Achievement, Equity and Retention:
Key Pedagogical Changes that Can Make a Real Difference in ANY College Classroom
[WITHOUT Lowering Standards]

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Overview: When diversity issues are cast in content-centered ways, many faculty may view them as irrelevant to their own teaching. However, examination of pedagogical practices reveals a need for major changes in nearly all courses. We will examine at least three types of pedagogical changes that can make a real difference in achievement and retention in almost any college or university classroom. Specific topics will include: How can I radically reduce or eliminate low grades in lecture courses without lowering standards? How can I make my students brighter and harder working using only 1 hour of class time (in ways that level the playing field for all groups)? And: Does my assessment system unfairly and unnecessarily favor particular groups? Throughout we will ask what else we can do to increase achievement and fairness. Processes today: Mini-lectures alternating with writing and small- and whole-group discussions. The focus will be on ideas that can be implemented in your own classes immediately.

This is a Default Scope & Sequence. It is NOT a Promise! Indeed, we cannot do it all

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THREE OPENING CASES

• Calculus--Highly Selective Institution--Blacks 60% D,F& W.
  Survey of entire faculty--How can this be? How would faculty you work with explain?

• Harvard—Your New Job: Work With Students Who Are In Academic Difficulty (Any subject).
  What would the faculty you work with anticipate to be the student’s problems?

• Your Department or Program: Faculty’s ideas of main reasons that students don’t succeed?

PART 1: QUICK WAYS TO MAKE BIG DIFFERENCES

HOW CAN I RADICALLY REDUCE OR ELIMINATE LOW GRADES IN LECTURE COURSES WITHOUT LOWERING STANDARDS?

[Framework: Structured Active Learning]

Example 1: Uri Treisman, Calculus & Minorities
Extended By Others to Rural Whites Etc.

Core Problems: Elite v Non-College Prep. High School Programs => Few Serious Peers;
Achievement Low Social Value; Penalize Peer-Checking, Don’t Study Together (Effectively)

Two (or more) important take home points? 1 or 2 Questions?

- Treisman’s Model: http://www.math.uiuc.edu/MeritWorkshop/uriModel.html

Example 2: Calculus Without F’s

Example 3: Economics Without F’s

Example 4: Low Math SAT & Chemistry
- Jacobs, D.C. 2000/Web. An alternative approach to general chemistry: Addressing the needs of at-risk students with cooperative learning strategies. http://gallery.carnegiefoundation.org/djacobs/index2.htm At risk = low math SAT: 50% fewer made D/F in general chemistry, twice as many made A or B. Retention of at-risk students increased 50% in subsequent organic chemistry and sophomore biology courses and 50% more majored in science.

Two (or more) important take home points? 1 or 2 Questions? [Implementation is next.]
Three Dysfunctional Illusions of Rigor

Note: I am only citing illusions in this workshop that I once shared enthusiastically.

1. **Hard courses weed out weak students:** When students fail it is primarily due to inability, weak preparation or lack of effort. [v. It is most often due to ineffective pedagogy.]

2. **Massive grade inflation is a corruption of standards.**
   [v. What we need is a lot more of the right kind of grade inflation.]

3. **Traditional methods of instruction are fair to a wide range of diverse students of good ability.** [v. Designed for and favor rich white males from great college prep programs]

IMPLEMENTATION IN YOUR CLASSES—THE THREE BASICS

1. **Preparation: Need Essentially ALL Students Prepared.**
   General Knowledge, In-Class Reading or Lecture, Worksheet, Quiz…
   *Worksheets & Red Pens*
   *Make it Count ENOUGH in grade*

2. **Cognitive Focus: On Same Topic and Important Focus**
   EXPERT Question or Worksheet … [NOT “Any Questions?”] [S-S discussion; NOT T-S OR S-T Recitation]

3. **Social System (Groups & Roles). Every Student Participating Constructively**
   Write-Pair-Share For Short Times.
   *Two-Minutes & Social Roles …*
   Teacher Formed Groups of 5-6 for Longer Discussions
   *Group Responsible For All Participating*
Example 5: Pedagogies Compared Broadly: Physics
Pre & Post Tests; Qualitative MC Questions; Misconception based (Start w Fill in blank)

**Y Axis: How Much They Advanced:** \( \% \text{Gain} = \% \text{Posttest} - \% \text{Pretest} \)

**Lines: Proportion Of Ignorance Cured:** % of maximum possible gain
\[ \text{Proportion of Ignorance Cured} = \left( \% \text{Posttest} - \% \text{Pretest} \right) / (100 - \% \text{Pretest}) \]

*This is a tough measure of the effectiveness of teaching—only get credit for net gains*


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**Two (or more) important take home points from Hake? 1 or 2 Questions?**
Example: Mazur’s Peer Instruction [lectures with carefully structured discussion]
  http://mazur-www.harvard.edu/education/educationmenu.php

Example: Biologists lecturing do worse than physicists
• Sundberg, Marshall D. 2003. Strategies to Help Students Change Naive Alternative Conceptions about Evolution and Natural Selection. Reports of the National Center for Science Education 23(2) 
  http://www.ncseweb.org/newsletter.asp?curiss=38

GREAT STARTING SITES FOR INTERACTIVE ENGAGEMENT

Who has worked with these?


Problem-based Learning, especially in large classes. http://chemeng.mcmaster.ca/pbl/pbl.htm  Problem Based Learning Clearing House. University of Delaware. https://chico.nss.udel.edu/Pbl/  See also list of sites: 
  http://www.udel.edu/pbl/others.html

Process Oriented Guided Inquiry Learning (POGIL). A POGIL classroom or lab consists of any number of students working in small groups on specially designed guided inquiry materials. These materials supply students with data or information followed by leading questions designed to guide them toward formulation of their own valid conclusions - essentially a recapitulation of the scientific method. The instructor serves as facilitator, observing and periodically addressing individual and classroom-wide needs. POGIL is based on research indicating that a) teaching by telling does not work for most students, b) students who are part of an interactive community are more likely to be successful, and c) knowledge is personal; students enjoy themselves more and develop greater ownership over the material when they are given an opportunity to construct their own understanding.
  http://www.pogil.org/info/introduction.php

National Center for Case Study Teaching in Science. SUNY-Buffalo (Clyde Herreid) [How to and many cases.] 
  http://ublib.buffalo.edu/libraries/projects/cases/case.html  Don’t miss the links to other case studies sites: 

Just-in-Time-Teaching. “JiTT is a teaching and learning strategy based on the interaction between web-based study assignments and an active learner classroom. Students respond electronically to carefully constructed web-based assignments which are due shortly before class, and the instructor reads the student submissions "just-in-time" to adjust the classroom lesson to suit the students' needs.… we are aware of approximately 300 faculty in 25 disciplines at approximately 100 institutions … who have adopted the JiTT strategy.”
  http://webphysics.iupui.edu/jitt/jitt.html

**Good Sources of Proven Techniques (Books):**


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**A NOTE OF CAUTION: GET A SMOOTHER START IN FOSTERING LEARNING**

**Caveat: Patience Helps.** “Karl Smith of University of Minnesota and Barbara Millis, soon to be of University of Nevada at Reno, are both authors of excellent books on cooperative learning ("interactive engagement") and both are refreshingly honest in their workshops about the deleterious effects of such methods on student evaluations if one plunges in too quickly or is in the initial awkward stages of learning a new pedagogy by doing…. I concur that if one MUST choose between student learning and student satisfaction, the learning has to come first. But, I have never seen an actual case yet in which that is THE choice that must ultimately be made over the long haul…. Granted, active learning done for the first time is awkward--but so is lecturing---and if one works to get proficiency in getting both learning and satisfaction, one can eventually prevail in both areas. If one is at the "one or the other" thinking, then one is stuck at being satisfied with half-success. It is borderline insanity not to continue to seek ways in which both learning and satisfaction can be retained. To choose otherwise is to give into going into classroom after classroom--spending one's life with "unhappy campers" (adults who are not satisfied or enthused about learning a topic or being in the room with me). Who wants that kind of professional life? Likewise, if one enjoys popularity, it's dangerous to smugly presume "I'm very popular; therefore I'm a great teacher." A really great teacher will be unafraid to put the results to the test in some type of learning assessment. Results of that can be just as callous a wake-up call as low student evaluation marks.” Ed Nuhfer POD 4 May 2004

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**Ways to Minimize**

Avoid Re-Inventing Square Wheels: Start with established methods and deviate with caution.  
Be sure to explain WHY you are teaching in atypical ways (increase learning and grades, etc.)  
Point out that grades are indeed better (assuming they are)  
Mid-Semester feedback and re-explanation

**Applications in your classes? Comments or Questions?**
HOW CAN I MAKE MY STUDENTS BRIGHTER AND HARDER WORKING USING ONLY 1 CLASS HOUR? AND SIMULTANEOUSLY LEVEL THE PLAYING FIELD FOR ALL GROUPS?

[Framework: Teach Basic Disciplinary Skills]


Why Works?

1. **Disciplinary Discourse** in College Prep. v Regular Secondary Schools

2. **Writing Across the Curriculum**: Diverse Examples--**NOT just “A” Papers**;

3. **ACTIVE LEARNING OF HOW TO MEET EXPECTATIONS** [**NOT just explained**]

More Examples: Not Just Essays Exams ....

Multiple Choice Questions, Introductory Courses (& GRE)

Reading Same Book in Different Courses? Thus …

CEN & Freshman Writing: Co-valedictorian …

Papers & Rubrics  *Rubrics, Criteria, etc. must be taught comparatively, not just explained*


IMPLEMENTATION IN YOUR CLASSES?

*Three Tasks to Your Students Need To Do Well to Succeed?*

[= In What Ways Do Your Students Need To Use Disciplinary Skills?]*

*How Do/Can You Provide Practice (Or Check That They Already Have Mastered?*
4. Students should come to us knowing how to read and write and do essay and multiple choice questions. [v. High school is MUCH simpler. AND: Each discipline has its own conventions. Only great preparatory programs (multiple AP courses) teach these.]


**COROLLARY: STUDENT ERRORS ARE OFTEN MISLEADING**

**Thinking Hard Increases Mechanical Errors**

Faculty often address mechanical and fundamental thinking errors equally

When master intellectual tasks, many mechanical errors vanish

=> Patience; Writing as Process (Require preliminary draft etc)

**Students misread expectations.** [e.g. Think have to abandon simple statements.]


**Intelligence of Student Errors** [Parallels Misconceptions (below)]


**Misunderstandings & Misconceptions: Too many for faculty member to catch and address**

Didn’t Fully Understand Presentation, Reading etc. OR Misunderstood Metaphor

**Misconceptions: Too many for faculty member to catch and address**

Common, Idiosyncratic &/Or Taught. Ex: Commas after trees

=> Remember Mazur: 50% reduction of errors in 2 minutes of structured S-S work


Two (or more) important take home points? 1 or 2 Questions?
REVIEW+: WHY DO ACTIVE LEARNING & DISCIPLINARY SKILLS MATTER?

- Why are these approaches so much more effective than traditional teaching? Understanding why they work makes it easier to refine how we use them.

**Problem 1.** Elite v Non-College Prep. High School Programs => Few Serious Peers; Achievement Low Social Value; Penalize Peer-Checking, Don’t Study Together (Effectively) (Above: Treisman)

**Problem 2.** Disciplinary Discourse in Intensely College Prep. v Regular Secondary Schools Students expect plain English; Faculty have forgotten it. (Above: Brufee)

**Problem 3.** Just Show Them an “A” Paper/Answer Illusion. [Underestimates difficulty of P #2.] Writing Across the Curriculum: Diverse Examples; Explicit Criteria

**Problem 4:** Misconceptions

**Problem 5.** Expert v Novice Address to Difficulties  Peer-Led Discussions in Psychology: Direct Answer v Elaboration (Not Published)

**Problem 6.** Fundamentals of Learning  Example: Information Processing (Limited Working Memory): **Guppy Effect.**


What three further changes in your teaching do these frameworks suggest? Questions?
PART 2: FOCUSING ON UNDERPOWERED STUDENTS

DO I PROJECT LOW EXPECTATIONS OR ONES THAT DIFFER BY GROUP?

[Framework: Stereotype Threat]

Stereotype Threat:
Women and Men on Math When “Diagnostic of Group Differences”
African Americans and White Americans
White Men too

General strategy:
Expect that all can do it—*it is only college*
Say: High Expectations but know you can do it.
1 on 1: Cite evidence that shows can do good work
Teach so they can indeed largely all get it.

Example: Equations and graphs in biology
I know many of you have found these approaches distasteful
Are important because …
Going to learn in a way where every one will understand

Implementation in your classes? Examples or comments or questions?

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DOES MY GRADING UNFAIRLY AND UNNECESSARILY FAVOR PARTICULAR GROUPS? [Framework: Tacit Bias in Assessments]

Example 1: When Give Exam Only Once Implicitly Assume:
   a. Student Knows When She Has Achieved "A" Level Mastery
   b. She Knows This so Well That She Allocates Enough Time
   c. She Has Control Over Her Time & Can Make That Allocation Stick
      (v Has Real Job or Is Single Parent With Sick Kids)
   d. Believes the Instructor Wants & Expects Her to Succeed (v “Stereotype Threat--Steele)

   **Response:** Two Exams...
      [v Grading Effort; v “Coverage”]

Example 2: Totally Fixed Deadlines For Papers, Lab Reports, Etc.

   **Responses:** Revisable Papers &/Or Set Number Of Late Days

   **Comment:** But… Professionals Need To Manage Time?
      Require Of Frosh v Elicit By End? Options ALLOW time-Management!!

   Implementation in YOUR Classes?

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ANOTHER DYSFUNCTIONAL ILLUSION

5. It is essential that students hand in papers on time and take exams on time. Giving them flexibility and second chances is pampering them. [v. Give limited time flexibility and a limited number of repeats on exams as a way of fostering increased achievement.]


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SYNERGY: STRUCTURED GROUPS & “MAPS”

Intensive Freshman Seminar:
What can I do that will maximize achievement over four years?
Affiliation, Power of Groups, Basic Skills, Excitement, Maps.

Three Maps from Nelson's Intensive Frosh Seminar:

Map 1: Me-Now, Me-Then
• Step 1. [Before Coming to IU] How Will College Help Me Earn More Money?
What Else Do I Want To Achieve There--Intellectually & Personally?
• Step 2. [Before Coming To IU] Compare Answers With Those Of 4 Adults.
• Step 3. [At IU] Examine Notes From Seniors: What I Wish I Had Known!
• Step 4. [At IU] What Are My Goals For Next 4 Years?
What Two Specific Steps Can I Take In First Week To Move Toward Each Goal?

Map 2: Thinking Modes [Perry]
• Step 1: What Kinds Of Answers Do I Expect? What Other Kinds Are There?
• Step 2: How Do Scientists Decide Which Answers Are Better? [“ways of knowing”]
• Step 3: How Will I Decide Which Answers Are Better?

Map 3: Objectivism To Constructivism Gradient
• Step 1: How Does This Gradient Work?
• Step 2: Where Does The Author/Teacher Place This Topic On Gradient?
Where Do I Think It Should Be Placed?

Group Process from Nelson's Intensive Frosh Seminar:
• Goals: 1. Increased conceptual mastery. 2. Learn the value of groups
• Set-Up:
  √ Text difficult enough that group work will help. [Anderson: Reality Isn’t ....]
  √ Instructor assigned groups of 4-5. Reshuffled occasionally.
  √ Question sheets over reading given out with assignment
  √ In-class practice: Write and compare answers on initial assignments
  √ Initial quizzes are practice only
• Three In-Class Grades.
  1. Each student assigned to write different question from assignment sheet.
  2. Average of individual grades for members of own group
     BUT all grades of at least 8/10 raised by 1/10 before averaging [B => A]
  3. Group revises each answer as needed using red pens--all communications written and initialed. [Immediate feedback. Most marking usually done for me by them]
     3rd grade is average of revised grades.
• Assessment:
  √ With group assisted learning, almost every student mastered most questions to at least the B level (after initial 2 or 3 practice quizzes).
  √ Group dynamics: Active group work every afternoon or night
     Best bonded IFS group 1st week [but also used challenge ed]

What frameworks/processes can you teach in the 1st yr that will maximize 2 and 4-yr success?
A FINAL DYSFUNCTIONAL ILLUSION

6. If we cover more content, the students will learn more. v. Less is usually more.

**Problem:** Always more than we can cover. [And I love it all!]

**Problem:** Increased coverage does not increase learning.

- Too much content makes us think we don’t have time for effective teaching.
- Too much content poisons student attitudes [*Thinking about Leaving*]

**Solutions:**
- Biology students learn more in non-majors courses.
- Physics 130 equations to 30
- Designate several periods as “spare” on the syllabus
- Design a course for one-half of available time—forces prioritization.
- Highlight text with exam ready study questions instead of with lectures.

- M. D. Sundberg & M. L. Dini. 1993. Science majors vs nonmajors: Is there a difference? *Journal of College Science Teaching*. Mar/Apr 1993:299-304. [Multiple sections and instructors. Both courses taught with traditional pedagogy, but with different intensities of 'coverage.' "The most surprising, in fact shocking, result of our study was that the majors completing their course did not perform significantly better than the corresponding cohort of nonmajors.”]


- J Russell, W. D. Hendricson & R. J. Herbert. 1984. "Effects of lecture information density on medical student achievement." *Journal of Medical Education* 59:881-889. [Three different lectures on the same subject. 90% of the sentences in the high-density lecture disseminated new information as did 70% in the medium and 50% in the low. Remaining time used for restating, highlighting significance, more examples, and relating the material to the student's prior experience. Students randomly distributed into the 3 groups (no significant differences in prior GPA or on knowledge base pretest). Students in low treatment learned and retained lecture information better.] [Here less is more.] [from C.C. Bonwell]


WHAT DO YOU DO OR COULD YOU DO TO LIMIT CONTENT ENOUGH TO ALLOW EFFECTIVE LEARNING?
PERSPECTIVE: Scholarship of Teaching and Learning [SOTL]

Traditional Teaching.

Scholarly Teaching:
   Basic mastery and application of general literature on college/university teaching. Compares own practices with “best practices” for similar courses elsewhere.

Scholarship of Teaching and Learning [SOTL]
   Recognize and care about problem: It ain’t working good enough
   Doing the same harder doesn’t work either
   [Better ways are not obvious from the literature]
   Qualitative explorations of what is happening
   Qualitatively new attempts to make it work
   Quantitative [and Qualitative] assessment of effects
   Make it Public

Some Conclusions and Questions

Conclusions:
1. Traditional, didactic, ways of teaching and grading are comparatively ineffective.
2. Traditional, didactic, ways of teaching and grading are tacitly biased against students from underpowered backgrounds. [Tacit or unintentional racism, classism, etc.]
3. There is very extensive support for the first two conclusions.
4. Students clearly recognize that traditional, didactic teaching is unsatisfactory.
5. Faculty and students both resist change. Faculty through Dysfunctional Illusions of Rigor

The two most important questions in higher education may be:
1. Why do faculty insist on teaching in ways that are widely recognized to be inefficient?
2. Why do administrators allow—even encourage—inefficient teaching?

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FUNDAMENTAL CHOICE: Sorting Students v Maximizing Achievement?
[i.e. Maximizing Number That Master At "A" Without Lowering Standards]

Underlying Questions:

1. *Measure Teaching By What Teacher Says Or By What The Students Learn?*

2. *Maintain Dysfunctional Illusions of Rigor v Foster Maximal Student Success?*


**SYNTHESIS**

- Perry: *Eventually, Students Here Have Just One Question: "Are you OK?"*

*How Does The Content You Choose To Teach And That You Choose NOT To Teach Reflect Your Own Personal Values, What You Stand For As A Morally Significant Human Being?*

*How Do The Pedagogies You Choose To Use And Those You Choose NOT To Use Reflect Your Own Personal Values, What You Stand For As A Morally Significant Human Being?*
SELECTED ADDITIONAL RESOURCES

TEACHING BASICS


Great First Downloads: IDEA Papers. Topics include Improving Lectures, Improving Discussions, Improving Essay Tests, Improving Student Writing, Improving Grading, Evaluating Teaching and many more. 4-8 pages each, feature both techniques and introduction to literature. Free PDFs http://www.idea.ksu.edu/resources/Papers.html Also archives of Tomorrow’s Professor Listserve http://sll.stanford.edu/projects/tomprof/newtomprof/postings.html


YOU CAN USE WRITING, EVEN IN LARGE CLASSES, WITHOUT GRADING KILLING YOU

Calibrated Peer Review (CPR)™ “is a Web-based program that enables frequent writing assignments even in large classes with limited instructional resources. In fact, CPR can reduce the time an instructor now spends reading and assessing student writing.” Developed for science with $7 from NSF & Howard Hughes. http://cpr.molsci.ucla.edu/


IS IT WORKING? ASSESS AND DOCUMENT WHAT IS HAPPENING IN YOUR CLASS


Great Starting Sites: Assessment Resources, National Resource Center on the First-Year Experience and Students in Transition, University of South Carolina. Includes a Searchable Database of Assessment Instruments, a list of Learning Styles Assessment Instruments, Invited Essays on key topics and programs, a List-serve with Searchable Archives AND Resources for First, Second and Senior Year Courses including primers, syllabi and more [http://www.sc.edu/fye/resources/index.html](http://www.sc.edu/fye/resources/index.html)

Want to Find More Resources?


NSF & NRC: National Science Foundation and National Research Council/National Academy Press. Entire text of each book can be read FREE online. These major groups are trying to help faculty understand and change.


