Modeling Science Practices and Standards Using Forensic Science

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What do you see in this photo?
Basic Class Structure

- **Teach** 3 topics: content and lab analysis
  - Content discussion/lecture/readings
  - Quizzes and homework assessments
  - Lab practical

- **Test** topic content and lab skills: Mini Crime Scene
  - First one: YIKES!
  - Next one: Much better.
  - Goal: 2 per marking period; 4 per semester.

- **Semester Exam**: More extensive Crime Scene covering entire semester skills and content

- **Projects**: Major crime research, book reads, make your own crime scene, Google blogger
1. **Ask Questions / Define Problems**

**Initial Investigation**
- Set up teams; observe crime scene.
- What is relevant evidence?
- What could have happened?
- What should be our next steps?
Many Clues...
2. Developing and Using Models
3. Planning and Carrying Out investigations

- Do you have a model(s), idea(s)?
- What to analyze? NOT to analyze?
- Designing analysis of evidence.
  - sequencing
  - limitations
  - time
  - personnel
Sifting Through Evidence
4. Analyzing and Interpreting Data

- Team directed for 3-4 days in the lab.
- Not all evidence is available: THINK & ask the right questions!
- Analyze the data: look for patterns and relationships. Talk with team.
- Is all data relevant? (red herrings)
- Construct a flow chart of events.
- Let your results drive your conclusions! Evidence always!
Multiple Classes?

- Some evidence can be processed by students.
- Some is “canned”.

FP 8: From Vis A Vis Marker in the Kitchen
5. Using Mathematics and Computational Thinking

- Examples of evidence processing that depends on mathematics
  - Glass Analysis: density and refractive index
  - Bloodstain Analysis: trigonometry, projectile motion, graphing
  - White Powder Analysis: chemical reactions, pH

\[ \text{density} = \frac{\text{mass}}{\text{volume}} \]

or, in short form:

\[ d = \frac{m}{V} \]
6. Constructing Explanations & Designing Solutions

What Happened?

• Using data (evidence) to reconstruct a crime scene (construct an explanation).

• Each team uses their results to construct flow chart of events.

• Propose a conclusion (solution).
7. Engaging in Argument from Evidence

- Teams compare reconstructions/flow charts.
- How many versions are possible?
- What should we do?
  - Check data
  - More experimentation
  - More evidence
  - Role play for plausibility
- Revision of model based on new evidence and/or argumentation
- Argument and discourse are good!

The purpose of an argument should not be victory, but progress.

7. Engaging in Argument from Evidence
8. Obtaining, Evaluating, & Communicating Information

- Make final report with evidence to substantiate
- Must be able to share information with appropriate audience
- Communication skills are important: scientific principles and jargon to general public for understanding
CCC
- Patterns
- Cause & Effect
- Energy & Matter
- Structure & Function
- Stability & Change

DCI

PHYSICAL SCIENCE
- HS-PS1 Matter and its Interactions
- HS-PS2 Motion and Stability: Forces and Interactions
- HS-PS3 Energy
- HS-PS4 Waves and their Applications in Technologies for Information Transfer

LIFE SCIENCE
- HS-LS1 From Molecules to Organisms: Structures and Processes
- HS-LS2 Ecosystems: Interactions, Energy, and Dynamics
- HS-LS3 Heredity: Inheritance and Variation of Traits

EARTH AND SPACE SCIENCES
- HS-ESS3 Earth and Human Activity
GOOD AFTERNOON, GILBERT.
I'M HERE TO COLLECT YOUR DOG'S DROPPINGS, WHICH I WILL THEN CAREFULLY ANALYZE TO DETERMINE IF INDEED YOUR DOG ATE YOUR HOMEWORK.

Never try to pull one over on your forensic science teacher.
Thanks for joining me!

Questions?

- **Contact Info:** kmirakovits@gmail.com
- **My website:** www.forensicscience-ed.com
- **Summer Workshop for Educators**
  - Western Michigan University
  - July 15-19 (one full week of training)
  - $400 (SCECH and Grad Credit options available)
  - SEE ME FOR FLYER
- **Please keep my contact info and let me know if you need help!**