Van Blerkom Chapter 3: Developing Measurable Objectives

 When making assessments, it is necessary that one focus upon observable criteria in order to establish student achievement. Assessment, therefore, requires that clear and well-defined “performance objectives” be specified (a performance objective is simply some observable manifestation of student skills and achievement).

1. Categories of Learning Outcomes

 To establish performance objectives, one needs to understand the various types of performances that can be observed. The two taxonomies named after Bloom and Gagne’ provide labels to the various performances one should expect.

a. Bloom’s Taxonomy of Objectives

 For cognitive skills, Bloom and colleagues developed six levels of performance. The lowest level is “knowledge.”

(1) Knowledge

 Simply the recall of information – facts, principles, etc. (understanding not necessary)

Examples:

* names the four scales of measurement
* identifies how many hundreds, tens, and ones are represented by any numeral

(2) Comprehension

 The lowest level of understanding, comprehension is typically identified as the ability to translate from one form to another; interpret, summarize, or paraphrase information; or extrapolate or anticipate a sequence of events based upon immediate information; to know what something means, like a definition.

Examples:

* ranking basketball teams by the winning percentages over a given season
* converting a verbalized hypothesis into statistical symbols
* anticipating a mutual fund growth or decline based upon a times-series graph of its performance over the last 10 years
* distinguish between nouns, verbs, and other parts of speech

(3) Application

 Use of information in new situations or settings; the information can be general ideas, rules, methods, principles, or theories that must be remembered and then applied.

Examples:

* solve problems using the appropriate formula
* solve a problem that requires the computation of the area of a square given the dimensions
* given a research scenario, determine which type of sampling should be used (this might also be 4. Analysis)
* writing sentences using appropriate grammatical rules

(4) Analysis

 Ability to disassemble material into component parts so the structure can be understood; breaking something into parts to detect relationships, organization, etc. of those parts; in short, the ability to identify elements embedded in a whole and recognizing relations among elements.

Examples:

* recognizing elements of a character, setting, and plot in a story
* distinguish between fact and opinion in a news story

(5) Synthesis

 Opposite of analysis – the ability to put elements together to form a new whole.

Examples:

* design a true experiment
* write a coherent and logical literature review on the relationship between high school dropout behavior and academic standards
* develop a theory that describes well the observed patterns of relationships among specified variables

(6) Evaluation

 Judgments based on criteria of value and worth; determining the value of something.

Examples:

* determine which of two competing theories better explain observed relationships
* compare and determine which is the better taxonomy for cognitive activity, Bloom’s or Gagne’

Often knowledge and comprehension are considered the lower-level of the taxonomy, with the others forming the high-level.

b. Gagne’s Categories of Learning Outcomes

(1) Verbal Information

 Simple knowledge of facts and events (this knowledge does not necessarily indicate understanding); very basic recall of information or understanding of information; like Bloom’s knowledge or comprehension.

Examples:

* name four types of correlation coefficients
* list all administrative positions typically found in public schools

(2) Intellectual Skills

 Knowing how or knowing procedures to accomplish some objective; being able to correctly convert, classify, identify, or generate things.

Examples:

* differentiating between directional and non-directional hypotheses
* generating hypotheses that express reasonable relations among variables
* identifying incidents of random and non-random sample selections

(3) Cognitive Strategies

 These are techniques one uses to facilitate or help one remember, think, understand, and otherwise learn various skills and information.

Examples:

* underlining or highlighting important information in texts
* paraphrasing what one reads
* multiplying the result of division by the divisor to check whether the number divided is obtained (a common sense way of checking division, not a rule)

Note: How do cognitive strategies differ from intellectual skills?

Cognitive strategies are simply tools one uses to understand better, or learn, information, and intellectual skills represent knowledge or understanding of information learned. So cognitive strategies may be viewed as the process or monitoring of learning or understanding, and intellectual skills may be the is the result of those cognitive strategies.

(4) Motor Skills

 These are simply skills that can be represented by movement or the physical manipulation of oneself.

Examples:

* control of hands while speaking in public
* proper form displayed while serving in tennis
* illustrating yoga

(5) Attitudes

 Mental states that impact upon one’s behavior; the effect one’s beliefs, opinions, etc. have on behavior or choices.

Examples:

* preferring basketball over tennis
* choosing to join the Republican party
* the decision to challenge the instructor on many topics (and thus the willingness to suffer the consequences)

So, the five general areas of learning outcomes include verbal information, intellectual skills, cognitive strategies, motor skills, and attitudes. In education it is often useful to further subdivide intellectual skills into subcategories.

Intellectual Skills Sub-categories

(2a) Discrimination

 The ability to determine whether objects are different or the same; may not be able to say how they are different.

Examples:

* noting that two pencils are different
* seeing that cats and dogs differ
* matching pitch

(2b) Concepts

 The identification or classification of objects, events, or ideas (differs from discrimination in that one can name or understand the objects, events, etc. and why object or ideas belong to a certain group or class)/

Concrete Concepts

 Noting that objects are different and being able to explain this difference--explain why objects are different; being able to classify objects into categories by label (and based upon perceptual characteristics). Concrete concepts differ from discrimination in that with discrimination one cannot classify objects into categories by name, rather, one can simply note that objects are different or similar.

Examples:

* following instruction to point only to daisies
* isolating from a group of people those with brown hair
* identifying items that taste salty

Defined Concepts

 The identification or classification of ideas and events, rather than perceptual objects, based upon understanding the defining characteristics of those ideas or events; ability to describe differences and similarities among various ideas or other abstract concepts using defining characteristics.

Examples:

* identify examples of school rule violations
* distinguish directional from non-directional hypotheses
* classify examples of research as either true experimental, quasi-experimental, or non-experimental

(2c) Rules and Higher-order Rules

 The understanding of rules can be demonstrated by the application of procedures or principles to solve a problem/

Examples:

* calculate a t statistic
* correctly use semi-colons in a paragraph

To demonstrate higher-order rules, one must do something that requires the use of more than one rule; further, the product or solution must be new to the individual – must be a new way of integrating rules for the student being observed.

2. Components of Performance Objectives

 A performance objective describes an observable event that will be used to indicate that a student has learned given information. To write well performance objectives, the following four components are useful.

a. Capability

 The capability to be assessed should be specified using either Bloom’s or Gagne’s taxonomies.

b. Behavior

 Identify in the performance objective that behavior you plan to observe that best indicates achievement; the behavior should be capable of being directly observed, if possible.

When one combines names of capability with descriptions of behavior, one has a performance objective. The following examples will use Bloom’s taxonomy to illustrate performance objectives.

Examples:

* Knowledge: Write the names of four correlation coefficients.
* Application: Write two sentences that both require use of semi-colons.
* Analysis: Label both facts and opinions found in a news story.
* Synthesis: Write a coherent and logical literature review on the relationship between high school dropout behavior and academic standards.

c. Situation and Special Conditions

 Sometimes it is necessary to state the specific situation in which the performance is to be observed; note that situations specify the context in which the behavior will be observed.

Special conditions indicate conditions that must be revealed in the student’s behavior to adequately judge that the targeted knowledge has been learned by the student.

Examples:

* Knowledge: When presented with statistical symbols for correlation coefficients, write the corresponding names for the correlation coefficients.
	+ capability = Knowledge
	+ situation = when presented…
	+ behavior=write names
* Analysis: When presented with a results and discussion section of a research paper, identify, within one class period, all statistical and non-statistics inferences made in the paper.
	+ capability = analysis
	+ situation = when presented…
	+ behavior = identify…
	+ special condition = within one class period
* Comprehension: When presented with written hypotheses, provide in writing the corresponding hypotheses in statistical symbols.
	+ capability = comprehension
	+ situation = when presented…
	+ behavior = provide…

3. Selection of Performance Objectives

 When determining and selecting performance objectives, the following criteria should be considered.

a. Describe the Results of Learning

 The focus should be one student behavior once learning is accomplished; thus, performance objectives should avoid the following.

* Indicating teacher performance such as “Students will be taught the distinction between quantitative research methods.”
* Specifying the learning process such as “Students will learn the distinctions between random and non-random sampling procedures.”
* Focusing on course content, such as “Students will know the distinction among four types of score reliability.”
* Placing more than one objective (or capability) in the performance objective, such as “Students will apply and synthesize various aspects of sampling methods.”

b. Use Relevant Behavior as Indicators

 It is important that behavior that illustrates the desired capability be specified, and to help assure this, capabilities should always be specified. Thus, the following is not a relevant behavior for the desired capability.

* Application: When presented with written hypotheses, provide in writing the corresponding hypotheses in statistical symbols. (capability, situation, behavior)

c. Assess all Critical Aspects of Knowledge and

d. Assess the Appropriate Sample of All Knowledge

 It is important that critical, fundamental aspects of a given domain be assessed; for example, with statistics it is important that students know how and when to apply the given statistical procedures, so performance objectives that assess only knowledge or comprehension are not adequately assessing student understanding of statistics; one should also see some application and perhaps analysis as well.

One method to combat the above problem is to determine early the number of performance objectives to be assessed for each content domain, and to specify clearly those capabilities to be examined. It is important that an adequate sampling of a given domain be developed and used, and this will eliminate the chance of improper balance or weight being applied to too few areas or domains.

4. Using Objectives

 Teachers can use objectives to plan lessons and to develop tests. For test development objectives can be directly for identifying content that should be included on a test. Another approach is to use a table of specifications in which objectives are sorted by topic, then a taxonomy, such as Bloom’s or Gagne’s, is incorporated to help identify test item focus. A table of specifications is discussed and illustrated in the next presentation on test validity evidence.

Self-Test

1. Items a through h list descriptions of behaviors. For each description, use the following options to identify the category each behavior represents.

* verbal information
* intellectual skills
* cognitive strategy
* motor skill
* attitude
1. choosing to go to the library rather than the beach
2. riding a skateboard
3. recalling the number of students in your high school graduating class
4. stating the date on which you were born
5. classifying foods as fruit or vegetable
6. repeating several times the names of classmates to learn their names
7. because of supply and demand, expecting the price scalpers are charging for football tickets to rise as the team wins more games
8. knowing that leap year normally occurs every four years

2. Write three performance objectives. At least one objective must include a situation and at least one must include a special condition. Label each section of the performance objective using the following:

1. behavior
2. capability
3. situation
4. special condition.

3. Items a through i list descriptions of behaviors. For each description, use the following options to identify the category each behavior represents.

* verbal information
* discrimination
* concrete concept
* defined concept
* rule or higher-order rules
* attitude
* motor skill
1. stating the three major causes of the Civil War
2. parallel parking
3. classifying paintings as impressionistic or expressionistic
4. converting pounds to kilos
5. demonstrating the correct spelling of "ie" and "ei" words
6. recognizing the difference between long o and short o sounds
7. juggling three balls
8. listing the effects of beer and wine on the task of driving
9. identifying works of Mozart and 2 minute sound bytes