

## STUDENT LEARNING AND REFLECTION

Thinking about Learning

## DAY 3 WORKSHOP OBJECTIVES

After Day 3, workshop participants will be able to:

1. Describe the characteristics of a "high structure" course
2. Reorganize their course to adopt a version of the "flipped" class format
3. Explain the Dunning-Kruger effect
4. Describe the characteristics of less effective and more effective examples of student study strategies
5. Create assignments that could be used in their own classes to help students assess their level of knowledge

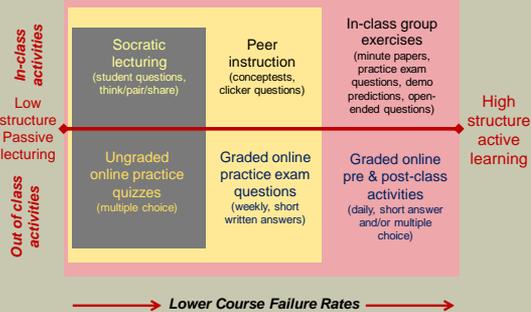
## SEVEN PRINCIPLES OF GOOD PRACTICE

1. Encourages student-faculty contact
2. Develops cooperation among students
3. Encourages active learning
4. Provides prompt feedback
5. Emphasizes time on task
6. Communicates high expectations
7. Respects diverse talents and ways of learning

Chickering & Gamson, AAHE Bulletin, 1987, p. 3-7

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## Degree of Course Structure



Freeman et al., 2011, CBE-Life Sciences Education v.10, p. 175-186.

## FLIPPED (INVERTED) CLASSES

- Students complete pre-class work online
- Time in class dedicated to confronting more challenging concepts

Lage et al. (2000) flipped microeconomics **class structure**:

- **Preclass lecture** from videotape(!) or narrated PowerPoint
- Introduction: Instructor responds to **student questions**
- **Mini-lecture** (~10 minutes) on key concepts
- **Active learning**: An economic experiment or lab exercise
- Students apply concepts to **review questions/worksheets**
- Final questions.

Lage, M., Platt, G., and Treglia, M., 2000, Journal of Economic Education, v.31, #1, p.30-43.

## MULTIMEDIA MODULES

Undergraduate students enrolled in a reformed introductory Physics course:

### Experiment:

- Web-based pre-lecture video-based modules designed around multimedia learning research
- Face-to-face lecture time reduced (75 → 50 min)
- Multimedia presentations used narration with equations, illustrations, and animations

### Control:

- Students received standard lectures and recommendations to read textbook before attending class

Stelzer, T., Brookes, D.T., Gladding, G., and Mestre, J.P., 2010, American Journal of Physics, v.78, #7, p.755-759.

## MULTIMEDIA MODULES

### Results:

- **Performance:** Students in experimental group had a higher average exam score (77% vs. 74%,  $p < 0.01$ )
  - **Perceptions:** Students in experimental class considered the course **less difficult**, had **better attitudes**, and considered **lectures more valuable**
  - Previously ~70% of students attended lecture; **attendance for reformed class ~90%**

Stelzer, T., Brookes, D.T., Gladding, G., and Mestre, J.P., 2010, American Journal of Physics, v.78, #7, p.755-759.

## PRE-CLASS QUIZ: VIDEO VS. TEXT

Undergraduate students enrolled in a reformed introductory Physics course:

### Experiment:

- Students completed pre-class quiz questions after viewing video-based multimedia learning modules

### Control:

- Students completed pre-class quiz questions after completing reading task

Chen, Z., Stelzer, T., Gladding, G., 2010, Physical Review Special Topics, Physics Education Research, v.6, p.1-5

## PRE-CLASS QUIZ: VIDEO VS. TEXT

### Results:

- **Performance:** Students in experimental group had a higher average quiz score (57% vs. 49%)
  - Scores of students in experimental group that skipped parts of module (49% - same as "reading" group)
  - Scores of students in experimental group that viewed all parts of module (65%)

% answers correct in control (x-axis) and experimental (y-axis) classes

Chen, Z., Stelzer, T., Gladding, G., 2010, Physical Review Special Topics, Physics Education Research, v.6, p.1-5

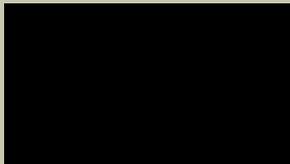
## STUDENT SUCCESS WITH MULTIMEDIA

Stelzer et al. attribute improved student learning to:

- Dual channel processing (visual + auditory) in comparison to textbook
- Effective multimedia design, specifically minimizing cognitive load (*coherence principle*) by omitting additional details often present in texts

## FLIPPED GEOLOGY CLASSES

- Physical Geology at NCSU: ~15 minutes of basic lecture material moved to preclass assignments
- Students complete related online quiz
- Lesson begins with a few related ConcepTests



- Fall 2014 began using short videos
- 20 YouTube videos w/links to quizzes

<http://www.youtube.com/c/GeoScienceVideos>

## PRECLASS ASSIGNMENTS

Review your lesson and identify some information that students can learn on their own before attending class

- *Identify a couple of questions you can ask to assess student knowledge and comprehension*
- *Estimate the total time it will take for students to complete the preclass activity (try to match time for "new" formative assessments)*

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