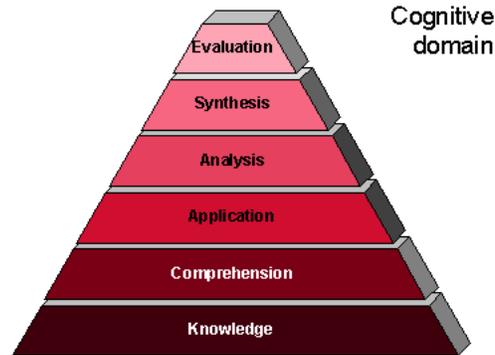


## **Objectives & Selected Response Items**

### **What are objectives good for?**

- Have a master plan, a “roadmap”
- Top Down planning
  - Broad objectives for class
  - Objectives for large units
  - Specific behavioral objectives
- Ensure assessment at all levels of knowing
  - [Bloom's Taxonomy](#)

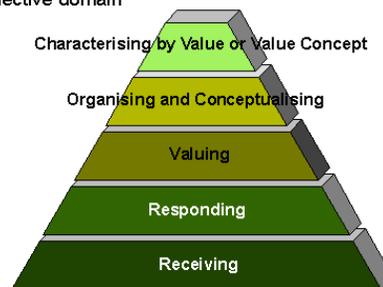
## Bloom's Taxonomy



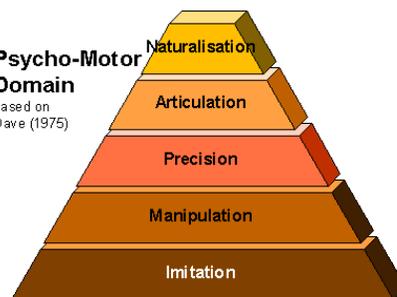
**Bloom's Taxonomy** provides a useful way of describing the complexity of a cognitive objective by classifying it into one of six hierarchical categories ranging from the most simple to the most complex.

## Bloom's Taxonomy

Affective domain



Psycho-Motor Domain  
based on  
Dave (1975)



### **Current trends in learning objectives:**

- Shift from learning discrete facts to complex performance--reflected in a greater emphasis from cognitive psychology as opposed to behavioral psychology
- **Behaviorism**--bottom up approach
- **Cognitive** (Constructivist) approach believes in teaching for and assessing higher level skills in the learning process

### ***Guidelines for writing objectives:***

- Learning objectives should be **MEASURABLE**
- Use verbs that are specific and indicate observable responses
- General objectives should provide a comprehensive yet parsimonious overview of course content
- Specific objectives focus on content within each major unit of the class/course

Bloom's Taxonomy of Educational Objectives		
Level	Description	Example
<b>Knowledge</b>	Rote-memory, learning facts.	Name each state capital.
<b>Comprehension</b>	Summarize, interpret, or explain material	Summarize the use of symbols on a map.
<b>Application</b>	Use general rules and principles to solve new problems.	Write directions for traveling by numbered roads using a map.
<b>Analysis</b>	Reduction of concepts into parts and explain the relationship of parts to the whole.	Describe maps in terms of function and form.
<b>Synthesis</b>	Creation of new ideas or results from existing concepts.	Construct a map of a hypothetical country with given characteristics.
<b>Evaluation</b>	Judgment of value or worth.	Evaluate the usefulness of a map to enable travel from one place to another.

Type of Objective	Example 1: Main Idea of the Story	Example 2: The area of the Circle	Example 3: The Colonization of Africa
Knowledge	Define "main idea."	Give the formula for the area of a circle.	Make a timeline showing how Africa was divided into colonies.
Comprehension	Give examples of ways to find the main idea of a story.		Interpret a map of Africa showing its colonization by European nations.
Application		Apply the formula for area of a circle to real-life problems.	
Analysis	Identify the main idea of a story.		Contrast the goals and methods used in colonizing Africa by different European nations.
Synthesis	Write a new story based on the main idea of the story read.	Use knowledge about the areas of circle and volumes of cubes to derive a formula for the volume of a cylinder.	Write an essay on the European colonization of Africa from the perspective of a Bantu chief.
Evaluation	Evaluate the story.		

### **Examples of objectives at different levels**

- Students will be able to identify important contributions of Skinner embedded in a multiple choice format
- Students will be able to apply the method of loci mnemonic when studying for their quiz
- Students can distinguish between fixed interval and variable interval reinforcement schedules

### **Examples of objectives at different levels**

- Students will be able to synthesize information from the course and personal experience to create a sophisticated visual representation for effective instruction
- Given an argument supporting the use of extrinsic rewards students will be able to break down the premises into those which are logical and those which are fallacies

## Bloom's Taxonomy of Learning Outcomes

- 1956 Bloom (editor): *The Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain*.
- **Six categories of cognitive learning:**
  - **Knowledge** (recall, knowledge of specifics, ways of dealing with specifics, facts, generalizations, theories & structures)
  - **Comprehension** (interpretation, extrapolation, summarizing)
  - **Application** (ability to use learned material in a practical manner, or within a new situation, using rules, principles)
  - **Analysis** (criticize, deconstruct, identify assumptions)
  - **Synthesis** (relating one theory to another, combining and re-constructing ideas, seeing relationships)
  - **Evaluation** (the ability to appraise, assign value, assess arguments, etc.)

## Bloom's Taxonomy: Verbs for Writing Instructional Objectives

Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
arrange, define, duplicate, label, list, memorize, name, order, recognize, reproduce state	classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, translate	apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, practice, schedule, sketch, solve, use, write.	analyze, appraise, calculate, categorize, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, test.	arrange, assemble, collect, compose, construct, create, design, develop, formulate, manage, organize, plan, prepare, propose, set up, write.	appraise, argue, assess, attach, choose compare, defend estimate, judge, predict, rate, core, select, support, value, evaluate.

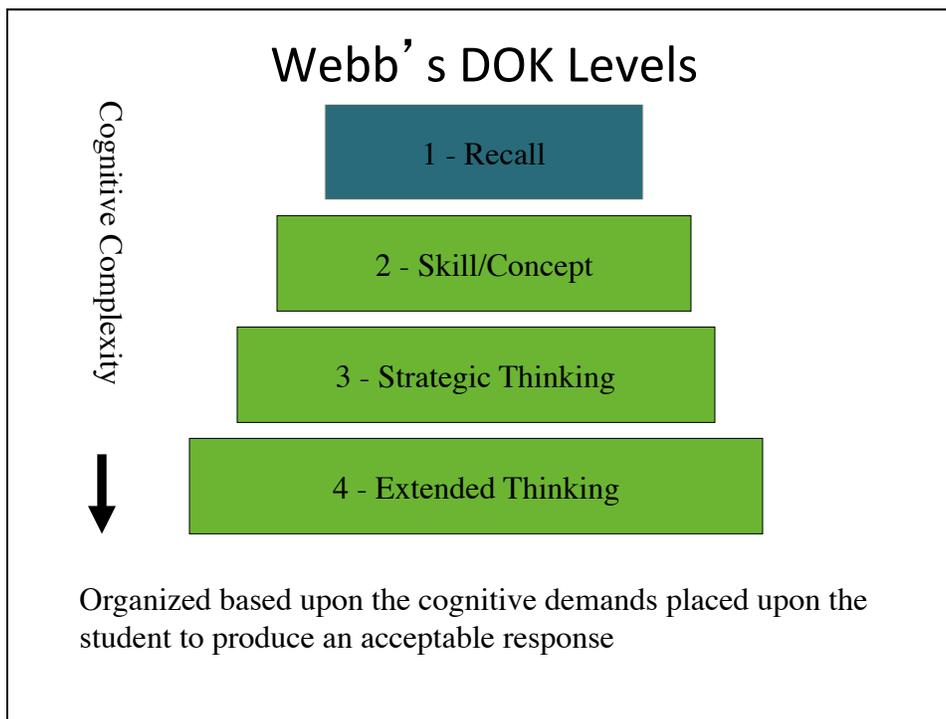
## Bloom's Taxonomy: Criticism

- Almost 50 years old.
- Behaviorist approach.
- Developed before we understood the cognitive processes involved in learning and performance.
- The categories or “levels” of Bloom's taxonomy (Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation) are not supported by any research on learning.

The Knowledge Dimension	The Cognitive Process Dimension					
	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual Knowledge						
Conceptual Knowledge						
Procedural Knowledge						
Meta-cognitive Knowledge						

Table 1: The Revised Taxonomy Table

Bloom's revised taxonomy (Anderson & Krathwohl, 2001)



## Depth of Knowledge Levels

### Level 1 – Recall

*Recall of a fact, information, or procedure.*

- **Level 2 – Skill/Concept**

*Use of information, conceptual knowledge, procedures, two or more steps, etc.*

- **Level 3 – Strategic Thinking**

*Requires reasoning, developing a plan or sequence of steps; has some complexity; more than one possible answer; generally takes less than 10 minutes to do.*

- **Level 4 – Extended Thinking**

*Requires an investigation; time to think and process multiple conditions of the problem or task; and more than 10 minutes to do non-routine manipulations.*

LEVEL 1 – RECALL & REPRODUCTION				
POSSIBLE PRODUCTS				
Quiz	List	Collection	Podcast	Social bookmarking
Definition	Workbook	Explanation	Categorizing/Tagging	Searching
Fact	Reproduction	Show and Tell	Commenting	Googling
Worksheet	Vocabulary Quiz	Outline	Bulleting	
Test	Recitation	Blog	Highlighting	
Label	Example	Wiki	Social networking	

Level 2 – Working with Skills & Concepts			
POSSIBLE PRODUCTS			
Photograph	Presentation	Reverse-Engineering	Blog Commenting
Illustration	Interview	Cracking Codes	Blog Reflecting
Simulation	Performance	Linking	Moderating
Sculpture	Dairy	Mashing	Testing (Alpha/Beta)
Demonstration	Journal	Relationship Mind Maps	Validating

LEVEL 3 – SHORT-TERM STRATEGIC THINKING				
POSSIBLE PRODUCTS				
Graph	Survey	Debate	Conclusion	Podcast
Spreadsheet	Database	Panel	Program	Publishing
Checklist	Mobile	Report	Film	Wiki-ing
Chart	Abstract	Evaluating	Animation	
Outline	Report	Investigation	Video cast	

Level 4 – Extended Strategic Thinking			
POSSIBLE PRODUCTS			
Film	Project	New Game	Newspaper
Story	Plan	Song	Media Product

## Table of Specifications (or Test Blueprint)

The method of ensuring congruence between classroom instruction and test content is the development and application of a table of specifications, which is also referred to as a test blueprint.

Table 7.5: Table of Specifications for Test on Chapter 2: Based on Content Areas

(Number of Items)

*Level of Objective*

<i>Content Areas</i>	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total
Scales of Measurement	2	2		2			6
Measures of Central Tendency	3	3					6
Measures of Variability	3	3	3				9
Correlation & Regression	2	3		2	2		9

## **How does a teacher decide what to put on a test?**

- **Consulting [Published Sources](#) –**
  - Using test questions from a publisher can lead to high-quality tests or very low quality tests:
    - typically checked for errors or potential problems (not true ALL the time, however!)
    - may not adequately reflect the material that was taught.
    - May not test at level YOU want or need
- **Using Instructional Objectives –**
  - Ideally, a test should cover the ALL objectives of the class.

## **The When and How of Testing**

- **More Frequent, Shorter Tests**
  - Students tend to leave their studying until just before the test; the more often they are tested, the more they will study.
- **Consider Testing Conditions**
  - Poor conditions can depress test performance. Be attentive to the conditions the student will face.
- **Ensure Clear Directions**

## **Developing an Assessment: Types of Items**

- **Selected-response** items require a student to select a response from available alternatives (*multiple-choice, true-false, & matching items*).
- **Constructed-response** items require students to create or construct a response (*fill-in-the-blank, short answer, essay items, performance assessments & portfolios*).

## **Selected Response vs. Constructed Response**

- Which type is better?
- There is no consistent advantage of one over other. One is not inherently superior to the other.
- Select the item type that provides the most direct measure of the intended learning outcome.

**Should a classroom assessment instrument be very hard, very easy, or somewhere in between?**

- When assessments are too easy, students may not study very much and therefore may not learn as much as we would like
- When students become accustomed to passing assessments with minimal effort, they may be easily frustrated in later years when they encounter more challenging material and do have to work hard

**Should a classroom assessment instrument be very hard, very easy, or somewhere in between?**

- When assessments are too easy, teachers and students alike may think students have mastered something they haven't really mastered at all. In other words, the assessments are not a valid measure of students' learning
- When assessments are too difficult, students may become discouraged and believe they are incapable of mastering the subject matter being assessed

## **Creating Your Own Assessments:**

- Remember, it takes a lot practice to develop good assessment instruments and items!
- Ideally you should consider measuring outcomes in multiple ways (e.g., multiple choice, projects, homework, etc.)
- Don' t fall into the “either/or” thinking

## **A brief introduction to test construction**

- Why would you use a true-false type item?
- What are the pros and cons to this type of item?
- What makes a good T/F item?

## True false items

- **Benefits:**
  - Can quickly assess a bunch of objectives/efficient
  - Easy to score
- **Disadvantages:**
  - 50% of items correct by random chance
  - Limited amount of info gained
  - Emphasizes rote memorization without understanding
  - Low diagnostic capability

## How to write GOOD T/F items

- Attempt to test something other than rote memorization
- Avoid **specific determiners** – words that give away the answer
  - E.g. always or never, impossible
- Make each statement **UNEQUIVOCALLY** true or false- no room for argument or interpretation
- **NO** double-barreled items---unless the item is intended to show a cause and effect relationship the item should contain only one idea

## **How to write GOOD T/F items**

- If an opinion is used it should be attributed to someone
- One strategy is to create a list of true statements from the material and then convert approximately half of them to false statements
- True and False statements should be approximately the same length (true statements may tend to be longer--qualifiers)
- Avoid ambiguous terms or statements

## **Creating Matching Items**

- Use homogenous material (e.g., famous tennis players)
- Include unequal number of responses and premises & responses may be used more than once

## **Matching Items**

- **Advantages**
  - Compact form/measure a lot at one time.
  - Ease of construction (for the most part)
- **Disadvantages**
  - Restricted to factual information
  - Difficulty of finding homogenous material

## **A brief introduction to test construction**

- **Why would you use a multiple-choice type item?**
- **What are the pros and cons to this type of item?**
- **What makes a good multiple-choice item?**

## **“Best Buy”**

- **Multiple Choice Item Format provides a “Best Buy” for**
  - **Content coverage**
  - **Administration**
  - **Scoring**
  - **Reliability**

## **Item Writing Rules Why Worry?**

- **An item containing a flaw that directs any examinee to the correct answer who otherwise would NOT know the answer is invalid**
- **If an item is answered correctly, but for the wrong reason, it is not measuring the outcome it was intended to measure**
- **Flawed items provide an advantage to test-wise students**

## **Multiple Choice Items Rules for Writing Stems**

- The stem should present a single self-contained question, problem, or idea
- State the problem as simply and clearly as possible (avoid excess verbiage and window dressing)
- The stem should contain as much as the item's content as possible

## **Writing GOOD multiple-choice questions:**

- Attempt to test something other than rote memorization
- Avoid specific determiners– words that give away the answer (like a, an, his or her, etc.)
- e.g. EDP 560 is an:
  - A. Semester of Laughs
  - B. Terrific Time
  - C. Terribly Good Time
  - D. Absolute abomination

## **Writing GOOD multiple-choice questions:**

- **Be clear in the stem what you are looking for**
- **Not:**
  - Christopher Columbus was: ....
  - (what? Male? A guy who lived long ago? Adventurer? Smallpox carrier?)

## **Writing GOOD multiple-choice questions:**

- **Make sure that ONE answer is clearly the best**
- **Make correct answer a,b,c,d,e in equal amounts**

## **Writing GOOD multiple-choice questions:**

- Use plausible options as distracters
- The leader of the Allied forces in the Pacific during WWII was:
  - A. Hitler
  - B. Eisenhower
  - C. MacArthur
  - D. Mickey Mouse

## **Writing GOOD multiple-choice questions:**

- Be careful using “all of the above” as an option– this is often a specific determiner
- Using “none of the above” may increase the level of knowing and difficulty
- Make sure the answer is clearly defensible

## **Writing GOOD multiple-choice questions:**

- The question should not typically be answerable without studying the material
- Avoid giving the answer away in the question or in the remainder of the test
- Create items that measure knowledge at all levels
- Work on your distracters-- they make all the difference!

## **Written Exams *Multiple Choice Format***

### **Advantages**

- Lower chance score
- Reliable
- Good sampling
- Can be computer scored
- Low administration cost
- Large candidate groups

### **Disadvantages**

- Often requires recognition only
- Difficult to write
- Requires longer development time than other exams

## **Multiple choice items**

- **Advantages:**
  - More versatile than T/F in assessing higher cognitive levels
  - Can quickly assess a bunch of objectives
  - Easy to score
- **Disadvantages:**
  - 25% of items correct by random chance (if 4)
  - Limited amount of info gained
  - Emphasizes rote memorization without understanding

## **Item Analysis**

## **What to consider when assembling your Test Items**

- **Content Validity** = The extent to which an instrument is a representative sample of the content domain being addressed
- **Construct Validity** = How well test performance can be interpreted as a meaningful measure of some characteristic or quality
- Carefully analyze how each item is written/ explained

## ***What to consider with the results of your test***

- Overall percent correct or percent attaining mastery
- Effectiveness of your distracters (for multiple choice items)
- Item Discrimination - the degree to which items discriminate between students with high and low achievement

## **Item difficulty**

- **Item difficulty refers to the percent of students who got an item correct.**
- **What is the optimal level of difficulty for a multiple choice item?**
  - **If you are doing norm-referenced testing?**
  - **If you are doing criterion-referenced testing?**
  - **An ideal test will maximize your ability to discriminate between the students who REALLY know the stuff from students who REALLY don't know the stuff.**

## **Easy Items**

- **When you see a very easy item, there are a few reasons why this might be:**
  - **The students really learned that material**
  - **The question is too easy for your students**
  - **The answer is telegraphed in the question (via specific determiner, e.g.)**
  - **Your distracters are not working**
- **In order to determine which of the above is the case, we need to examine the item itself.**

## **Delving further**

- **When you see very high difficulties, there are a few possible reasons:**
  - Answer key wrong
  - Item does not measure content covered
  - Item is poorly or confusingly worded
  - The distracters are confusing or ambiguous
- **In order to determine which of the above is the case, we need to examine the distribution of answers.**

## **Item Discrimination**

---

- **Need to look at who answered the items correctly and incorrectly**
  - Arrange the total scores in order from highest to lowest
  - Group the students by performance for the purpose of comparison (e.g., top third, bottom third)
- **Determine if the item is discriminating between high and low scoring groups**

## Item discrimination

Item is discriminating well if:

1. Almost all in the high scoring group answered correctly
2. Incorrect answers were made by the lower scoring students

Proportion of HIGH group who got item correct - Proportion of LOW group who got item correct

Example:

	<u>High</u>	<u>Low</u>	
A.	4	12	
B.*	20	10	$(20/25) - (10/25) = .40$
C.	1	2	
D.	0	1	

## Item discrimination

Item is not discriminating well if:

1. An equal number in the high and low groups answered correctly, OR
2. More correct answers were from the low group

Example:

	<u>High</u>	<u>Low</u>	
A.	10	2	
B.	4	6	$(5/25) - (10/25) = - .20$
C.*	5	10	
D.	6	7	

## Item discrimination

Item discrimination may be fine, but still may be problematic if: Only half of the choices are selected

Example:

	<u>High</u>	<u>Low</u>	
*A.	20	5	
B.	0	0	$(20/25) - (5/25) = .60$
C.	0	0	
D.	5	20	

Because neither the high or low group selected these, it is likely that B & C are poor distracters

## Example of a GOOD hard item

- a. 70% ← correct
- b. 10%
- c. 10%
- d. 10%

Note that a good percentage got the item correct, but of those missing it, all the distracters were working effectively

## **Example of a hard item with poor distracters**

- a. 70% ← correct
- b. 0%
- c. 30%
- d. 0%

Note that a good percentage got the item correct, but it appears that B and D might not be good distracters. Perhaps this item should be revised, specifically looking to see why B and D are not being chosen

## **Example of an ambiguous item**

- a. 25% ← correct
- b. 25%
- c. 25%
- d. 25%

It appears that students are randomly responding to this item. It might be poorly worded, or cover material not covered in class. It NEEDS to be revised!

## Example of a real problem!

- a. 25% ← correct
- b. 10%
- c. 65%
- d. 0%

What might be going on here?

## Figuring Item Discrimination

# getting the item correct (Upper Group)      —      # getting the item correct (Lower Group)

---

The total # of students per group

	<u>Item #1</u>	<u>Item #2</u>	<u>Overall Test</u>	
Student 1	1	1	99	
Student 2	1	0	98	
Student 3	0	1	96	
Student 4	1	0	93	
Student 5	1	0	93	<b>Item #1</b>
Student 6	1	1	93	
Student 7	1	1	91	<b>6-3/7 = .43</b>
Student 8	1	0	89	
Student 9	0	0	89	
Student 10	0	0	87	
Student 11	1	1	86	<b>Item #2</b>
Student 12	0	0	86	
Student 13	1	0	82	<b>4-5/7 = -.14</b>
Student 14	1	1	82	
Student 15	1	1	80	
Student 16	1	1	78	
Student 17	0	1	75	
Student 18	1	0	75	
Student 19	0	1	74	
Student 20	0	1	73	
Student 21	0	0	71	

## **Cautions in Interpreting Item-Analysis Results**

- **High discrimination  $\neq$  high validity**
- **Low discrimination does not necessarily indicate a defective item**
- **Item-analysis data from small samples are highly tentative**