Bloom's Taxonomy

Objectives

. To discuss the rationale for active learning and non-traditional modes of teaching, so that students are less likely to resist those methods

Activities

I. **Assign reading** of the one page summary of Bloom's Taxonomy before class (the version of Bloom's Taxonomy in the handout has been prepared by D. R. Clark who has granted me permission to use it for teaching purposes in classes at CWU provided it includes appropriate citation). Do NOT include questions on back of the worksheet in the materials distributed for reading.

II. (Optional) A **class ticket question** about Bloom's Taxonomy or at beginning of class a brief reading quiz over Bloom's Taxonomy.

III. **Handout and minilecture** covering instructor determined key aspects of Bloom's Taxonomy and its role in understanding the types of cognitive domain tasks students will encounter in their progression through college coursework. Some suggested aspects of that lecture:

- Review the taxonomy
- Point out that the taxonomy is hierarchical in the sense that successive levels represent more sophisticated and challenging, but valuable, thinking and learning.
- Perhaps ask students to identify assignments they have had in previous courses that correspond with the different levels. Estimate the percent of their assigned work that correspond to the different levels (most will be in the knowledge category).
- A university education is a transition to thinking and learning at successively higher levels in the taxonomy, and so the types of instruction must change. While lecture can be an effective way to transmit knowledge we know from research that it is less and less effective at teaching and learning for the higher levels in the hierarchy. This means that they can expect that what their instructors do in class and expect of them will change – that for tasks higher up in the hierarchy more and more engagement and responsibility of the student is required and the instructor becomes less a transmitter of knowledge and more a facilitator of learning.
- It is in their best interest to actively seek out opportunities to learn at higher levels of Bloom's Taxonomy

IV. **In-class exercise** with partner: assignment classification on back of worksheet. (Note that in our classroom context, #9,10,11 were assignments that these students would face, so presented an opportunity for discussing the rationale of such assignments as opposed to "sage on the stage" learning.

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Materials & Resources

Handout on Bloom's Taxonomy (below)

Classroom Context

Freshman Seminar

Time Requirement

15-25 minutes in class

About this Project

This is one of a set of materials compiled for instructors to draw upon in order to frame non-traditional modes of classroom teaching for their students. Our hope is that these materials can help reduce any student resistance to such techniques.

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Other materials available online at www.colorado.edu/sei/fac-resources

V. **Class discussion** of the assignment classification, along with instructor emphasis of the importance of recognizing and appreciating the different cognitive domain tasks and the different roles and responsibilities of students and faculty in the different cognitive domains. What I typically point out are the roles and responsibilities that they and their instructors will have in proposing and carrying out a quarter-long small group "research" project that is a key element of the curriculum. I also discuss that because these proposals and projects by design represent higher level thinking and learning in the taxonomy they can be quite challenging to students, can generate anxiety, and can look very different from the kind of learning that they have become comfortable with (based on instructor experience in this curriculum). The instructors understand this and will be a resource for the students to successfully complete their projects, but by the same token won't give students step-by-step instructions or provide all the answers. Finally, the taxonomy is evidence that in spite of the challenge this type of learning environment represents it is in their interest, and seriously investing themselves in it will serve them well for the remainder of their university career and beyond.

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Bloom's Taxonomy: Cognitive Domain

Category	Example and Key Words
Knowledge: Recall data or information.	**Examples**: Recite a policy. Quote prices from memory to a customer. Knows the safety rules. **Key Words**: defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Comprehension: Understand the meaning, translation, interpolation, and interpretation of instructions and problems. State a problem in one's own words.	**Examples**: Rewrites the principles of test writing. Explain in one's own words the steps for performing a complex task. Translates an equation into a computer spreadsheet. **Key Words**: comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives Examples, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Application: Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned in the classroom into novel situations in the work place.	**Examples**: Use a manual to calculate an employee's vacation time. Apply laws of statistics to evaluate the reliability of a written test. **Key Words**: applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analysis: Separates material or concepts into component parts so that its organizational structure may be understood. Distinguishes between facts and inferences.	**Examples**: Troubleshoot a piece of equipment by using logical deduction. Recognize logical fallacies in reasoning. Gathers information from a department and selects the required tasks for training. **Key Words**: analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Synthesis: Builds a structure or pattern from diverse elements. Put parts together to form a whole, with emphasis on creating a new meaning or structure.	**Examples**: Write a company operations or process manual. Design a machine to perform a specific task. Integrates training from several sources to solve a problem. Revises and process to improve the outcome. **Key Words**: categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes.
Evaluation: Make judgments about the value of ideas or materials.	**Examples**: Select the most effective solution. Hire the most qualified candidate. Explain and justify a new budget. **Key Words**: appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports.

Clark, D. R. (2004), Bloom Taxonomy Cognitive Domain Categories Table. Retrieved November 3, 2009 from http://www.nwlink.com/~Donclark/hrd/bloom.html#revised

Seminal reference on Bloom's Taxonomy:

Bloom, Benjamin S. & David R. Krathwohl. (1956). Taxonomy of educational objectives: The classification of educational goals, by a committee of college and university examiners. Handbook 1: Cognitive domain. New York , Longmans.

Prepared by Michael Braunstein, Central Washington University

For each of the following items, imagine the instructor in a course you are taking has assigned the item as a task, assignment, exercise, or project. Identify which category of Bloom's Taxonomy best describes the assignment.

1. List the first three elements in the Periodic Table of Elements in order.

2. Compare and contrast the Theory of Evolution by Natural Selection and Intelligent Design, identify which one you think is more consistent with the scientific evidence and defend your position.

3. Solve Newton's Laws of motion for the acceleration of a solid ball rolling down a ramp inclined at 30° to the horizontal

4. Use the computer programming algorithm described in section 3.2 of your text to write a program that will find the roots of the quadratic equation.

5. Explain the process by which mitochondria produce ATP.

6. Use a voltmeter to troubleshoot the electronic circuit you've been assigned, and identify why it doesn't work.

7. Follow the instructions in the lab manual to titrate your solution.

8. Write a senior thesis concerning the research you performed last summer during the Science Honors Program.

9. Use the data you collected on bacterial colonies to graph population versus nutrient density in an Excel spreadsheet and interpret it.

10. Write a proposal to carry out a project related to the topic of energy.

11. Carry out an independent project related to the topic of energy with a group of students and write a final report on the project.

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