PEER INSTRUCTION
for INTRODUCTORY ASTRONOMY

http://hea-www.harvard.edu/~pgreen/educ/PI.html

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IMPLEMENTING PEER INSTRUCTION

◦ Lecture briefly in ∼standard format on one of the fundamental concepts to be covered.

◦ Present a *ConcepTest*: a short multiple-choice question tests students' understanding.

◦ After 1 minute, the students answer individually.

◦ If $\sim 30 - 70\%$ choose correctly, students form small groups.

◦ 2 minutes for discussion, then new answers are recorded.

◦ A quick tally decides - stay on this concept, or move on?

BENEFITS OF PEER INSTRUCTION

◦ Engages student ego and attention.

◦ Provides real-time student/instructor feedback.

◦ Provides student self-gauging.

◦ Emphasizes conceptual over rote learning.

◦ Unearths/Challenges pre/misconceptions.

◦ Enhances student involvement in the learning (and scientific) process.

◦ Students hear and provide explanations in their own terms.

IMPLEMENTATION HINTS

◦ *First class:* gauge student background and prior knowledge. Prepare them for conceptual class mode.

◦ *So students come prepared:* Reading quizzes encourage students to read before class, and minimize definitions and factoids. See/modify a simple webform example at

`http://hea-www.harvard.edu/~pgreen/educ/RQexamp.html`

◦ *Voting methods:* Use a technique that is rapid, easy to visualize, and discourages herd voting:

- thumbs
  - up, down, left, right for A, B, C, D (hard to see, though)
- colored flashcards
  - free! easy! download or print from `http://hea-www.harvard.edu/~pgreen/educ/PI.html`
- electronic voting systems
  - expensive, but many advantages! see reviews at http://www.psy.gla.ac.uk/~steve/ilig/tech.html

◦ *Walk around:* Listen to student discussions to unearth pre/misconceptions, to encourage participation, and to glean good distractors for future ConcepTests

◦ *Use grades:* To add motivation, on occasion you can collect individual and/or group answers to ConcepTests posed in class. This encourages individual accountability as well as group participation.

ASTRONOMY CONCEPTEST DATABASE

http://hea-www.harvard.edu/~pgreen/educ/ConcepTests.html

Currently On-Line:

Dozens of instructor/collaborators have already contributed to a database of ConcepTest questions that continues to grow.

- adding 2 good conceptual questions (or reviewing 10) makes *you* a collaborator
- $\sim$ 500 ConcepTest questions now on-line, organized by topic
- $\sim$ 100 more ConcepTests written or submitted; help review and edit!

www Access Limitation

- increases the database
- prevents student access
- increases instructor participation
- facilitates evaluation, attribution, and modification

Get the Book !!

Peer Instruction for Introductory Astronomy

- Prentice-Hall 2002 paperback
- now available on *amazon.com, prenhall.com*
- technique description, classroom recipes, and ConcepTest library
- includes CDROM with individual PDFs/Word docs for easy searching, printing, or projecting

A HANDFUL OF REFERENCES
for Peer Instruction and ConcepTests

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- Peer Instruction for Astronomy HomePage:
  http://hea-www.harvard.edu/~pgreen/educ/PI.html

and Astronomy ConcepTest Database
  http://hea-www.harvard.edu/~pgreen/educ/ConcepTests.html

- Eric Mazur's Physics Peer Instruction HomePage:
  http://galileo.harvard.edu
- Classroom Assessment Techniques
  http://www.flaguide.org/
- The Astronomy Diagnostic Test
  http://solar.physics.montana.edu/aae/adt/
- National Institute for Science Education
  http://www.wcer.wisc.edu/nise/cl1/CL/default.asp
- Astronomy Education Review
  http://aer.noao.edu/

PUBLICATIONS:

- Zeilik, M. et al. 1997, "Conceptual Astronomy: A novel model for teaching postsecondary science courses", Am. J. Phys., 65, 987
- P. M. Sadler 1992, "The initial knowledge state of high school astronomy students", Dissertation, Graduate School of Education, Harvard University
- Hake, R. 1998, "Interactive-engagement vs traditional methods: A 6000 student survey of mechanics test data for introductory physics courses," Am. J. Phys., 66, 64. See also http://physics.indiana.edu/~hake

  Peer Instruction has extensive documented success in Intro Physics!