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Have you taught a science lab before?

- 1. No, never
- 2. Yes, once
- 3. Yes, more than once

What do you hope to learn from this workshop?

- 1. How to manage and get what you expect from a lab-full of students
- 2. How to prepare for and execute labs in the best and most efficient way
- 3. How to maximize student learning in a lab setting

What level of labs do you usually TA?

- 1. Mostly introductory labs.
- 2. Mostly intermediate and advanced labs.
- 3. A mix of different levels.

Learning Objectives

The Workshop Participant Will:

- **1. Recognize** how students learn to maximize teaching
- 2. Understand how to set up a safe, clean, and interactive environment that is conducive to student learning
- 3. Identify how to effectively prepare to teach and facilitate undergraduate science labs



Different Viewpoints

- Students
 - o Don't want to do unnecessary work. • Want to learn new things and enjoy themselves.
- TAs (you!)
 - Want the lab to run smoothly.
 - Want the students to learn new things.

Lab Techs

- Want the lab to run smoothly.
- Want to not have to clean everything up afterwards.



The Value of Labs

Expose students to the actual process of

that they usually get in lecture.

science instead of the end results and data

The Value of Labs

- Small class sizes (unlike lectures)
- Interactive sessions
- Hands-on reinforcement of things taught in lecture
- Introduction to people students can talk to

The Value of Labs Develop intuition and deepen understanding of concepts. Apply concepts learned in class to new situations. Experience basic phenomena. Develop critical, quantitative thinking. Develop experimental and data analysis skills.

- Learn to use scientific apparatus. • Learn to estimate statistical errors and recognize systematic

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- . Develop reporting skills (written and oral).
- Practice collaborative problem solving. Exercise curiosity and creativity by designing a procedure to test a hypothesis
- Better appreciate the role of experimentation in science.
- Test important laws and rules.









- Knowledge is constructed by integrating new information; a personal understanding
- Learning by constructing meaning
- Teaching: builds on prior background, work with the content to construct a meaning for the student





How to Maximize Learning

- If students are just following a recipe (passive learning) they will forget what they have done quickly and won't enjoy the process
- The real trick is to get students to critically analyze what they are already doing • Asking questions
- The easiest ways to get students to use their brains are the simplest for you, but not always the most intuitive

Peer Learning

- Get students used to the idea of using each other as resources
- Ask successful lab groups to demonstrate how and what they did to the rest of the group
- Positive reinforcement, effective learning, and minimal effort = a powerful method!

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Introduction Cards

- Student introduction cards are a simple way to learn more about the members of your class
- The information you receive can be valuable in tailoring the content of your teaching
- The act of soliciting personal information sends a positive message to your students
- Make sure you do it on the first day!
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Sample Introduction Card A Major: Indecided. Hometown: Richmond Hill Languages spoken: English. Educational Goals: Interests: Dream Job:



Sample Introduction Card C

Major: BIOCHEM
Hometown: CALGARY
Languages spoken: ENGUSH, FRENCH, MANDARIN
Educational Goals: Inion a 9 year degree in 3.
Interests: cross country running, puriming, 'I
Dream Job: Prof, hochemistry classical by
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- Find out where supplies are stored
- Know the safety rules and procedures. Tell students, show them eye washes, emergency showers, etc.
- Set policies on preparation and behaviour (including cell phones!)

Beginning of Semester

- Start to get to know your students
- Explain the policy on cheating and plagiarism
- Do all this straight away!



Beginning the Lab

- Introduction
 - Don't be nervous about presenting; you're the expert and the student's don't want you to stumble
 - Use tools to keep you on track, e.g. PowerPoint
 - Recycled presentations have their own benefits and risks
 - Link this lab to the previous one or lectures if possible
 Clarify anything you found confusing or tricky in your
 - Make your own (perhaps verbal) pre-lab quiz if there
 - Make your own (perhaps verbal) pre-lab quiz if there isn't one to keep them prepared

Beginning the Lab (cont'd)

- Be explicit of what the students should be getting out of the lab (Learning Objectives)
- Write the flow of the lab's sections on the board; also write times they should be starting the sections
- Do demonstrations early if possible

Beginning the Lab (cont'd)

- Demonstrations
 - Generally do them at the beginning of the lab; closer to when they'll
 need it might seem to make more sense but can disrupt the flow of
 faster and slower students.
 - Make sure everyone can see! If that's impossible, maybe one student per pair can come up.
 - $\circ\;$ Go through what you're doing verbally as you do it to help them remember it.
 - Allow for questions; be explicit that they can ask













Questions



- If you don't know a factual question admit this and tell them you'll look it up. Wikipedia is your friend!
- Use the Socratic Method to answer procedural and conceptual questions.
 Respond to their questions with questions that lead them to the answer using their own knowledge



Ending the Lab: Lab Reports

• Another opportunity to help students learn:

Feedback

- See Grading and Feedback workshops
- What to do about plagiarism?







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