*

Friday, March 9

10:00AM to 3:00PM

Crowne Plaza

Los Angeles International Airport



April 13-14, 2018

Uri Treisman

- Keynote
- Breakout for Math & STEM faculty

<http://www.cpp.edu/~csusymposium>

Support Models “How To” Center

www.calstate.edu/app/mathqr/how-to-center.shtml

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"How-to" Center | Student-Support Course Models

This collection of webcasts, videos and informational articles is provided in support of CSU faculty who are redesigning courses and adding co-requisite support courses to GE mathematics, quantitative reasoning and written composition courses.

Math & QR
GE Mathematics and Quantitative Reasoning

Webcasts

Articles on Course Design, Co-Requisite Models, Equity and Success

For a collection of articles addressing remediation and alternative approaches [click here](#)

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<http://www.calstate.edu/app/mathqr/how-to-center.shtml>

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Path to Calculus (including college algebra):

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