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:

- **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.

<table>
<thead>
<tr>
<th>Level</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Recall</td>
</tr>
<tr>
<td>2</td>
<td>Comprehend</td>
</tr>
<tr>
<td>3</td>
<td>Apply</td>
</tr>
<tr>
<td>4</td>
<td>Synthesis</td>
</tr>
<tr>
<td>5</td>
<td>Evaluate</td>
</tr>
<tr>
<td>6</td>
<td>Describe the complications of hypertension (Level 2)</td>
</tr>
<tr>
<td></td>
<td>Make decisions based on diagnosis, investigation and management (Levels 3-5)</td>
</tr>
</tbody>
</table>

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

(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?

<table>
<thead>
<tr>
<th>Action</th>
<th>Action</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who, What, Where, When, How</td>
<td>Which one</td>
<td>Name</td>
</tr>
<tr>
<td>How much</td>
<td>Describe</td>
<td>Label</td>
</tr>
<tr>
<td>Describe</td>
<td>Define</td>
<td>List</td>
</tr>
<tr>
<td>Memorise</td>
<td>Reproduce</td>
<td>Recall</td>
</tr>
<tr>
<td>Literal questions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Comprehension – Can students EXPLAIN ideas?

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

### Application – Can students USE ideas?

<table>
<thead>
<tr>
<th>Action</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is this used for?</td>
<td>How would you use</td>
</tr>
<tr>
<td>Make a model</td>
<td>Tell what would happen</td>
</tr>
<tr>
<td>If…how</td>
<td>Demonstrate how</td>
</tr>
<tr>
<td>Construct how</td>
<td>Show how</td>
</tr>
<tr>
<td>How much would there be if…</td>
<td>Design a lesson</td>
</tr>
<tr>
<td>Choose the statements that don’t apply</td>
<td></td>
</tr>
</tbody>
</table>

### Analysis – Do students SEE relationships?

<table>
<thead>
<tr>
<th>Action</th>
<th>Analysis, Research, Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole into parts</td>
<td>What inconsistencies, fallacies</td>
</tr>
<tr>
<td>Group, Categorise, Compare and Contrast</td>
<td>What is the relationship</td>
</tr>
<tr>
<td>Arrange</td>
<td>What is the function of</td>
</tr>
<tr>
<td>Chart</td>
<td>What conclusions</td>
</tr>
<tr>
<td>Diagram</td>
<td>What does the author believe</td>
</tr>
<tr>
<td>Reason for…</td>
<td>Make a distinction</td>
</tr>
<tr>
<td>Conclude</td>
<td>State the point of view</td>
</tr>
<tr>
<td>Separate</td>
<td>What relationship</td>
</tr>
<tr>
<td>Similar</td>
<td>Graph</td>
</tr>
<tr>
<td>Like</td>
<td>Differentiate</td>
</tr>
<tr>
<td>Dissect</td>
<td>Categorize</td>
</tr>
<tr>
<td>Distinguish fact from fiction, fact and inference, fact from opinion, advantage from disadvantage</td>
<td>What persuasive technique</td>
</tr>
</tbody>
</table>

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

- New ways of doing
- Consider the unexpected
- Hypothesis
- Compose
- Design
- Construct
- Build
- Solve the following
- Plan
- Link concepts in an unusual and flexible way
- What if
- Invent

- Take risks
- Pose an alternative
- create
- Solve
- Blend
- How else would you
- Combine
- Imagine
- Predict
- Make
- Make a film
- Propose an alternative

**Evaluation – Can students make JUDGEMENTS and support them?**

- Evaluate quality, relevance, reliability, truth
- Accuracy and effectiveness
- Rate
- Defend
- Grade
- Verify
- Criticise
- Find the errors
- Appraise

- Which is best
- Choose and explain why
- Rank
- Choose
- Order
- Dispute
- Defend
- Editorialise
- Judge

What fallacies, consistencies, inconsistencies appear
Which is more important, better, moral, appropriate, inappropriate, useful, clearer, suits the purpose, achieves the goal, logical, valid

**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.

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

*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*
Steps in writing objectives

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

7. **Review** the appropriateness of objectives and their correlation with what is taught and assessed.

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**Diagram:**

- Intended aims & objectives of the Faculty
- Intended learning outcomes of the course
- Intended learning outcomes of the unit
- Intended learning outcomes of the lesson
- Design Backward
- Deliver Forward
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
  - Report
  - Short answer questions
  - Reflective case summary
  - Videotaped consultation

- **Assessing critical thinking skills**
  - Essay
  - Report
  - Critical incident analysis
  - Assessing Peer feedback

- **Assessing problem solving skills**
  - Simulation
  - Report
  - Clinical assessment
  - Essay Question
  - Observed long case

- **Assessing performance of procedures and demonstrating techniques**
  - Mastery performance tests
  - Video skill assessment
  - Assessment of competence in simulation
  - Case History exercises
  - Clinical tutor evaluation
  - Observed long case
  - Clinical tutor assessment

- **Assessing ability to reflectively integrate learning into professional practice**
  - Reflective journals
  - Simulations
  - Case Study
  - PBL
  - Clinical tutor evaluation
  - Videotaped consultation
  - Case presentation
• 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.

<table>
<thead>
<tr>
<th>Content area</th>
<th>Recall/Recognition</th>
<th>Skills Comprehension</th>
<th>Critical Thinking</th>
<th>Problem Solving</th>
<th>Total Allocation of marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No of questions at this level</td>
<td>No of questions at this level</td>
<td>No of questions at this level</td>
<td>No of questions at this level</td>
<td>No of questions at this level</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>3</td>
<td>12</td>
<td>0</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Cells/Tissues</td>
<td>4</td>
<td>13</td>
<td>3</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Genetics</td>
<td>2</td>
<td>10</td>
<td>3</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Reproduction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invertebrates</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Vertebrates</td>
<td>5</td>
<td>11</td>
<td>4</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Plant life</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Ecological</td>
<td>0</td>
<td>7</td>
<td>3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>65</td>
<td>15</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
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. \(1/50 = 2\%, \text{or 2/100}\)

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