Addressing Diversity in the classroom through Active Learning and SLOs

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What do students perceive?

http://www.youtube.com/watch?v=dGCJ46vyR9o
Diversity in our classrooms

- Age groups
- Different goals
- Socioeconomic background
- Levels of preparation
- Life Experiences
- Abilities/disabilities
- Cultural Background
- Learning styles

Sharing Experience

1. What was the diversity you have faced in the classroom which was MOST challenging?

2. What did you do to deal with the situation?
Why Worry About Student Engagement?

BRAINSTORM in small groups

National Survey of Student Engagement Results

What are the attributes of an effective educator?

A) Knowledgeable
B) Fair
C) Friendly
D) Organized
E) All of the above
An Effective Educator Today

Designer

Motivator

Facilitator

Knowing Our Students and How They Learn

TWO THEORIES ABOUT HOW STUDENTS LEARN:

- **Talent Development Approach:** If the instructor can just provide X, Y, Z, then all students will learn effectively.

- **Developing Effective Educational Practices:** Instructor provides strong commitment to knowing their students, where they came from, their preferred learning styles, their talents, and when and where they need help.
The process learning: firing neurons

http://www.youtube.com/watch?v=o9p2ou1lyC0

Learning involves the three processes of memory.
ENCODING

Def.: Taking information in through the senses

ENCODING → STORAGE → RETRIEVAL

WE ENCODE USING

Our Senses!
STORAGE

Def.: Filing information away in the brain; putting information in short- or long-term memory.

INFORMATION STORAGE

Short-term memory
Only 6-9 pieces of information
Limited time period

Long-term memory
Unlimited of information
Unlimited time period
STORE INFORMATION IN LONG TERM MEMORY

By . . .
- ORGANIZING
- REINFORCING
- REHEARSING

Organize
- Arrange information in a meaningful way.
- Order information logically, sequentially.
RETRIEVAL

Def. Pulling information from storage when needed, then returning information to storage or future reference.

What are Learning Styles?

Information enters the brain three main ways: sight, hearing and touch. The one most used is called the Learning Style.

Multimodal learners can use more than one sense to learn
Visual Learners learn by sight
Auditory Learners learn by hearing
Tactile Learners (kinesthetic) learn by touch
Some learners like to work in groups others are solitary.
What is Active Learning?

- Active learning occurs when students are given the opportunity to interact with the subject matter of a course.
- It is anything students do in the classroom other than passively listening to a lecture.
- Students generate rather than receive knowledge.
- The teacher facilitates rather than dictates the students’ learning.
- Active learning can vary from occasional use in a course to the main “teaching” strategy used by the instructor.
What is the advantage of Active Learning?

![Graph showing the retention percentage over time for active learning and lecture.]


Activities related to Active and Passive Learning

<table>
<thead>
<tr>
<th>AFTER TWO WEEKS WE TEND TO REMEMBER ..</th>
<th>READING</th>
<th>HEARING WORDS</th>
<th>LOOKING AT PICTURES</th>
<th>WATCHING A MOVIE/VIDEO TAPE</th>
<th>LOOKING AT AN EXHIBIT</th>
<th>WATCHING A DEMONSTRATION</th>
<th>SEEING IT DONE ON LOCATION</th>
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<tbody>
<tr>
<td>10% of what we read</td>
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<td>20% of what we hear</td>
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<td>50% of what we see and hear</td>
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<td>70% who say</td>
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<td>90% who say</td>
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Why Use Active Learning?

When compared to traditional teaching methods (lecture), students learn more material, retain the information longer, meet other students, and enjoy class more.

Let's think of Active Learning strategies we use in class

- Make a list of every active learning activity or exercise you can think of in 60 seconds.
Ways to Learn Actively

Students solve problems, answer questions, formulate questions of their own, discuss, explain, debate, or brainstorm during class.

Active Learning

- Problem-Based Learning
- Cooperative Learning
- Learn By Doing
- Inquiry-based learning

Active Learning

- Inside Classroom of Active Learning
  University of Minnesota

- http://www.youtube.com/watch?v=lFT_hoiuY8w
Improving Lectures

Small group discussion

- Plan objectives
- Include graphics, charts, graphs, etc
- Learn students’ names
- Cue important points
- Give short activities
- Give students time to generate questions
- Have students summarize major points

What do I do in my classroom to promote active learning?

First, get to know my students better.
How?
By a survey at the beginning of the semester.

Introductory Quiz Spring 2013

Hello BBO Scholars,
Please fill up this survey in the form of a quiz that will give me an idea about navigating through the course and earn you credit points! Thank you in advance.
* Required
1. You are a ___________ student *
   □ High school
   □ 2+ year college transfer
   □ Bachelor’s degree course
   □ Pre-Nursing / dental / medicine,
   □ Pre-Biology major
   □ undecided
   □ Other
2. Did you take a biology course before? **
   □ Yes
   □ No
3. Did you take a chemistry course before? **
   □ Yes

Know their learning styles

The VARK Questionnaire
How Do I Learn Best?

Questionnaire version 7.1 More Information
Choose the answer which best explains your preference and tick the box next to it. Please tick more than one if a single answer does not match your perception. Leave blank any question that does not apply.

You have finished a competition or test and would like some feedback. You would like to have feedback:
□ using examples from what you have done.
□ using a written description of your results.
□ from somebody who talks it through with you.
□ using graphs showing what you had achieved.

Do you prefer a teacher or a presenter who uses:
□ demonstrations, models or practical sessions.
□ question and answer, talk, group discussion, or guest speakers.
□ diagrams, charts or graphs.

What do I do with the information?

Design course materials and assessment tools that map to SLOs and that can engage students in active learning: go down the learning pyramid.

- Read and Comprehend
- Think pair share
- Video quiz
- Use computer programs
- Debates
- Concept maps
- Drawings
- Model building
- Strip sequence questions
- Group quizzes
- Challenging statements
- Presentations
- Case studies
- Exams: summative
Evaluations

**Formative** - assessment of a person’s current knowledge and/or skill level with the goal of improving it. Typically done using; quizzes, short papers and surveys.

**Summative** - evaluation of student or instructor regarding their final level of knowledge and/or skill. Typically done using: major tests, exams, term projects and course evaluations.
Assessment by students

What worked for you?

Hi Bio Scholars,
This has been a very engaging and educative semester for me as I hope it has been for you. I tried to find out tactics which helped you in your learning process. Please complete the following survey(it is worth 5 points which will be added to your finals).
* Required

1. What kind of a learner are you? *
Please refer to your VARK survey. You can put in more than one choice
- Visual
- Audial
- Kinesthetic
- Multimodal

2. What kind of activities help you with learning? *
Please think of the activities we did in class.
- Listening to lectures and taking notes
- Doing labs
- Discussing the questions with fellow student
- Doing activities in lab like the mole activity or pH activity
- Doing the problems on the board as a class
- Doing review together
- Finding out why your answer was incorrect as we did in DNA tech quiz.

3. What kind of assignment helped you to understand the course material and its relevance to our lives? *
You can use multiple options.
- Watching videos related to the topic which I had used at the website as well as in the classroom
- Reading material that was used outside the textbook
- Concord Consortium assignments on membrane transport, cellular respiration and protein synthesis
- Concept maps
- Virtual Labs
- Cartoons
- Answering questions in movies related to the course
- Multiple choice questions
- Crossword puzzle
- Short answer questions
- Creating your presentation

4. I enjoyed the group project of creating the presentation.*
- Agree
- Strongly agree
- Do not agree
- Disagree
- Strongly disagree

5. My understanding of the biological world and myself has increased considerably after taking this class.*
- Agree
- Strongly agree
- Do not agree
- Disagree
From what to how

• The focus of my teaching shifting to more “how we come to know” and less on “what we know”. *(Example: DNA as a double helix - how we know?)*

The balance?

• Content vs. Process Learning
• Passive vs. Active Learning
• Formative vs. Summative Evaluation

Feedback is what lets us know we have the balance right
Process vs. Content

- Process
- Content

How

What

Process

Content
Why is process important?

• The knowledge base for disciplines is constantly expanding and changing.
• Memorizing facts and information is not the most important skill in today's world. Facts change, and information is readily available -- what's needed is an understanding of how to get and make sense of the mass of data.

• [http://www.thirteen.org/edonline/concept2class/inquiry/index.html](http://www.thirteen.org/edonline/concept2class/inquiry/index.html)

REPORT
Increased Structure and Active Learning Reduce the Achievement Gap in Introductory Biology
David C. Haak, Janneke HilleRisLambers, Emile Pitré, Scott Freeman

Science Vol. 332 no. 6034 pp. 1213-1216

'We asked the following: Can an existing STEM course be modified to improve performance by students from disadvantaged educational and socioeconomic backgrounds who are at high risk of failing, without requiring increased resources in the way of staffing or external funding? In essence, our work addresses what Benjamin Bloom called the “2 Sigma Problem”: the need to create teaching–learning conditions under large–group instruction that allow students to achieve at the level they would under individual instruction by a skilled tutor (10, 17). The question has taken on added urgency as faculty–to–student ratios worsen in response to the global economic crisis.'
We propose that almost all students arrive on college campuses with 12 years of practice at Bloom’s levels 1 and 2, but that most students from deprived educational backgrounds have had minimal exposure to higher-order thinking [Blooms’ levels 3 and above \(^{(30)}\)].

Highly structured course designs provide practice with problem-solving and reasoning skills that may be new to high-risk students in introductory college STEM courses.

Specifically, active learning that promotes peer interaction makes students articulate their logic and consider other points of view when solving problems, leading to learning gains [e.g., \(^{(31)}\)].

3. What are the learning tools you use in class?

4. What are your concerns about using active learning activities & techniques? Solutions?
Concerns & Issues

Content vs Outcomes

5. How do you balance content coverage with learning?

**ANSWER: SLOs**
Teach to the SLOs, NOT the content. You do not have to cover EVERYTHING as long as you achieve the course SLOs.
SLOs FREE us from the prison of content coverage.

**STEP 1:**
What are the course SLOs?

- Should be the same for all instructors of the same course.
- Should be independent of teaching methodology.
- Should be approved by Curriculum Committee and articulation agreements.
Assessing SLOs

Assessing SLOs is our way of ensuring our teaching methodologies are working, regardless of which ones we choose to use.

Focus on SLO assessment results can free us from worry about content coverage.

Course/Program Improvement

Use SLO assessment results to plan and experiment with course and program improvements.

Assess these improvements at the next assessment cycle.
Some benefits of learning outcomes

• Each instructor of a course can have his or her own methodology as long as he or she teaches the same SLOs
• Each cycle all instructors assess the SAME SLOs and discuss the data together to share ideas and suggestions for ways to improve.
• Discussions are independent of classroom methodology and focus on results!

Theory Into Practice

5 Questions for Instructional Design

1. What do you want the student to be able to do? *(Outcome)*
2. What does the student need to know in order to do this well? *(Curriculum)*
3. What activity will facilitate the learning? *(Pedagogy)*
4. How will the student demonstrate the learning? *(Assessment)*
5. How will I know the student has done this well? *(Criteria)*
Original Terms | New Terms
---|---
• Evaluation | • Creating
• Synthesis | • Evaluating
• Analysis | • Analyzing
• Application | • Applying
• Comprehension | • Understanding
• Knowledge | • Remembering

(Based on Pohl, 2000, *Learning to Think, Thinking to Learn*, p. 8)

To sum up.................
Please write out two important points of this presentation which may be useful to you in class in the reference cards given to you.
“If a doctor, lawyer, or dentist had 40 (or 400) people in his office at one time, all of whom had different needs, and some of whom didn’t want to be there and were causing trouble, they, had to treat them all with professional excellence for nine months, then he might have some concept of the classroom teacher’s job.”

-Donald D. Quinn