WORKSHOP ON ACTIVE LEARNING

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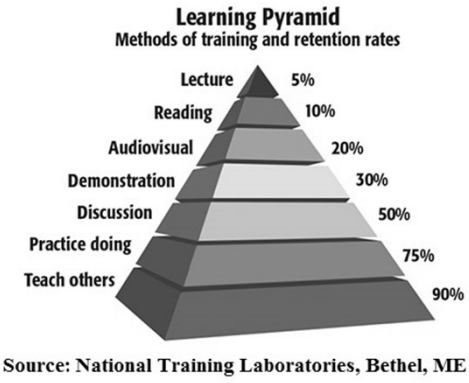
What is it? Major Characteristics

- Students are involved in more than passive listening
- Students are engaged in: discussion, writing, reading, problem solving
- Less emphasis on information "transmission" and greater emphasis on developing critical thinking, analysis, evaluation

Why lecture?

Lecturing has advantages. It (1) enables the instructor to supplement the textbook by providing cutting-edge material; (2) gives the instructor presumed "control" in the classroom, although ironically students may not actually be disrupting the flow of material because they are passive or otherwise distracted; (3) lets the instructor offer key information that all students are (presumably) exposed to at the same time; and (4) offers an opportunity for an inspiring teacher to stimulate students.

Why Active Learning



Source: National Training Laboratories, Bethel, ME

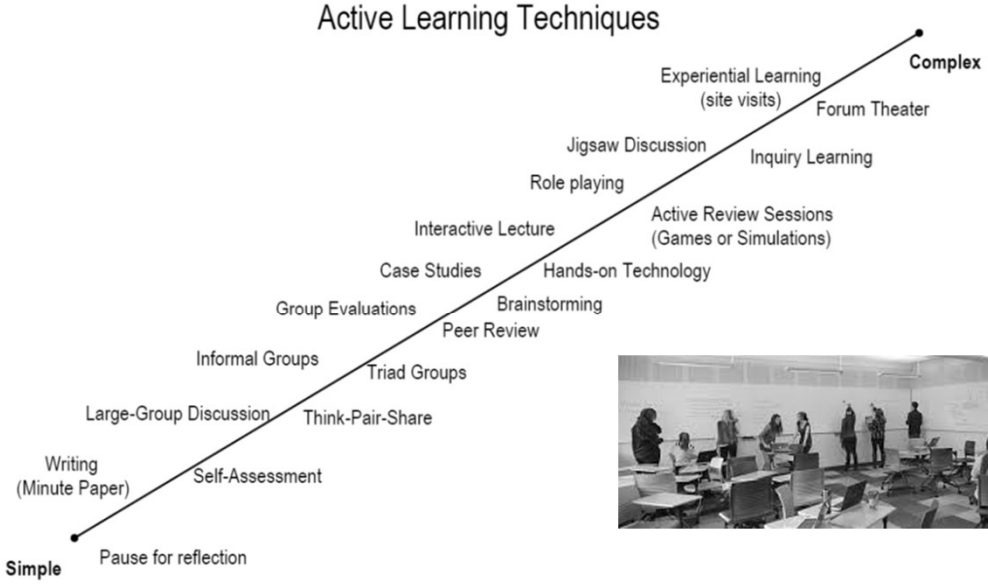
…the use of active learning strategies cut course failure rates by around one-third

Freeman, S. *et al*. *Proc. Natl Acad. Sci. USA* **111**, 8410–8415 (2014).

Why use active learning?

- The amount of information retained by listening declines substantially after ten minutes (Thomas, 1972, *Studies in adult education*)
- Dewey – Experience is the key to learning
- Research comparing lecture versus discussion (prepared by the National Ctr for Research to improve postsecondary teaching, 1987) showed that:
  - In experiments involving measures of retention at the end of a course, the results favor discussion over lecture.

Active Learning Techniques



This spectrum arranges active learning techniques by complexity and classroom time commitment.

Prepared by Chris O'Neal and Tershia Pinder-Grover, Center for Research on Learning and Teaching, University of Michigan

Lower Risk Activities

Pause Procedure

Short Writes

- Summarize last lecture, readings, etc.
- What didn't you understand?
- Analytical lists
- Journal entries

Thumbs up/thumbs down response to statement

Surveys or questionnaires

Formative (ungraded) quizzes

Think-Pair-Share

Brainstorming

Pairs/groups develop an outline of the lecture

Structured group discussions (specific questions provided)

From recall to application…

Lecture example …."name the sensory nerves of the leg"

~versus~

Class discussion…."You're innocently walking down the street when aliens zap away the sensory neurons in your legs. What happens?"

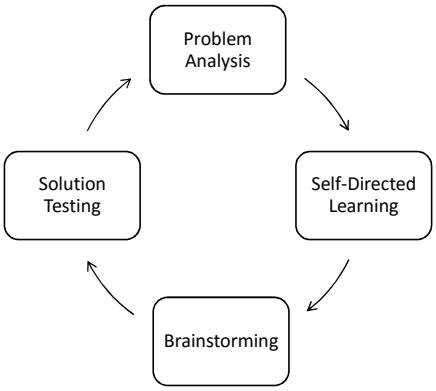
a) Your walking movements show no significant change.

b) You can no longer walk.

c) You can walk, but the pace changes.

d) You can walk, but clumsily.

PBL – PROBLEM BASED LEARNING



Problem-based learning from a Virology course

Student teams act like the CDC. They must investigate the virus and manage treatment and containment.

Outbreak alert: six students at the Chicago State Polytechnic University in Illinois have been hospitalized with severe vomiting, diarrhea and stomach pain, as well as wheezing and difficulty in breathing. Some are in a critical condition. And the university's health center is fielding dozens of calls from students with similar symptoms.

If students decided to run a blood test or genetic assay, Prof. Tobin would give them results consistent with enterovirus D68, a real respiratory virus.

If they decided to send a team to Chicago, Tobin would make them look at real flight schedules and confirm that there were enough seats.

For more project ideas: http://www.pblprojects.org/projects/stem-pbl/

Team-based/Project based learning

Start with Team-based exercises on smaller problems

"We find up to 20% better grades over usual methods," says Tor
developed a team-based learning approach

From The Engineer of 2020: Visions of Engineering in the New Century "the challenge of working effectively with multicultural teams will continue to grow" (p. 35)

But only 39% of employers think our graduates are "very well prepared" for teamwork.

Inquiry based learning

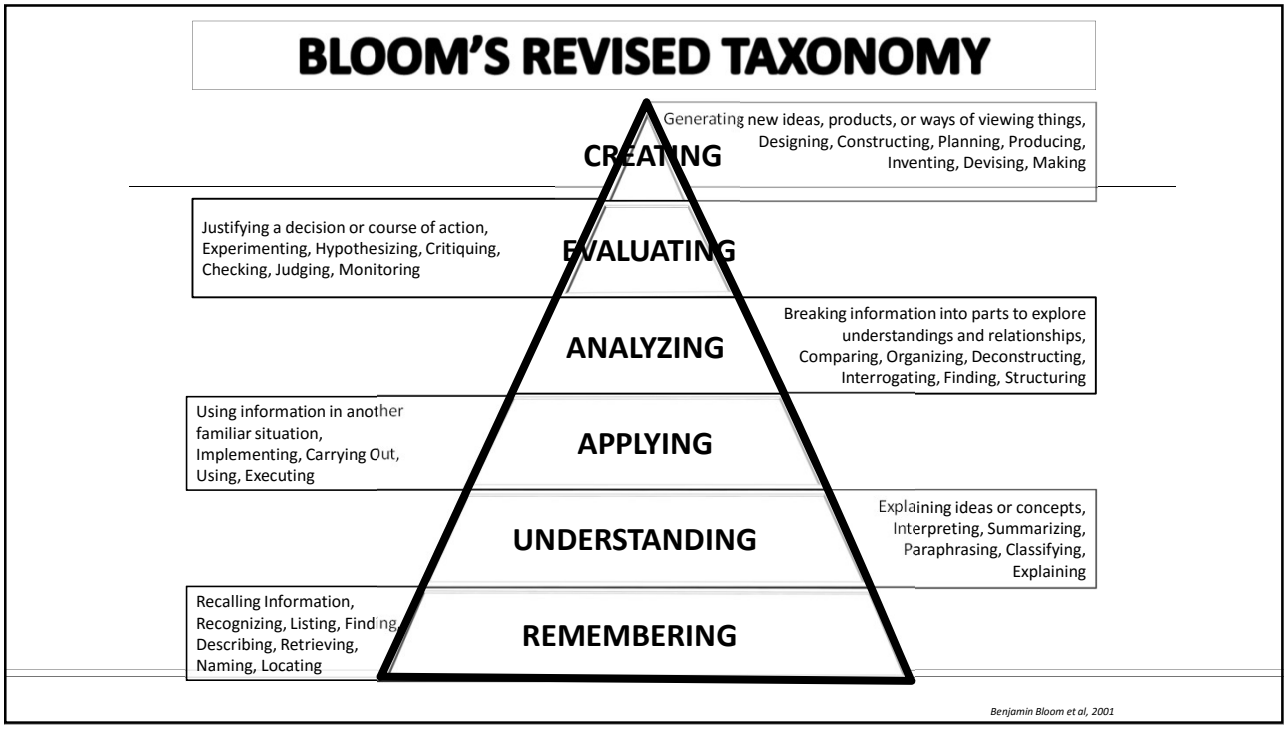
- Find the question to explore. Dive into engaging, relevant, and credible media forms to identify a "need" or opportunity for inquiry.
- Create the hypothesis based on initial information - Summarizing, paraphrasing, and categorizing.
- Asking questions to drive continued, self-directed inquiry
- Create experimental design, analyze data
- Reach conclusions (there is no "right" answer)

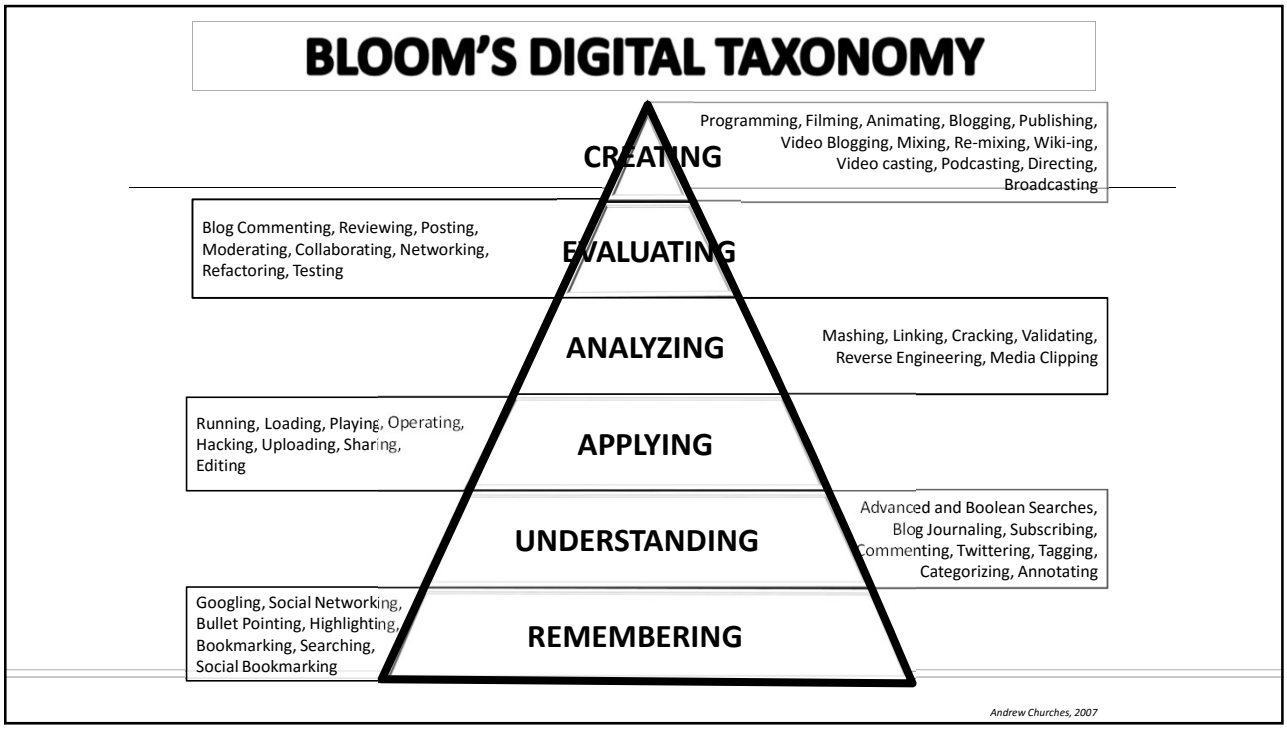
Wiki examples

Vanderbilt Divinity, wiki "Bible in American Culture"
- students share pop culture references to the Bible, creating a shared class resource
- students to take turns taking notes on class discussions and to share those notes on the class wiki

University of Delaware, wikis for Calculus undergraduate course
- Students can collaborate on solving problems
- Students learn to use standard mathematical formulas and language

Barnard, English class wiki and discussion board
- Students do text analysis in the wiki space
- Students discuss analysis in the discussion board




BLOOM'S DIGITAL TAXONOMY
CREATING
Programming, Filming, Animating, Blogging, Publishing, Video Blogging, Mixing, Re-mixing, Wiki-ing, Video casting, Podcasting, Directing, Broadcasting
EVALUATING
Blog Commenting, Reviewing, Posting, Moderating, Collaborating, Networking, Refactoring, Testing
ANALYZING
Mashing, Linking, Cracking, Validating, Reverse Engineering, Media Clipping
APPLYING
Running, Loading, Playing, Operating, Hacking, Uploading, Sharing, Editing
UNDERSTANDING
Advanced and Boolean Searches, Blog Journaling, Subscribing, Commenting, Twittering, Tagging, Categorizing, Annotating
REMEMBERING
Googling, Social Networking, Bullet Pointing, Highlighting, Bookmarking, Searching, Social Bookmarking
Andrew Churches, 2007