WRITING INSTRUCTIONAL OBJECTIVES

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Educators have used instructional, or behavioral, objectives for at least four decades. Robert Mager's little text, *Preparing Instructional Objectives*, first printed in 1962, assisted many instructors in formulating and writing objectives. Since then, the use of objectives has become commonplace in education. The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) also affirms the value of objectives. Specifically, Essentials 12 and 13 address the importance of incorporating objectives within the curriculum and specific units of study.

The purpose of this unit is to assist the educator in writing objectives using a standard protocol. Objectives are not difficult to write if one follows the guidelines noted below.

Instructional objectives are written for the student and they state what the student is expected to do following instruction. Objectives are specific, observable, and measurable learning outcomes. In contrast, goals are general and non-specific. Goals are appropriate for an entire course or a curriculum of study, while objectives are written for individual units of study.

There are benefits to incorporating objectives within our coursework. Objectives emphasize major points and reduce non-essential material. Objectives simplify note taking and cue the students to emphasize major points. Objectives assist students in organizing and studying content material. They guide the students to what is expected from them and help them to study important information. Objectives assist the student in studying more efficiently. Finally, when examination items mirror objectives, students can use the objectives to anticipate test items.

There are four components of an objective: 1) the action verb, 2) conditions, 3) standard, and 4) the intended audience (always the student). The action verb is the most important element of an objective and can never be omitted. The action verb states precisely what the student will do following instruction. Verbs are categorized by domains of learning and various hierarchies. Benjamin Bloom and his colleague, David Krathwohl, were pioneers in categorizing the domains and levels.

The three domains of learning are the cognitive domain that emphasizes thinking; the affective domain highlighting attitudes and feelings; and the psychomotor domain featuring doing. The first domain that was characterized by Bloom was the cognitive, which is further divided into six levels or hierarchies.

Cognitive (Thinking) Domain

Knowledge
Comprehension
Application
Analysis
Synthesis
Evaluation

Sometimes the six hierarchies or levels listed above are grouped into three categories:

Level 1. Recall – Knowledge and Comprehension
Level 2. Interpretation – Application and Analysis
Level 3. Problem-Solving – Synthesis and Evaluation

Recall objectives are at the basic taxonomic level and involve recall or description of information. Interpretation is a higher level of learning and involves application and examination of knowledge. Problem-solving skills test the highest level of learning and involve construction and assessment of knowledge. Examples of appropriate verbs for use with each of the three domains follow.

Writing Objectives: Key Verbs
Cognitive (Thinking) Domain

The following key verbs will help to write good objectives and also establish a relative "taxonomic level" for each Objective.

KNOWLEDGE

Cite
Choose
Define
Label
List
Locate
Match
Name
Recall
Recognize
Record
Repeat
Select
State
Write

COMPREHENSION

Arrange
Associate
Clarify
Classify
Convert
Describe
Diagram
Draw
Discuss
Estimate
Explain
Express
Identify
Locate
Outline
Paraphrase
Report
Restate
Review
Sort
Summarize
Transfer
Translate

APPLICATION

Adapt
Apply
Catalogue
Chart
Compute
Consolidate
Demonstrate
Develop
Employ
Extend
Extrapolate
Generalize
Illustrate
Infer
Interpolate
Interpret
Manipulate
Modify
Order
Predict
Prepare
Produce
Relate
Sketch
Submit
Tabulate
Transcribe
Use
Utilize

ANALYSIS

Analyze
Appraise
Audit
Break down
Calculate
Categorize
Certify
Compare
Contrast
Correlate
Criticize
Deduce
Defend
Detect
Diagram
Differentiate
Discriminate
Distinguish
Examine
Infer
Inspect
Investigate
Question
Reason
Separate
Solve
Survey
Test
Uncover
Verify

SYNTHESIS

Arrange
Assemble
Build
Combine
Compile
Compose
Conceive
Construct
Create
Design
Devise
Discover
Draft
Formulate
Generate
Integrate
Make
Manage
Organize
Plan
Predict
Prepare
Propose
Reorder
Reorganize
Set up
Structure
Synthesize

EVALUATION

Appraise
Approve
Assess
Choose
Conclude
Confirm
Criticize
Critique
Diagnose
Evaluate
Judge
Justify
Prioritize
Prove
Rank
Rate
Recommend
Research
Resolve
Revise
Rule on
Select
Support
Validate

Level 1: Recall

Level 2: Interpretation

Level 3: Problem-solving

Note: Some verbs may be applicable within more than one category: for example. depending on the situation, "calculate" may fit under application or analysis.

Writing Objectives: Key Verbs
Attitudinal or Affective (Valuing) Domain

RECEIVING	RESPONDING	VALUING	ORGANIZATION	CHARACTERIZATION BY A VALUE OR VALUE COMPLEX
				Act
				Administer
				Advance
			Anticipate	Advocate
			Collaborate	Aid
		VALUING	Confer	Challenge
			Consider	Change
		Adopt	Consult	Commit (to)
		Aid	Coordinate	Counsel
	RESPONDING	Care (for)	Design	Criticize
		Complete	Direct	Debate
	Agree	Compliment	Establish	Defend
	Allow	Contribute	Facilitate	Disagree
RECEIVING	Answer	Delay	Follow through	Dispute
	Ask	Encourage	Investigate	Empathize
Accept	Assist	Endorse	Judge	Endeavor
Acknowledge	Attempt	Enforce	Lead	Enhance
Attend (to)	Choose	Evaluate	Manage	Excuse
Follow	Communicate	Expedite	Modify	Forgive
Listen	Comply	Foster	Organize	Influence
Meet	Conform	Guide	Oversee	Motivate
Observe	Cooperate	Initiate	Plan	Negotiate
Receive	Demonstrate	Interact	Qualify	Object
	Describe	Join	Recommend	Persevere
	Discuss	Justify	Revise	Persist
	Display	Maintain	Simplify	Praise
	Exhibit	Monitor	Specify	Profess
	Follow	Praise	Submit	Promote
	Give	Preserve	Synthesize	Promulgate
	Help	Propose	Test	Question
	Identify	Query	Vary	Reject
	Locate	React	Weigh	Resolve
	Notify	Respect		Seek
	Obey	Seek		Serve
	Offer	Share		Strive
	Participate (in)	Study		Solve
	Practice	Subscribe		Tolerate
	Present	Suggest		Volunteer (for)
	Read	Support		
	Relay	Thank		
	Reply	Uphold		
	Report			
	Respond			
	Select			
	Try			

The affective domain in concerned with <u>changes</u> (growth) in interests. attitudes and values. It is divided into five major classes arranged in hierarchical order based on level of involvement (from receiving, to characterization by a value).

Writing Objectives: Key Verbs
Psychomotor (Doing or Skills) Domain

Absorb	Dispense	Macerate	Separate
Add	Dispose	Measure	Set
Adsorb	Dissect	Mix	Sever
Adjust	Dissolve	Moisten	Shake
Aliquot	Drain	Mount	Sharpen
Apply	Draw	Observe	Ship
Aspirate	Dry	Obtain	Siphon
Assemble	Elute	Open	Spin
Balance	Employ	Operate	Spread
Bind	Estimate	Pack	Squeeze
Blend	Evacuate	Palpate	Stain
Build	Examine	Participate	Standardize
Calculate	Expel	Perform	Start
Calibrate	Fasten	Pick	Stick
Centrifuge	Fill	Pipet	Stir
Change	Filter	Place	Stop
Choose	Fractionate	Plate	Stopper
Classify	Frame	Plot	Store
Clean	Freeze	Position	Suspend
Collate	Grade	Pour	Take
Collect	Grasp	Prepare	Test
Combine	Grind	Press	Thaw
Connect	Group	Process	Thread
Construct	Guide	Produce	Tilt
Control	Handle	Program	Time
Combine	Heat	Pull	Tip
Confirm	Hemolyze	Puncture	Titrate
Connect	Identify	Push	Trim
Construct	Illustrate	Read	Touch
Control	Incubate	Record	Transfer
Cool	Inject	Release	Troubleshoot
Correct	Input	Remove	Turn
Count	Insert	Replace	Type
Create	Invert	Resuspend	Use
Crush	Investigate	Retest	Utilize
Cut	Isolate	Rinse	View
Decant	Label	Roll	Warm
Demonstrate	Locate	Rotate	Wash
Describe	Localize	Save	Watch
Design	Lyse	Scan	Weigh
Dialyze	Maintain	Score	Withdraw
Differentiate	Make	Screen	Wipe
Dilute	Maneuver	Seal	Wrap
Discard	Manipulate	Select	
Dismantle	Mark	Sensitize	

Writing Objectives

The ABCD method of writing objectives is similar to the theory explained here; the terminology is just slightly different. *A* is the audience, always the student. *B* is the behavior or the action verb. *C* is the condition for the objective and *D* is the degree of achievement or acceptable criteria.

Conditions

Conditions describe the relevant factors associated with the desired performance. For example:

1. after attending a lecture. . . .
2. following review of a demonstration. . . .
3. given a case study. . . .
4. after completing the assignment. . . .
5. given a specific instrument. . . .

Criteria

The criteria are specified as the acceptable level of achievement desired. They tell how well the learner must perform. This part of the objective may be omitted when there is no deviation from standard procedures or protocols. For example:

1. percent of correct responses
2. within a given time period
3. in compliance with criteria presented by the faculty

Order and Tense

There is a preferred order when writing objectives. The condition is usually placed first, followed by the behavior or verb, and then the criteria. Objectives are written in the future tense. For example:

Recall: After attending lecture and reading the assigned materials, the student will state the function of a thermometer.

Interpretation: After attending lecture and studying the assigned materials, the student will demonstrate how a thermometer works.

Problem-Solving: After attending lecture and studying the assigned materials (including problem sets), the student will formulate the degrees in C given the degrees in F, or vice versa.

To avoid redundancy in writing objectives an educator often lists a single condition with the objectives underneath.

After attending lecture and studying the assigned materials, the student will:

       1. . . . . .
       2. . . . . .
       3. . . . . .

Nonfunctional Verbs

The following verbs cannot be measured or are redundant. They should be <u>avoided</u> when writing objectives.

able to	shows interest in
appreciation for	knows
awareness of	has knowledge of
capable of	learns
comprehend	memorizes
conscious of	understands
familiar with	will be able to

Examples of Objectives for the Cognitive Domain

Poor	To increase the student's ability to visually identify white cells on a differential.
Better	The student will identify correctly all white cells on a differential.

Poor	The student will gain knowledge of automated chemistry tests.
Better	The student will state the principle for each automated chemistry test listed.

Poor	The student will be familiar with red blood cell maturation in the bone marrow.
Better	The student will diagram the maturation of red blood cells.

Poor	The student will understand the interpretation of hemoglobin electrophoresis patterns.
Better	Given several electrophoretic scans, the student will correctly diagnose each normal or abnormal pattern.

Levels Within the Cognitive Domain

LEVEL #1. KNOWLEDGE

Knowledge involves recognition or recalling of

- definitions
- specifics

Here, one is expecting learners to:

- remember an idea, phenomenon, or a fact in somewhat the form in which it was presented.

For example, one might design an activity that requires a learner to:

- write the formula for ethyl alcohol
- define diuresis
- list the six levels in the cognitive domain of Bloom's taxonomy

Generally, KNOWLEDGE encompasses the cognitive process of <u>remembering</u> learned material

LEVEL#2.   COMPREHENSION

Comprehension usually involves

- translation
- associations

Here, one is expecting the learner to:

- communicate an idea or thing (event) in a new or different form (translation)
- see relationships among things or events (associations)

For example, one might design an activity that requires a learner to:

- describe three distinguishing features of the Lewis blood group system
- explain the rationale for using "selective media" in microbiology

Generally, COMPREHENSION encompasses the cognitive process of <u>explaining</u> material that has been learned.

LEVEL #3 APPLICATION

Application is described by Bloom as "the use of abstract forms in particular and concrete situations. The abstractions may be in the form of general ideas, rules or procedures, generalized methods."

In application, one expects the learner to

- relate or apply ideas to new situations
- use what he/she comprehends from a variety of areas to solve problems

For example:

- when given the clinical situation of a patient needing a transfusion, submit the most suitable blood product to be used
- apply Universal Precautions to establish and maintain a safe laboratory environment

Generally, APPLICATION involves using knowledge to find or develop new solutions.

LEVEL #4 ANALYSIS

Analysis involves examining

- elements
- relationships
- organizational principles

Here, one is expecting the learner to:

- break "things" down into their component parts
- uncover the unique characteristics of a concept or event

For example,

- when given a patient's hematologic data, appraise that data to ascertain whether they are internally consistent and can be reported
- when given various cell panels, analyze the results to identify an unexpected antibody(s)

Generally, ANALYSIS involves the ability to break down material into component parts so that its organizational structure may be understood.

LEVEL #5 SYNTHESIS

Synthesis involves an ability to

- generate a set of abstract relations (to "hypothesize")
- create a plan or propose a set of operations

Here, one is expecting the learner to:

- take "things " and reorganize them in a new way
- create new or original concepts

For example,

- prepare appropriate financial statements for decision-making
- propose a "core laboratory" structure to optimize efficiency and effectiveness

Note: the processes with SYNTHESIS involve inductive, not deductive reasoning. This can be difficult when one considers that the profession of clinical laboratory science usually uses information to arrive at conclusions. (We are skilled deductive thinkers, but may not be as skilled inductive thinkers.) Thus, preparing objectives at this level may be difficult.

LEVEL #6 EVALUATION

Evaluation includes the ability to judge, using
- internal standards and
- external criteria

to bring about informed decisions

Here, one is expecting the learner to:

- make judgments about "things" or events based on internal and external criteria
- accept or reject "things" or events based on established standards

For example:

- evaluate and select a chemistry automated system in view of costs, personnel, productivity and space available
- validate all of the laboratory data received from a patient with a recent bone marrow transplant

Generally, this cognitive function involves the ability to <u>judge</u> the <u>value</u> of some thing for a given purpose.

The educator should use a combination of all three levels of cognitive verbs when writing learning outcomes. The test question should reflect the level of the objective; thus if an objective is recall, then a similar verb like "state" should be used in the test question. If the objective is problem solving, then the test question might use a verb such as "diagnose" or "evaluate."

Additional Examples of Objectives

Lecture Objectives (Hemolytic Anemias)

After attending the lecture, reading the assignment, and performing the tests in the laboratory, the student will:

1. Define the term hemolytic anemia. (recall)

2. Classify the major hemolytic anemias by their intrinsic or extrinsic causes. (recall)

3. Summarize each disease discussed in lecture including distinguishing characteristics, clinical manifestations, laboratory findings, pathology, and treatment. (recall)

4. For each disease discussed in lecture, determine the appropriate tests to resolve the problem. Include the principle and mechanism of each test in the evaluation. (interpretation)

5. Given a set of laboratory data and patient history, correctly diagnose the disease. (problem-solving)

Affective Objectives

After attending a lecture on Essential Functions, the student will exhibit the following behaviors:

1. Communicate effectively in written and spoken English.

2. Appropriately assess nonverbal and verbal communication.

3. Follow written and verbal directions.

4. Work independently and with others under time constraints.

5. Prioritize requests and work concurrently on at least two different tasks.

6. Maintain alertness and concentration during a normal work period.

7. Apply knowledge, skills, and values learned from course work and life experiences to new situations.

8. Show respect for self and others

9. Project an image of professionalism including appearance, dress, and confidence.

Psychomotor Objectives

Upon completion of the laboratory exercise the student will:

1. Correctly perform the electrophoretic procedure and obtain a satisfactory pattern that could be accurately interpreted by both the student and the faculty member.

2. Interpret normal and abnormal electrophoretic patterns with 100% accuracy as compared with patterns interpreted by the CLS.

3. Using a densitometer, obtain the concentration of each protein fraction within 10% of faculty member's results.

4. Perform calcium determinations on serum using a direct spectrophotometric method within 10% of the reported result.

5. Demonstrate skill in using micropipetting devices to the satisfaction of the faculty member.

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