**Teaching Laboratory Classes**

**Introduction**

Laboratory classes provide students with first-hand experience with course concepts and with the opportunity to explore methods used by scientists in their discipline. Leading a laboratory session has particular challenges and opportunities that differ from those in a standard classroom environment.

Vanderbilt laboratory classes are typically led by graduate student TAs. The TA needs to know and review the experiment, plan clear explanations, and create questions to stimulate student thinking. In addition, it is the responsibility of the TA to ensure that safety standards are followed. This page contains a variety of resources to help TAs insure that they, and the undergraduate students they teach, get the most out of the laboratory class.

**A Condensed Guide to Leading a Lab**

Best practices to follow that can help laboratory sessions run smoothly

Potential **goals** of laboratory classes:

* 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 errors.
* 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.

(from [*Science Teaching Reconsidered*](http://www.nap.edu/readingroom/books/str/), National Academy Press, 1997)

Some **‘best practices’** to help the lab run smoothly while maximizing *student learning*–

As you **prepare** to conduct a lab, consider the following questions:

* Will I be able to do the lab myself before class?
* Am I familiar with the materials and equipment?
* What are the safety considerations?
* Would it help if I gave my students a handout highlighting key theoretical, procedural, and safety points?
* How can I link this lab to the professor's lecture?
* How can I clearly communicate the criteria used in grading the lab reports?
* What kind of preparation should my students do before they come to lab?
* What tips can I give my students, so they can complete the lab successfully within the time allotted?
* Would it be helpful if I demonstrated new techniques to the students?
* How will I monitor student progress in the lab?
* Where might my students run into difficulty completing the experiment?
* What kinds of questions should I ask my students to stimulate their thinking and to encourage deeper understanding of the experiment?
* How can I help the lab pairs/groups to work together well?

(from the University of Washington’s [Center for Instructional Development and Research](http://www.washington.edu/teaching/conducting-labs/))

**During the lab:**

* Establish the specific goals of the lab (write them on the board)
* Prepare an outline (on the board) of the lab activities
* Do not hesitate to explain things more than once or answer questions that you may consider simple (this will likely save you from headaches later on)
* Demonstrate new techniques to the class or small groups
* Review safety issues for the lab
* Visit with each student individually during the lab
* Ask specific questions of the students in order to monitor their progress during the lab
* Provide ample feedback to students during the lab

**After the lab:** Grading Lab Reports (suggestions for providing constructive, formative feedback)

* Ensure that your grading scheme is consistent with course policy.
* Determine whether students understood the lab.
	+ Assess whether many students missed a critical concept.
	+ Evaluate whether students drew reasonable conclusions from the data they collected.
	+ Reward creative and rational but unconventional thought in application of principles.
* Read, evaluate and return lab reports in a timely manner with cogent feedback.
	+ Help students improve by telling them how they could have done better.
	+ Focus comments in specific areas rather than on the report as a whole.

(from the [University of Virginia’s Teaching Resource Center](http://cte.virginia.edu/resources/teaching-tips-for-science-labs/))

What makes a good TA? In their feedback to TAs, students indicate that they appreciate lab TAs who:

* Summarize the theory and procedure briefly before the students begin the lab.
* Demonstrate new techniques.
* Relate the lab to the lecture and to real world applications.
* Are willing to help and answer questions.
* Walk around and check with students to make sure that they are making progress.
* Ask questions that make students think more deeply about what they are doing and why.

(from the University of Washington’s [Center for Instructional Development and Research](http://www.washington.edu/teaching/conducting-labs/))

**Safety Resources**

Safety is always an important concern in teaching laboratories. Consult the departmental lab coordinator with questions about departmental safety policies.

For university wide resources and regulations, consult the Vanderbilt Environmental Health and Safety (VEHS) office.

615-322-2057 (General information)
835-4965 (Emergency pager)
[http://www.safety.vanderbilt.edu/index.htm](http://www.safety.vanderbilt.edu/about/contact-us.php)


This teaching guide is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/).