

INQUIRY INTO MATHEMATICS AND SCIENCE THROUGH THE USE OF TECHNOLOGY 😊

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SEC 404/504 and SEC 406/506

Today's class

- 5:00 - Introductions
- 5:15 - Probeware Integration – Why?
- 5:30 - Introduction to Probeware
- Short Break
- 6:00 - Station #1 – Graphing Your Motion, Experiment #33 (45 Minutes)
- 6:45 - Station #2 – The Greenhouse Effect, Experiment #3 (60 Minutes)
- 7:45 - Conclusion

Interdisciplinary Lessons...

Science and Mathematics

“Making connections and transferring ideas to a new context are difficult processes that many students cannot accomplish on their own...

The opportunities to make such connections does not always arise in the context of single-subject classes unless teachers take time out... “

(Marrongelle, Black, Meredith, 2003)

Mathematics

- The Principles and Standards for School Mathematics (NCTM, 2000) suggests students should make connections to other disciplines, particularly science.
- CCSS: Mathematical Practices
 - ▣ **Model with mathematics.**
 - ▣ **Use appropriate tools strategically.**

Science

- National Science Education Standards (NRC, 1996) notes “coordination of science and mathematics programs provides an opportunity to advance instruction in science beyond the purely descriptive. Students gathering data in a science investigation should use tools of data analysis to organize these data and to formulate hypotheses for further testing” (p. 218 – 219).

“Real-World” Mathematics & Science

- Mathematics and Science are intimately interconnected. Scientific principles and laws are tested, analyzed, and confirmed experimentally through mathematics.
- CBLs/LabPro Systems provide opportunities to conduct a wide range of data-collecting activities relatively inexpensively.
- Teachers should incorporate technology as a tool to examine mathematics and science ideas

(Randall, 1998)

What is inquiry?

Student-centered and/or student-directed is a means to which students can create meaningful knowledge, comprehension and critical thinking skills

- Guided Inquiry
- Structured Inquiry
- Open Inquiry

LabPro/CBL Probes

- Distance (motion detector)
- Force
- Pressure
- Temperature
- pH
- Microscope

Mathematical Ideas

- Functions

- linear

- quadratic

- logistic

- piecewise

- sinusoidal...

(data analysis, predictions, graphing, modeling...)

Science Ideas

- Velocity
- Water Quality
- Air Pressure
- Harmonic Motion
- pH Change
- Digital Microscopy

Station #1 – Graphing Your Motion

- Graphs made using a Motion Detector can be used to study motion.
- In this experiment, you will use a Motion Detector to make graphs of your own motion.
- Objectives
 - ▣ Use a Motion Detector to measure position, velocity, and acceleration.
 - ▣ Use a computer to produce graphs of your motion.
 - ▣ Analyze the graphs you produce.
 - ▣ Match position vs. time and velocity vs. time graphs.

Summary Thoughts?

- What did you enjoy about this type of “recipe-based” laboratory experience?
- How do you think your students would respond to this type of technology integration?
- Are there implementation barriers that teachers would need to be aware of?
- What was the math and science content? Was the content understood?
- Would you be willing to work in an interdisciplinary team in the future?

Station #2 – The Greenhouse Effect

- Greenhouses allow gardeners to grow plants in cold weather.
- This is because a greenhouse stays warmer than the outside air. You can feel this effect in a car parked in the sun.
- On a larger scale, the greenhouse effect helps keep our planet warm. It makes Venus one of the hottest planets in our solar system.
- In this experiment, you will use Temperature Probes to measure temperatures in a model greenhouse and in a control as they are heated.
- You will then calculate the resulting temperature changes.

Summary Thoughts?

- What did you enjoy about this type of “inquiry” themed laboratory experience?
- How do you think your students would respond to this type of technology integration?
- Are there implementation barriers that teachers would need to be aware of?
- What was the math and science content? Was the content understood?
- Would you be willing to work in an interdisciplinary team in the future?

Conclusion

- All Students are required to submit the following:
 - Complete Station #1 (Experiment 33) – Laboratory Handout
 - Complete a one-two page reflection
 - Complete Station #2 (Experiment 3) – The Greenhouse Effect
 - Complete a one-two page reflection