Developing Written Tests

This job aid is designed to help you to develop effective written tests.
After using it, you should be able to:

- decide on the most appropriate test questions for assessing learning
- match test questions with desired learning outcomes
- develop short-answer, long-answer, multiple-choice, and true-false test questions
- use graphics in tests.

BCIT LEARNING AND TEACHING CENTRE
3700 Willingdon Avenue, Burnaby, BC, V5G 3H2

Telephone: (604) 432-8927
Fax: (604) 431-7267
Web site: http://www.bcit.ca/ltc

Developing written tests

Evaluation may include several types of tests including essays, presentations, practical tests, laboratory skill tests, interviews, and so on. Written tests are mostly for evaluating information-based learning outcomes. However, they may also test knowledge, skills, or attitudes. They are part of the overall evaluation plan for students.

Test questions may be open-ended, requiring an answer in the form of an essay or a short statement in the student's own words. These reveal the student's learning but also tests their ability to express their thoughts in written English. They are also very time-consuming to mark. Test questions that reduce marking time may be short-answer, true/false, or multiple-choice. The type of question to use depends on what types of information you wish to test.

This job aid discusses several types of written tests and when to use them. It includes a discussion of using graphics in test questions.

Whatever type of test you decide to use, you must ensure that it fits within your overall evaluation plan. You must also ensure that it measures the desired learning outcomes for your course. You can greatly improve your test by evaluating its effectiveness—see the section below on testing the test and checking the scoring.

Plan your evaluation

As you design and use your written tests, refer to the desired learning outcomes for the course. (You may wish to refresh your understanding of learning outcomes by using our job aid *Writing Learning Outcomes*.) Ask yourself the following questions:

Before: 1. Are my learning outcomes clear and measurable?

2. Is my evaluation plan complete and suitable for the learning outcomes?

After: 3. Do my tests match my desired learning outcomes?

Write the test items

As you write your test items, take care with the details. This pamphlet will help you do this. Remember that clear instructions, consistent punctuation, and good layout improve a test.

Test the test and check the scoring

Remember to test the test—give it to other instructors or past students to check for multiple answers and unclear questions. Do several people give the same incorrect answer? If so, maybe the question is unclear or ambiguous.

Make sure that the scoring will give accurate information about the students' abilities. Ask yourself the following:

- Did I double-check that each question is clear and unambiguous? (Your test of the test will help you do this).
- Have I checked that there is only one possible correct answer?
- Did I define any partially correct answers and how they will be scored?
- Does each question test at the desired level of knowledge, skill, or attitude?

Use and revise your test

As you administer your tests and judge your students' performances, use the following checklist.

When using and revising my tests, I need to:

1. Promptly assign grades and inform students ..... ❑
2. Analyze the results and note frequently missed questions ..... ❑
3. Decide which questions or directions need revising ..... ❑
4. Revise and re-test the test ..... ❑

Types of tests described in this job aid

This job aid includes guidelines and checklists for constructing the following types of test items:

- short-answer
- long-answer
- multiple-choice
- true/false (alternative choice)

This is followed by a brief discussion of the use of graphics in test questions. It is important to use the appropriate types of tests in your evaluations.

Checklist for choosing the right type of written test

When deciding which types of test questions to apply, use the following checklist.

To decide which type of test to use, I need to:

1. Make an evaluation plan for my course ..... ❑
2. List the learning outcomes to be tested ..... ❑
3. Assess the time needed to score the tests for all the students in this course ..... ❑
4. Decide which learning will require tests other than written tests ..... ❑
5. Assign the most suitable type of written test for the skill, knowledge, or attitude to be tested ..... ❑
6. Read the checklists in this job aid to recall the essential points for constructing test items ..... ❑

Short-answer questions

Use short-answer questions when you wish to:

- test recall rather than recognition of information
- reduce the chances of guessing answers
- check computational skills
- check knowledge of sequence for procedures.

Forms of short-answer questions

Question

This form requires the student to write a list, a sentence, a phrase, or even a paragraph in response to a direct question. This form is used most often because it is easier to read and answer.

Example: What is the first thing you should do if a fire starts in a shop?

_____

Completion (fill-in-the-blank)

This form requires the student to insert the correct word, phrase, number, or symbol into an incomplete sentence. These are more difficult for students to understand—use them sparingly.

Example: A range of motion exercise which requires the nurse to provide the energy for movement is called a/an _____ exercise.

Direction

In this form, students are asked to do something such as name or list objects, characteristics or actions. Blanks may or may not be provided. The students must recall several pieces of information in a single question.

Example: List two characteristics of a good short-answer question.

1. _____

2. _____

Identification

In this form the student must supply answers for a given list of words, phrases, numbers, or symbols. This reduces the amount of reading by grouping several items.

Example: In the blanks on the right below, write the metric symbols for the measures listed on the left.

1. litre ____

2. metre ____

3. decagram ____

Writing short-answer questions

Use the checklist below to guide you in writing good short-answer test questions.

When writing short-answer test questions, I need to:

1. Use a clear statement or question ..... ❑
2. Use language that is appropriate to the job situation ..... ❑
3. Avoid grammatical clues ..... ❑
4. Give directions that refer clearly to a graphic if one is used ..... ❑
5. Specify units and the required degree of precision for answers ..... ❑
6. Ensure that writing spaces are long enough for the correct answer ..... ❑

When asking students to fill in blanks, I need to:

7. Omit only important words for blanks ..... ❑
8. Place blanks toward the end of the statement ..... ❑
9. Ensure that each blank calls for a single idea ..... ❑
10. Ensure that blank lines are the same length ..... ❑

Long-answer questions

Long-anwer questions are sometimes called *essay questions*. They contain case sudies or scenarios that require the student to apply, analyse. synthesize, or evaluate related products, processes, information, ideas, or procedures. There are two types of long-answer question:

- **extended response**—used when there is no limit on scope, time, or length, and no reference to any resource.
  Example 1. Describe how you would improve the operation of a diesel engine.
  Example 2. Discuss the pros and cons of using the problem-solving process in your work.
- **restricted response**—used when you wish to limit the time, length, number of examples, or anything else about the answer.
  Example 1. Evaluate the wiring diagram below according to the BC Building Code.
  Example 2. Analyse the situation provided and prepare a one-page recommendation for response to the client.

When to use them

Long-answer questions are useful when you wish to test:

- writing ability
- organization of thought and ideas
- synthesis of ideas into something new
- analysis and evaluation
- ability to recall
- ability to explain.

Scoring them

Problems associated with scoring these types of questions are:

- the time it takes
- the difficulty of scoring responses evenly.

Two systems are used, the analytic method and the rating method.

Analytic method

This is the most objective method and is used when testing specific competencies or learning outcomes. It is based on an *ideal* answer. The student must include specific points (grammar and spelling might be included). Marks are assigned to each of the required points. Part marks may also be given.

Rating method

This is the most commonly used method and is best used when comparing student performances. No specific answer is required or previously identified.

The rating method has three steps:

1. Judge the overall quality of answer on the first read.
2. Assign answers to a category (such as *good*, *average*, *poor*) from a group of three to five.
3. Re-read answers and score them within each category.

Constructing long-answer questions

Use the following checklist when constructing long-answer test questions.

When constructing long-answer test questions, I need to:

1. Give clear instructions on how to answer the question ..... ❑
2. Use words that the student can understand ..... ❑
3. Test only essential abilities ..... ❑
4. Clarify the limits on the required answer ..... ❑
5. Identify the assigned grade value of the question ..... ❑
6. Construct my scoring method before giving the test ..... ❑
7. Ensure that students understand how their answers will be scored ..... ❑

Multiple-choice questions

In a multiple choice question, the student is presented with several alternatives from which to choose the most correct response to a given question or statement.

Example: The purpose of a countersink is to:

a. provide a smooth, level seating for a bolt head

b. allow for adjustment of the screw

c. accommodate the head of the fastener

d. accommodate the head of a flat-head screw

Basic multiple-choice questions are the most commonly used test items. They are easy to score and can be scored more objectively than short- or long-answer questions.

When to use them

Use multiple-choice questions when you wish to:

- measure many learning outcomes during a single test session
- present a list of similar choices for the student to differentiate between
- reduce the guess factor in simple alternative choice decisions.

Limitations

These types of questions have several limitations:

- They test whether students *recognize* information rather than what they can supply.
- They rarely measure problem-solving skills accurately.
- They cannot test organization and presentation of ideas.
- They are difficult to construct so that the choices are believable.

Terminology

Special terms are used for describing the structure of multiple-choice questions:

Stem:	first part of question—an incomplete statement or a direct question
Alternatives:	3 to 6 options for the student to choose from in completing the statement or answering the question (including one answer and 2 to 5 distractors)
Answer:	correct response
Distractors:	incorrect responses (they distract the student from the answer!); they should be *believable* alternatives to the answer, not obviously wrong.

You can use the checklist opposite to help you to construct multiple-choice items.

Multiple-choice test items are more complex than the other types discussed in this job aid. Further guidance for constructing multiple-choice test questions may be obtained from an Instructional Development Consultant or from the book *Test Item Construction: A Self-Instructional Manual* by M. Meyer.

Checklist for writing multiple-choice test items

When writing multiple-choice test items, use the following checklist.

To write good stems, I check that:

1. The stem presents a clearly stated problem ..... ❑
2. Words are kept to a minimum ..... ❑
3. Normal language of the job is used ..... ❑
4. Stems are stated positively wherever possible ..... ❑
5. Important words are emphasized ..... ❑
6. Stem is grammatically consistent with the alternatives ..... ❑
7. Stem is parallel in form to the alternatives ..... ❑
8. Only officially recognized abbreviations are used ..... ❑

To write good alternatives, I check that:

1. Repetition in all the alternatives is avoided ..... ❑
2. Similar wording in stem and alternative is avoided ..... ❑
3. ***"****All of the above****"*** and ***"****None of the above****"*** are avoided ..... ❑
4. Alternatives are listed logically (e.g., in order of numerical size, rather than random) ..... ❑
5. Alternatives are all about the same length ..... ❑
6. Normal language of the job is used ..... ❑
7. Absolute words such as ***"****never****"*** and ***"****always****"*** are avoided ..... ❑

To include the answers, I check that:

1. Answer is the only correct one, or clearly the best ..... ❑
2. Answer is not obvious because of another question ..... ❑
3. Position of answer in the alternatives list varies unpredictably ..... ❑

To write good distractors, I check that:

1. All distractors are believable ..... ❑
2. Distractors are similar in form or otherwise harmonious with the answer ..... ❑

True/false (alternative-choice) questions

The choices offered in these types of questions may be *True/False*, *Yes/No*, *Fact/Opinion*, *High/Low*, *Agree/Disagree*, and so on. There must be only one correct response to the question.

Use true/false questions to test a student's ability to:

- recognize a correct statement of fact or opinion
- identify relationships (including cause)
- identify attitudes, value, and beliefs
- identify a new situation where known principles apply.

These types of questions are useful when a large amount of course material must be quickly tested. Their advantages are that relatively little reading is required to take the test and they are easy to score.

Scoring true/false (and multiple-choice) test questions

If you are not using optically scanned cards to score the tests, you may find it helpful to have the students indicate their responses near the left margin of each page.

Writing true/false questions

Use the checklist below to guide you in writing good true/false questions.

When writing true/false test questions, I need to:

1. Use statements that are absolutely true or false ..... ❑
2. Use language appropriate to the job situation ..... ❑
3. Ensure that statements are simple and easy to read ..... ❑
4. Ensure that each statement tests only one idea ..... ❑
5. Avoid negatives unless they are very important ..... ❑
6. Check that statements are specific and direct, not implied ..... ❑
7. Ensure that parts of each statement are either all true or all false ..... ❑
8. Name the authority when opinions or values are tested ..... ❑
9. Avoid direct quotes from the textbook ..... ❑
10. Use approximately the same number of true and false statements ..... ❑
11. Try to make the lengths of statements about equal ..... ❑

Using graphics in tests

A graphic is a picture, drawing, diagram, map, graph, or table. Sometimes graphics are used in a written test question, or the student may be required to produce or adapt a graphic while answering a question.

If the student could answer the question from general information without referring to a graphic, do not include a graphic. Use a graphic when:

- similar diagrams are used on the job—for example, electrical wiring diagrams, blueprints
- the student's ability to produce graphics is important—for example, for presentation overhead transparencies in business
- identifying parts or reading instruments is important and more efficiently done on paper than in a performance test.

Writing good questions referring to graphics

If a test question refers to a graphic, make it clear whether the required answer is a drawing or a written response. If the question requires the student to:

- *look at* a graphic, the student needs to know exactly where to find it and also where to put the answer. An example of this is shown below.
- *produce* a graphic, use rules similar to those for constructing long-answer questions.

Use the example below and the checklists on the next page to help you construct good test questions that refer to graphics.

Example of a test question referring to a graphic

6. *Identify each of the types of lines labelled A, B, and C in Figure 1 below.*

   A _____

   B _____

   C _____

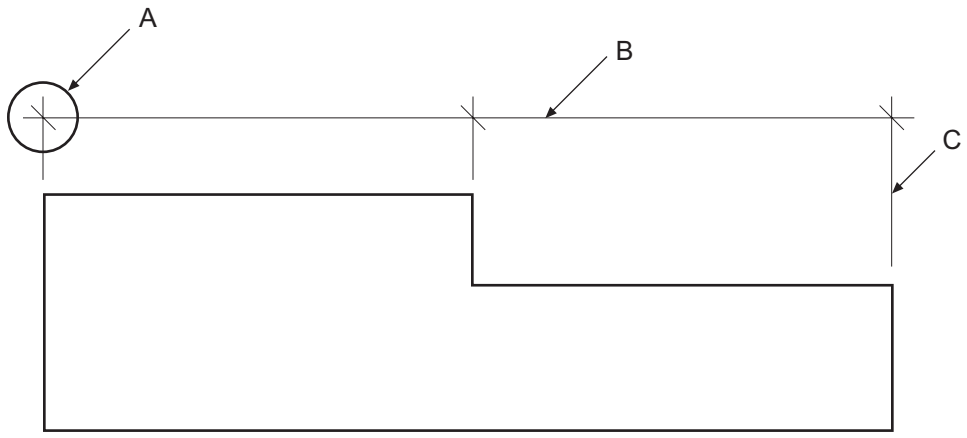

Figure 1 Diagram for Test 1 Question 6

Constructing test questions that refer to graphics

Use the following checklist when constructing questions referring to graphics.

When referring to graphics in test questions, I need to:

1. Indicate clearly where to find the diagram *(Examples: opposite; page 4; back of the test)* ..... ❑
2. Identify which diagram or part of diagram is being referenced *(Examples: Figure 2; Diagram 5b)* ..... ❑
3. Ensure that it is easy to view the graphic while answering ..... ❑
4. Describe the graphic and its focus *(Example: schematic of a circuit board for a small computer)* unless students are asked to identify it ..... ❑
5. Ensure that the question cannot be answered without referring to the graphic ..... ❑
6. Ensure that the graphic is clear, complete, and has needed labels ..... ❑
7. Ensure that the graphic is as simple as possible ..... ❑

Constructing test questions asking the student to produce graphics

Use the following checklist when constructing questions asking for a graphic.

When asking a student to produce a graphic, I need to:

1. Give clear instructions on what type of graphic is required *(Examples: sketch, schematic, blueprint)* ..... ❑
2. Use words that the student can understand ..... ❑
3. Test only essential graphics abilities ..... ❑
4. Clarify the limits of detail and scope of the required drawing ..... ❑
5. Identify the assigned grade value of the question ..... ❑
6. Construct my scoring method ahead of the test ..... ❑
7. Ensure that students understand how their answers will be scored ..... ❑

©1996, revised 2003 BCIT Learning and Teaching Centre • British Columbia Institute of Technology
Burnaby, British Columbia, Canada
All rights reserved. No part of this publication may be reproduced in any form or by any means without the prior written permission of the BCIT Learning and Teaching Centre, British Columbia Institute of Technology.