

Tenth Annual Workshop for New
Faculty in Physics and Astronomy

American Center for Physics
College Park, MD

November 10-13, 2005

About 700 newly hired faculty have participated (65% from PhD-granting institutions, 35% from baccalaureate and M.S. institutions), representing $\frac{2}{3}$ of PhD-granting institutions and $\frac{1}{4}$ of baccalaureate institutions

The Problem

“...The research universities have too often failed, and continue to fail, their undergraduate populations....Some of their instructors are likely to be badly trained or untrained teaching assistants who are groping their way toward a teaching technique; some others may be tenured drones who deliver set lectures from yellowed notes, making no effort to engage the bored minds of the students in front of them.....

Serious responses to complaints about undergraduate teaching have generated original and creative pedagogical and curricular experiments. But too often bold and promising efforts have vanished after external grant support disappeared, have withered on the fringes of the curriculum, or have been so compromised that their originality has been lost.

.....Advanced research and undergraduate teaching have existed on two quite different planes, the first a source of pleasure, recognition and reward, and the latter a burden shouldered more or less reluctantly to maintain the viability of the institution.”

Reinventing Undergraduate Education: A Blueprint for America's Research Universities (Report of The Boyer Commission on Educating Undergraduates in the Research University , 1998 – <http://naples.cc.sunysb.edu/Pres/boyer.nsf/>)

The Students' View

“Students were very clear about what was wrong with the teaching they had experienced and had many suggestions about how to improve it. They strongly believed that the source of these problems was that SME faculty do not like to teach, do not value teaching as a profession, and lack, therefore, any incentive to learn to teach effectively....”

“Students also made very specific criticisms of the pedagogical techniques of their SME professors. The most common of these were that lessons lacked preparation, logical sequencing or coherence, and that little attempt was made to check that students were following the arguments or ideas. Students interpreted poor preparation as reflecting faculty disinterest in how well their students were learning.”

Student comments

“I noticed a big difference when I switched to management. In every class I swear they have some sort of group work...Now, when I go from class to class, I've had all these groups so I know everyone in the class. And that makes it comfortable to ask the professor questions because you don't feel stupid like you do with a bunch of strangers.”

“They just can't understand your questions. They don't understand why you don't understand, and they can't explain what they are telling you any other way...And the department knows very well they're not good professors, but they keep them on because they're good researchers.”

“There’s no sort of interaction back and forth. Just the professor sitting up there presenting material to you.”

“In a physics recitation, people would rather shut up than say something that could be wrong. That’s why there was so little interaction, and strong feeling of intimidation.”

“They just continually write. And they’re standing in front of what they write, but they don’t care. They’ll look over their shoulder now and then, and say, ‘Okay, you are all still there,’ and just keep going. And the number of people that don’t go to classes is amazing.”

E. Seymour and N. Hewitt, *Talking About Leaving: Why Undergraduates Leave the Sciences* (Westview Press, 1997)

Objectives of Workshop

- Change bad habits at early stage in faculty member's career
- Promote adoption of PROVEN national reforms, especially those that can be implemented with minimal time commitment and minimal risk
- Exposure to national role models, who have pledged to support local course reform efforts, provide materials and engage in continuing dialogue
- Provide a coherent and interconnected set of paradigms for improvement of instruction
- Formation of cohort group; follow-up activities

CHARACTERISTICS OF REFORMED TEACHING

1. The focus is on learning (the student) rather than teaching (the instructor).
2. Students are active participants, and inquiry-based methods are used in the lecture, lab, recitation, and the textbook with its ancillary materials.

CHARACTERISTICS OF REFORMED TEACHING

3. The instructor must set specific learning goals rather than teaching goals (the latter often being a syllabus based on the table of contents of the textbook), and must adopt realistic and appropriate assessment mechanisms.
4. Formative assessment of student learning permits adjustments in content and methodology in real-time (that is, during class or between classes).

OLD vs. NEW TEACHING

1. I covered it in class, therefore it is the student's fault if the material is not understood.

1. I haven't really taught it until the student understands it.

OLD vs. NEW TEACHING

2. Content is determined by the textbook or by what I think the students *should* learn.

2. Content is determined by what the students *can* reasonably be expected to master during the allotted time.

OLD vs. NEW TEACHING

3. I talk; the students listen and learn.

3. Students interact (with me and with one another) and respond to queries; I observe and discover what they learn and how they learn.

The challenge of good teaching should excite you as much as the challenge of good research or scholarship.....

BUT.....

(1) There is no perfect lecture.

(2) There is no perfect research product (paper, proposal, etc.).

Your time is limited – do the best you can within the time available.

Workshop Logistics

- Divided into 2 groups (A and B)
- Usually, one group is in plenary session while the other is in breakouts
- 2 breakouts devoted to specific types of courses: intro physics, upper-division physics, astronomy (choose 2 of 3)
- Other breakouts split by institutional type:
 - type 1: grants PhD in physics
 - type 2: small liberal arts colleges (usually 1000-1500 students, 3-6 physics faculty)
 - type 3: everyone else (regional publics, MS-granting, service academies, technical institutes, etc.)

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10. Day-to-day schedule with reading assignments, exams (locations and times), special deadlines (term papers, withdrawal dates, etc.).
9. No make-up exams, no early or late exams.
8. Policy on incomplete grades: An incomplete grade is awarded ONLY to allow missing work to be made up and ONLY if all other work is satisfactory and ONLY if advance arrangements have been made with the instructor about the work to be completed and the deadline for completing the missing work.

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7. Policy on final grades: Based on results from previous terms, it is expected that the final grade cut-offs will be approximately: 85% for A, 75% for B, 65% for C, 55% for D. Actual cut-offs this term may be higher or lower than these.
6. Your final grade is FINAL – no work may be handed in for additional credit after the final exam.
5. Plus and minus grades are given only rarely and only when justified by special circumstances.

COROLLARY: NEVER post a list of final letter grades at the end of the term. Post only the cumulative score of each student and the cut-offs.

Suppose you have determined that the range for a B grade is 75% – 85% (= 225 – 255 out of 300). How would you grade the following students?

Student	Exam 1	Exam 2	Exam 3	Total	Grade
Ada	80	80	80	240	B
Bob	90	60	90	240	B+,A-
Cal	70	100	70	240	B-
Dan	60	80	100	240	B+,A-
Eve	100	80	60	240	B-

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4. No office hours on the day of an exam.
3. Corrections of errors in exam grading: Requests for regrading of exams must be in writing and must specify exactly why additional credit is warranted. No requests for changing an exam grade will be accepted more than 48 hours after an exam is returned.
2. Academic regulations, especially policy on academic dishonesty.
1. Notice regarding accommodations for students with DOCUMENTED learning or physical disabilities.