

Developing Objectives and Relating them to Assessment

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Overview

Objectives:

When you have mastered the material in this Guide, you should be able to

1. write clear objectives which define the specific outcomes or competencies to be achieved in terms of skills, knowledge, attitudes or values,
2. form the basis upon which to select or design instruction materials, content or teaching techniques,
3. provide the basis for determining or assessing when the instruction purpose has been accomplished,
4. provide a framework within which a learner can organize his or her efforts to complete the learning tasks.

***Hint:* well-written objectives should be clearly defined, observable, measurable and valid.**

Writing Objectives

There are various ways of writing objectives. Besides referring to themes, you might also classify according to educational domains. The three groups of domains identified by educational psychologist, Benjamin Bloom are commonly used to group objectives and learning outcomes. These are:

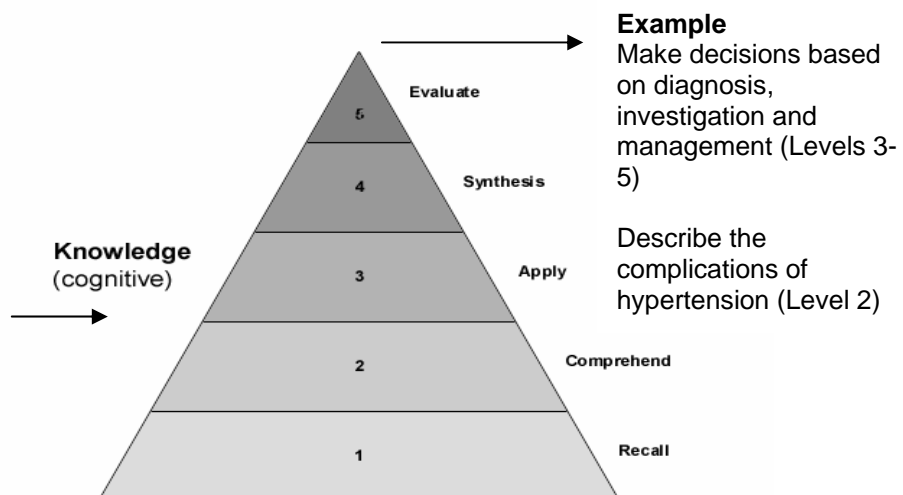
Hint: Include Knowledge, Skills and Attitudes Objectives

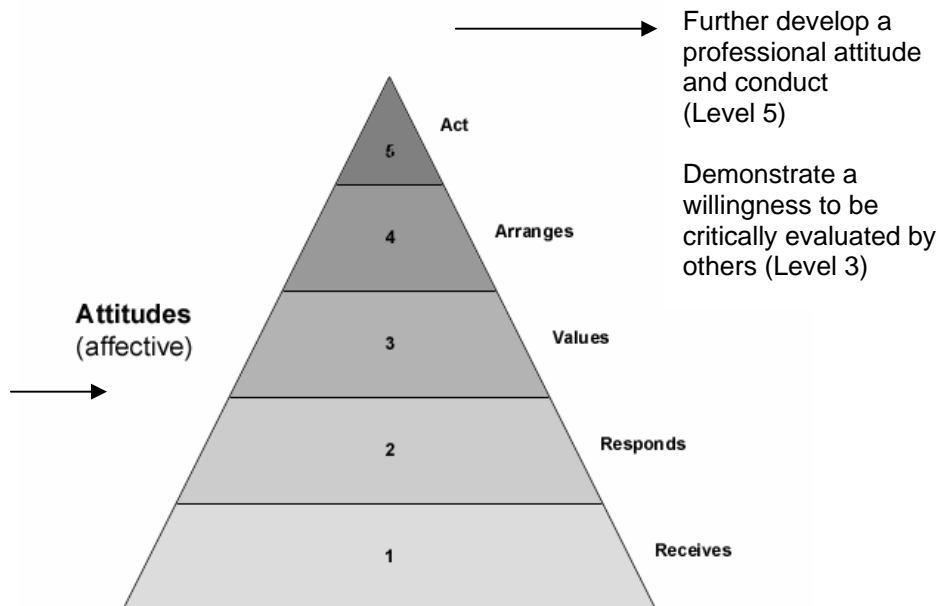
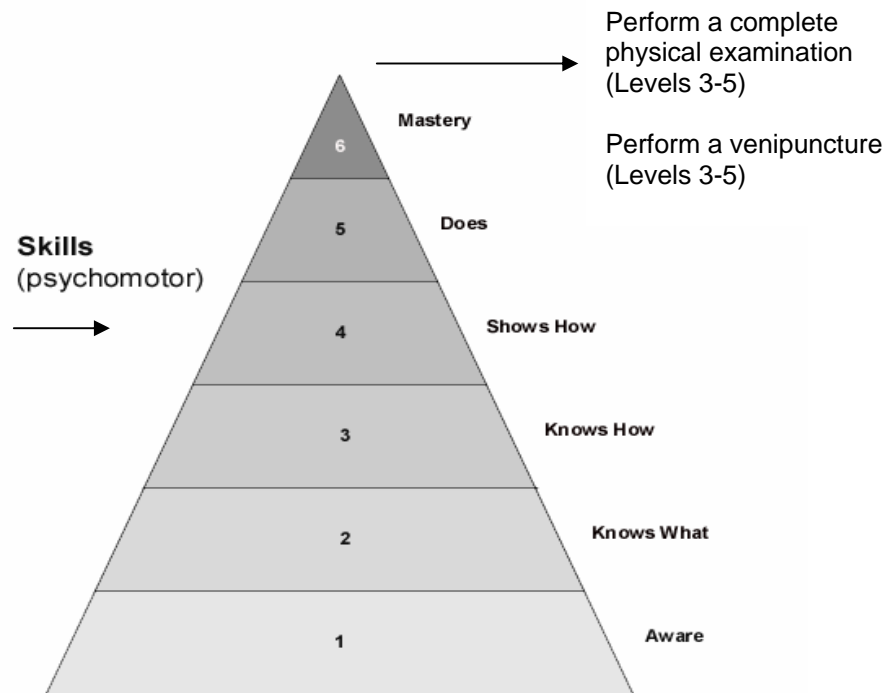
- **Cognitive domain** – encompasses intellectual or thinking skills (Termed **Knowledge Objectives**)
- **Psychomotor domain** – encompasses physical skills or the performance of actions. (Termed **Skills Objectives**)
- **Affective domain** – encompasses attitudes and values (Termed **Attitudes Objectives**)

Levels of Objectives Writing

Within each Domain there are several levels you may wish to specify in your objectives writing. This will depend upon the extent of detail that is required in the curriculum and what you know about the learning style and readiness of the students.

Hint: Try to cover the different levels of each learning Domain





In each Domain, Bloom identified several levels, each with a list of suitable verbs for describing that level in written objectives. The following table describes the cognitive domain, and levels are arranged from the least complex levels of thinking to the most complex levels of thinking.

COGNITIVE DOMAIN	
Level and Meaning	Use these words in written objectives to describe the associated cognitive level:
Knowledge: The remembering of previously learned material (recall of facts)	define, distinguish, identify, inquire, label, list, match, memorise, name, read, recall, recognize, relate, repeat, record, select
Comprehension: The ability to grasp the meaning of the knowledge being learned	associate, describe, differentiate, discuss, explain, extend, generalise, give examples, illustrate, infer, interpret, locate, rearrange, reorder, restate, rewrite, summarize, transform, translate
Application: The ability to use learning materials in a new way	apply, calculate, choose, classify, demonstrate, develop, generalize, illustrate, operate, organize, practise, restructure, sketch, solve, transfer, use
Analysis: The ability to break material down into its parts so that its organizational structure may be understood	analyse, categorize, classify, compare, contrast, deduce, describe, detect, diagram, discriminate, differentiate, distinguish, experiment, group, inspect, point out, put into lists, question, subdivide, test
Synthesis: The ability to combine previous experiences with new material to form a whole new structure	combine, compile, create, design, generate, integrate, modify, plan, produce, propose, solve
Evaluation: The ability to judge the value of material for a given purpose	appraise, assess, choose, compare, conclude, consider, criticize, evaluate, judge, measure, rate, score, select, support, validate, value

(Source: Bloom, B., *Taxonomy of Educational Objectives*, 1956)

Hint:
Group together related Objectives

A variety of cognitive levels should be represented in the objectives.

Some objectives should deal with *facts*, some with *concepts* and some with the *application* of the information. Assuming that the objectives are well written, this will also lead to exam questions that address a variety of cognitive levels.

Using Bloom's Taxonomy of Cognitive Levels for grouping objectives, the following provides some examples of how you might use these for assessment purposes:

Knowledge – Can students RECALL information?

Who, What, Where, When, How	Which one
How much	Name
Describe	Label
Define	List
Memorise	Reproduce
Literal questions	Recall

Comprehension – Can students EXPLAIN ideas?

Explain	What are they saying
Describe in your own words	Explain what is happening
Inferential questions	Give an example
Summarise	State in 5 words
What would go better	Explain what is meant
Select the definition	What restriction would you add
Read the graph table	Translate
This represents	Outline
Condense this paragraph	Locate
What part doesn't fit	Match

Application – Can students USE ideas?

What is this used for?	How would you use
Make a model	Tell what would happen
If...how	Demonstrate how
Construct how	Show how
How much would there be if...	Design a lesson
Choose the statements that don't apply	

Analysis – Do students SEE relationships?

Whole into parts	Analyse, Research, Survey
Group, Categorise, Compare and Contrast	What inconsistencies, fallacies
Arrange	What is the relationship
Chart	What is the function of
Diagram	What conclusions
Reason for...	What does the author believe
Investigate	Make a distinction
Cause for	What motive is there
Conclude	State the point of view
Separate	What relationship
Similar	Graph
Like	Differentiate
Dissect	Categorize
Distinguish fact from fiction, fact and inference, fact from opinion, advantage from disadvantage, good from poor reason	What persuasive technique

Synthesis – Can students combine ideas and CREATE a new entity?

New ways of doing	Take risks
Consider the unexpected	Pose an alternative
Hypothesis	create
Compose	Solve
Design	Blend
Construct	How else would you
Build	Combine
Solve the following	Imagine
Plan	Predict
Link concepts in an unusual and flexible way	Make
What if	Make a film
Invent	Propose an alternative

Evaluation – Can students make JUDGEMENTS and support them?

Evaluate quality, relevance, reliability, truth	Which is best
Accuracy and effectiveness	Choose and explain why
Rate	Rank
Defend	Choose
Grade	Order
Verify	Dispute
Criticise	Defend
Find the errors	Editorialise
Appraise	Judge
What fallacies, consistencies, inconsistencies appear	
Which is more important, better, moral, appropriate, inappropriate, useful, clearer, suits the purpose, achieves the goal, logical, valid	

Hint:
 Avoid using verbs that represent actions or concepts that are difficult to measure such as *appreciate, be familiar with, believe, comprehend, enjoy, know, learn, master and understand*

Stating Objectives clearly

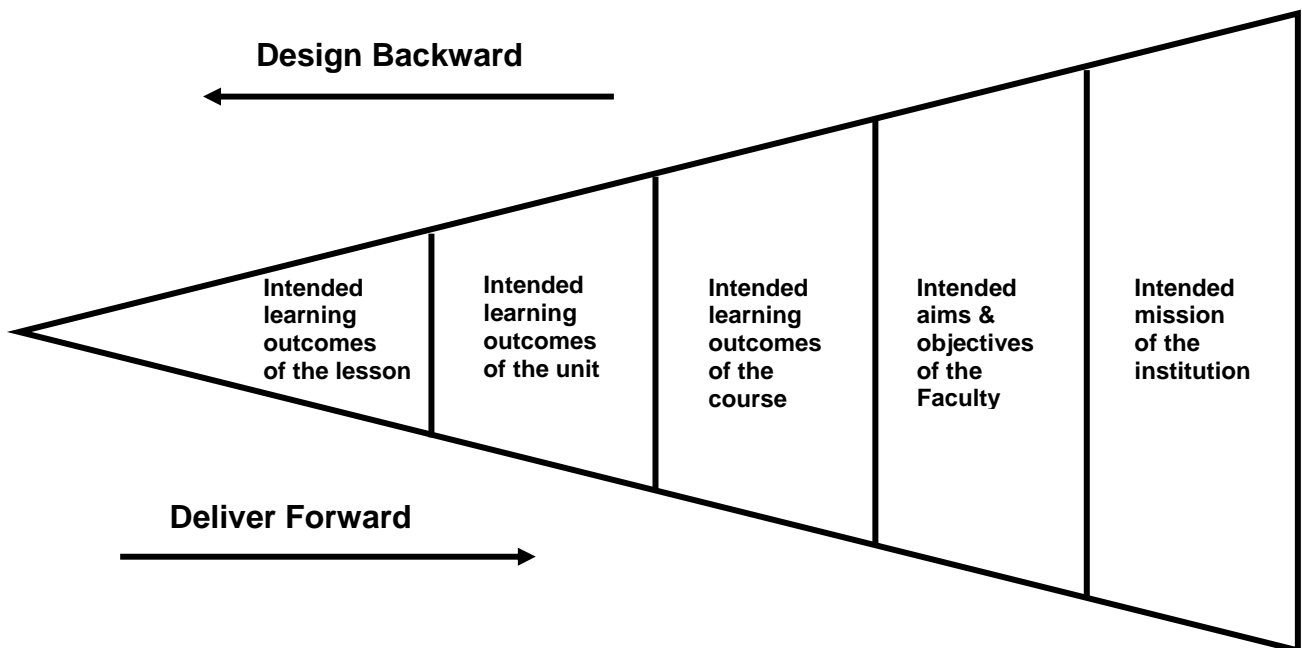
In order for objectives to provide a useful basis for creating test questions, they must contain verbs that describe *observable, measurable, achievable* actions and *specific levels of thinking*, because these are things that can be tested. The words in the left of the table below are difficult to assess, to recognise whether the objective has been achieved.

Avoid words like.....	Use words like.....
Know	List
Understand	Describe, explain
Be familiar with	Evaluate
Appreciate	Identify
Be aware of	Design
Have a good grasp of	Explain
Have a knowledge of	Select
Realise the significance of	Distinguish
Believe	Construct
Be interested in	Solve

Steps in writing objectives

Hint:
Work backwards from existing data

1. **Review existing course aims, objectives**, literature, course documents and reports to benchmark appropriate standards required for objectives writing
2. **Identify professional attributes of ideal graduating students** (eg refer to professional bodies, Australian Medical Council Guidelines). Graduate attributes are used to decide appropriate learning outcomes for the course
3. **Deduce learning outcomes** from desirable terminal practice-based behaviours implicit in graduate attributes
4. **Assign priority to the course themes**
5. **Assign priority to learning levels** (knowledge, skills, attitudes). The knowledge domain for Medicine should be complete and comprehensive,(as is presented in the Medical Core Skills list) This means that knowledge content and skills content need to be carefully detailed.
6. **Agree on a basic educational philosophy** which captures preferred teaching methodologies and assessment approaches
5. **Establish ways of measuring attainment** of objectives/learning outcomes via the selection of appropriate assessment tools
6. **Review** the appropriateness of objectives and their correlation with what is taught and assessed.



Checking the quality of objectives

- ✓ Do objectives reflect appropriately all the intended outcomes and do they sit well with the present state of knowledge of the students?
- ✓ Are they observable and measurable and the outcomes clearly defined to a specified standard or set of conditions?
- ✓ Are they attainable by intended learners and in the time available?
- ✓ Do they reflect the course and curriculum aims?

Remember, objectives should:

- **define specific outcomes** or competencies **to be achieved** in terms of skills, content mastery, attitudes or values
- **form the basis** upon which **to select or design instruction materials, content or techniques**
- **provide the basis for determining or assessing** when the instruction purpose has been accomplished
- **provide a framework** within which **learners can organize their efforts to complete the learning tasks**

Well written Objectives and Learning Outcomes:

- Are carefully worded to include standards, conditions and terms which must be met.

Criteria/standards: - defined levels of accuracy, quality, quantity, time constraints

- include special conditions that apply to the actual activity that the learner will perform

Performance:
the learner will..(verb)...

- specify the degree of accuracy or proficiency that the learner must meet.

Conditions:
given "x"... without "y "

Choose assessment methods from the following categories to suit your desired objectives, learning outcomes and course content

• Demonstrating knowledge and understanding

Essays	reflective journals/portfolios
Report	Critical incident analysis
Short answer questions	Concept mapping
Reflective case summary	Case based article
Videotaped consultation	Critical appraisal

• Assessing critical thinking skills

Essay	Critical evaluation of the literature
Report	Critique on an issue
Critical incident analysis	Reflective journal writing
Assessing Peer feedback	Seminar presentation

• Assessing problem solving skills

Simulation	Problem Based Learning (PBL)
Report	Poster
Clinical assessment	Simulated patient interviews
Essay Question	Viva voce
Observed long case	

• Assessing performance of procedures and demonstrating techniques

Mastery performance tests	OSCE
Video skill assessment	Web-based skills assessment
Assessment of competence in simulation	Ward rating
Case History exercises	Special clinical skills exam
Clinical tutor evaluation	Laboratory reports
Observed long case	Case presentation
Clinical tutor assessment	Case assessment

• Assessing ability to reflectively integrate learning into professional practice

Reflective journals	Portfolio
Simulations	Critical incidents
Case Study	Project
PBL	Log diary
Clinical tutor evaluation	Clinical experience record
Videotaped consultation	Reflective case summary
Case presentation	Clinical tutor rating

- **Assessing independent learning skills**

Learning contracts	Portfolios
Peer assessment	Project
Critical appraisal	Reflective case summary
Clinical experience record	Case based article

- **Assessing collaborative learning skills**

Group projects where the group *process* and *group outcomes are assessed* (using criteria against which the group can assess itself and determine future, more effective ways of functioning)

Peer tutoring

- **Assessing research skills**

Research assignment that is professionally relevant (and where students are assisted to develop the requisite skills)

Develop a database on a particular area	Literature review
Writing an annotated bibliography	Research paper
Case based article	

Hint:
Testing experts recommend covering each objective with more than one assessment tool

- **As you can see, some assessment methods can be used to assess more than one objective in the same activity.**
- **Some assessment methods can also cover more than one level of learning at the same time, depending upon how well the objective or learning outcome has been written.**

The following grid shows how you might plan a Biology exam to include questions at the various cognitive levels. Exam content is then chosen to match the level.

Content area	Recall/ Recognition No of questions at this level	Skills Comprehension Application No of questions at this level	Critical Thinking Problem Solving No of questions at this level	Total Allocation of marks No of questions at this level
Biochemistry	3	12	0	15
Cells/Tissues	4	13	3	20
Genetics Reproduction	2	10	3	15
Invertebrates	4	6	0	10
Vertebrates	5	11	4	20
Plant life	2	6	2	10
Ecological	0	7	3	10
Total	20	65	15	100

You can also write multiple choice questions (MCQs) which measure at the various cognitive learning levels, such as in the following Biology example:

1. Knowledge

Which of the following are raw materials or photosynthesis?

- a. Water, heat, sunlight
- b. Carbon dioxide, sunlight oxygen
- c. Water, carbon dioxide, sunlight
- d. Sunlight, oxygen, carbohydrates
- e. Water, carbon dioxide, carbohydrates

2. Comprehension

If living cells similar to those found on earth were found on another planet where there was no molecular oxygen, which cell part would most likely be absent?

- a. Cell membrane
- b. Nucleus
- c. Mitochondria
- d. Ribosome
- e. Chromosomes

3. Application

Phenylketonuria (PKU) is an autosomal recessive condition. About one in every fifty individuals is heterozygous for the gene but shows no symptoms of the disorder. If you select a symptom-free male and a symptom-free female at random, what is the probability that they would have a child afflicted with PKU?

- a. $(.02)(.02)(.25) = 0.0001 = 0.01\%$, or about 1/10,000
- b. $(.02)(.02) = 0.0004 = 0.04\%$, or about 1/2,500
- c. $(1)(50)(0) = 100\% = \text{all}$
- d. $(1)(50)(0) = 0 = \text{none}$
- e. $1/50 = 2\%$, or 2/100

4. Analysis

Mitochondria are called the powerhouses of the cell because they make energy available for cellular metabolism. Which of the following observations is *most* cogent in supporting this concept of mitochondrial function?

- a. ATP occurs in the mitochondria
- b. Mitochondria have a double membrane
- c. The enzymes of the Krebs cycle, and molecules required for terminal Respiration, are found in mitochondria
- d. Mitochondria are found in almost all kinds of plant and animal cells
- e. Mitochondria abound in muscle tissue

5. Evaluation

Disregarding the relative feasibility of the following procedures, which of these lines of research is likely to provide us with the most valid and direct evidence as to revolutionary relations among different species?

- f. Analysis of the chemistry of stored food in female gametes
- g. Analysis of the form of the Krebs cycle
- h. Observation of the form and arrangement of the endoplasmic reticulum
- i. Comparison of details of the molecular structure of DNA
- j. Determination of the total protein in the cells