

FIELD PAPERS

Junior Secondary Educational Improvement Project

BOTSWANA

**Workshop Outline
on
Writing Test Questions**

November 1986

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Educational
Systems

Florida State University
Howard University
Institute for International Research
State University of New York at Albany

United States Agency for International Development
Bureau for Science and Technology
Office of Education
Contract No. DPE-5283-C-00-4013-00

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Agency for International Development
Bureau for Science and Technology
Office of Education
Contract No. DPE-5823-C-00-4013-00
Project No. 936-5823

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Workshop Outline on Writing Test Questions

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November 1986

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Table of Contents

Part A: Writing Test Questions

Short Answer and Completion Items	1
Essay or Extended Response Items	3
Objective Items - True or False	5
Objective Items - Matching	6
Objective Items - Multiple Choice	8

Part B: Item Writers' Workshops

Test Blueprint	11
Levels of Learning - Examples of Items	12
Some Item Writing Suggestions	14
Writing Alternatives	16

PART A WRITING TEST QUESTIONS

Test Writing Specifications. A test specifications guide is a two-dimensional matrix or grid. Performance objectives are classified into this grid according to content and level of learning. The horizontal dimension in the test specification grid shows content; the vertical dimension shows levels of learning. The performance objectives in the test specification grid form the basis for writing test questions (test items). We shall focus upon three types of questions: (a) short-answer and completion questions, (b) extended response questions, and (c) objective items.

Levels of Learning

Syllabus Content Topic Categories

a b c d e

Higher-order rules:

 Problem-solving

Rules: Applications

Concepts: Comprehension

Information: Knowledge

SHORT ANSWER AND COMPLETION ITEMS

Short-answer questions require the student to respond to the item with a word, short phrase, number, or symbol. There are three types: the question, completion, and association varieties.

Question: What is the capital city of Botswana? _____
How many microns make up one millimetre? _____

Completion: The capital city of Botswana is _____
The symbol for the element oxygen is _____

Association: On the blank next to the name of each chemical element, write the symbol used for it.

Barium _____
Calcium _____
Chlorine _____
Zinc _____

The short-answer item type is useful for observing performance at the lowest level of the Bloom taxonomy (e.g., knowledge of terminology, facts, classifications), but it is also useful for observing higher level abilities such as the ability to make simple interpretations of data and applications of rules (counting syllables in words, identifying parts of an organism, or applying the definition of an isosceles triangle), the ability to solve numerical problems in science or mathematics, and the ability to manipulate symbols and balance equations in chemistry.

Strengths are that these kinds of items are easy to write and score. Also students cannot guess the correct answer very easily. Weaknesses are that subjectivity can enter into scoring in the matter of spelling, grammar, and legibility.

Suggestions for Writing Short-Answer and Completion Items

1. Use the question form if possible.
2. Word the item clearly so that the intended answer is the only one possible.
3. Put the blank at the end, if possible.
4. Important words should be omitted, not trivial ones.
5. Use only one or two blanks per sentence.
6. State how precise or specific answers should be.
7. Don't give away the answer with clues.

Identify a problem in each of the following items and indicate how to improve the item.

1. Where is Molepolole, Botswana located? _____
2. _____ is the capital city of Botswana.
3. _____ and _____ are two kinds of test items.
4. A kilogram is equal to _____ pounds.

ESSAY OR EXTENDED RESPONSE ITEMS

There are two kinds of abilities measured by essay or extended response items — those that deal with the students' ability to write about the subject matter and those that measure the students' general writing ability.

The advantages of the essay test item are that higher-order performance objectives are better measured, such as the ability to organize ideas, develop a logical argument, evaluate certain given situations, express thoughts and feelings. Originality is emphasized. No single answer is correct.

The disadvantages of the essay test item are that scoring is difficult and time-consuming, marks are subjective, and grading is influenced by things other than the abilities being measured. Other problems are that only a limited amount of content can be covered in a single test and scoring suffers from halo effects.

Suggestions for Writing Essay Items

1. Define the behavior to be demonstrated before you write the item.
2. Ask questions that require knowledge use in a NEW situation.
3. Ask questions that have a specific focus.
4. All students answer the same questions.
5. Word questions so that students know what their task is.
6. Word questions so that experts can agree on a correct answer.
7. Tell students how long the answer should be and how many marks are given.
8. Tell students how much time they should spend on a question.

Suggestions for Scoring Essay Items

There are two methods for scoring essay tests: these are the analytic scoring method and the holistic scoring method. In the analytic method, the scorer develops an outline and a list of major elements to be included in an ideal answer, and then decides on the number of points to be awarded to students who include each element in their answers. In the holistic method, the scorer makes a judgment about the overall quality of an answer. One way to do this is to decide beforehand how many quality categories will be used to sort answers, such as A, B, C, D, E; or excellent, satisfactory, unsatisfactory; or 4, 3, 2, 1. After each essay is read, it is placed into whatever category applies. Then all essays in each category are re-read to see whether they are similar in quality or should be resorted. Some general rules for scorers are the following:

1. Prepare a scoring guide.
2. If a test has more than one extended response question, score each question separately before moving on.
3. Score subject-matter correctness separately from other factors such as neatness, penmanship, spelling, and so on.
4. Score papers without knowing the name of the student.
5. Provide feedback to students—comment on only two or three points in any paper; be encouraging; summarize comments and keep track of them.
6. If marking decisions are very critical, then have the papers scored by two or more markers.

Essay Question Phrasing

Here are some ways to phrase essay questions according to the type of response that is required from the student.

Type	Phrasing
Comparing	Describe the similarities and differences between ... Compare the following two methods for ...
Justifying	Which alternatives below do you favor and why ... Explain why you agree or disagree with ...
Summarizing	State the main points included in ... Briefly summarize the contents of ...
Generalizing	State a set of principles that explain ... Formulate several valid generalizations from ...
Inferring	What is most likely to happen if ... How would Thabo act if ...
Classifying	Group the following according to ... What do the following have in common ...
Applying	Describe a situation that shows the principle of ... Show the solution for ... using the principle ...
Analyzing	Show the relationship between... Identify the reasoning errors in ...

Synthesizing	Describe a plan to prove that ... Write a set of specifications for ...
Evaluating	Defend each of the following statements ... Describe the strengths and weaknesses of ...
Creating	List as many ways as you can for ... Make up a story about ...
Relating cause and effect	What are the major causes of ... What are the likely effects of ...

OBJECTIVE ITEMS — TRUE-FALSE

A true-false item consists of a statement which the examinee must judge or mark as either true or false. “Yes-no” and “right-wrong” responses are also sometimes used. Four varieties are shown below.

True-False: The sum of the interior angles of a triangle is
180 degrees.....T F

Yes-No: Is it possible to have a balanced diet without
eating meat?Y N

Right-Wrong: $5 + 3 \times 2 = 16$ R W

Correction: The new student, who we met today, is here. (whom)

Advantages of true-false items are that they are easy to write, are easy to score, and can cover a wide range of content in short time. Criticisms are that these items often cover trivial facts, are not always unambiguous, are open to guessing, and oversimplify content. However, true-false items CAN be well-written and CAN meaningfully test a student’s ability to identify the correctness of a variety of statements.

Suggestions for Writing True-False Items

1. Make sure the item is either definitely true or false.
2. Use short statements: have only one idea per statement.
3. Use exact language.
4. If the item states an opinion, attribute the statement to a source.

5. Use positive statements, avoid double negatives.
6. Avoid verbal clues (words like "always," "never," and "every" tend to make statements false).
7. Test important ideas, rather than trivia, general knowledge, or common sense.
8. True statements and false statements should have about the same number of words.
9. Do not simply copy statements directly from a textbook.

Testing for More Than Factual Detail

Well-written items can be developed for the following kinds of propositions.

GENERALIZATIONS in a subject	"Most ...
COMPARISONS among concepts	"The difference between ... is ...
CONDITIONAL propositions	"If ..., then
RELATIONSHIPS between two concepts, events, facts, etc.....	"Increasing ... tends to ...
EXPLANATIONS for why events occur	"The main reason for
EXAMPLES of a concept	"An instance of ... is ...
PREDICTIONS of events	"One could expect that increasing
STEPS in a procedure	"In order to
COMPUTATIONS	"The average of 2, 3, and 7 is 12.

OBJECTIVE ITEMS -- MATCHING

A matching exercise presents the student with a list of PREMISES, a list of RESPONSES, and DIRECTIONS for matching the elements of the two lists. Premises usually appear in the left-hand column, responses in the right-hand column. Each of the premises is an item, and can be marked as such. Each premise is like the stem in a multiple-choice item, with the responses serving as correct answers and alternatives. Examples of this possible premise and response sets are shown below.

Possible Premise Sets	Possible Response Sets
Accomplishments	Persons
Noted events.....	Dates
Definitions.....	Terms and Phrases
Examples.....	Rules, principles

(continued)

Concepts, operations.....Symbols, signs
 Titles of works.....Authors
 Uses and functions.....Parts, components
 Names of objects.....Pictures of objects

Suggestions for Writing Matching Exercises

1. Make the matching exercise homogeneous. The premises should be all homogeneous elements, and all responses should be plausible for each premise.
2. Completely explain the basis for matching; make directions clear; tell students whether responses may be used once, more than once, or not at all.
3. All responses should be plausible options for each premise.
4. Use short lists of premises and responses. This saves reading time, helps the student locate the answer, and increases the chances that responses are homogeneous.
5. Avoid “perfect matching.” You can have one response matched to two premises or include some responses which do not match a premise.
6. Identify premises with numbers and responses with letters. Then, if you have a test with ten multiple-choice items followed by a matching exercise with five premises, the five premises would be numbered 11 to 15.
7. Avoid using incomplete sentences as premises.
8. Arrange responses in a logical order — dates, numerical values, alphabetic — this makes it easier for the student.
9. Put longer phrases in the premise list, since the student must re-read the response list for each premise.

An Example

Directions. Match the name of the planet with each of the characteristics listed in the left-hand column. Place the letter of the planet in the space to the left of the characteristic of that planet.

Premises	Responses
_____ 1. Planet with 12 moons.	a. Earth
_____ 2. Planet that rotates once every 24 hours	b. Jupiter
_____ 3. Called the “Red Planet.”	c. Mercury
_____ 4. Smallest of the planets.	d. Neptune
_____ 5. Planet closest to the sun.	e. Venus
	f. Mars
	g. Pluto

OBJECTIVE ITEMS—MULTIPLE-CHOICE

Multiple-choice items consist of one or more introductory sentences (the stem) followed by two or more suggested responses (called options, alternatives, or responses) from which the student chooses one as a correct answer. The stem asks a question, sets a task, or states a problem. Only one response is scored as the correct or best answer; the other incorrect responses should be plausible and are called distractors.

An Example What is chiefly responsible for the increase in the average length of life in the USA during the past fifty years?

- A. The safety movement which reduced accidents
- B. Compulsory health courses in public schools.
- C. Reduced death rate among infants and young children.

STEM which sets the problem or asks a question.

OPTIONS A, B act as plausible answers to those who lack enough knowledge.

The CORRECT ALTERNATIVE

The multiple-choice item CAN usefully measure the student's ability to discriminate and make correct choices; to comprehend concepts and principles; to judge various courses of action; to make inferences; to compute; to interpret new information; and to apply information and knowledge.

The multiple-choice item CANNOT measure the ability to give examples or explanations; to produce original ideas; to organize personal thoughts; or to show patterns of reasoning.

In writing multiple-choice items, start with three steps: (1) form a question or an incomplete statement (a stem) about a main idea to be tested; (2) write the correct answer to the question in the stem in as few words as possible; (3) write distractors that are plausible to students who lack the amount of knowledge the item is to measure.

Writing the Stem

1. The stem should present a single problem. If possible, write a direct question in the most direct way to inform the student what response is intended.
2. If you use an incomplete sentence, put the alternatives at the end.
3. Use a suitable vocabulary and language level; control sentence length and structure.
4. Generally do not use negatively worded stems. If you must use a negatively worded stem, use the negative in only the stem or the options (not both), and either underline the negative or CAPITALIZE it. Remember, there are some things students should NOT do, like mixing dangerous chemicals.
5. Do not ask for a personal opinion in the multiple-choice context.
6. Do not use textbook wording or situations.
7. If you are testing students knowledge of special terms and their definitions, put the definition in the alternatives.
8. Some hints on writing stems to measure various aspects of knowledge.

Purpose What purpose is served by ...? What is the most important reason for ...? What principle is shown by ...?

Cause What is the cause of ...? What conditions are needed for ...?

Effect What is the effect of...? If...(this) .. is done, what happens?
What should be done to make ... (A) happen?

Seeing Error Which of the following is wrong? What mistake has been made in the following procedure? What kind of error is shown in this example?

Difference What are the important differences between ...

Similarity What is the important similarity between ...

Association What tends to go with ...? If we do ... to A, what happens to B?
How often do A and B go together?

Writing Alternatives

1. Try to write three to five functional alternatives. Functional options are those that attract students who do not have the requisite knowledge.

2. Each alternative should be appropriate to the stem and homogeneous.
3. Put repeated words in the stem.
4. Usually place alternatives one below the other.
5. Options should be arranged in a logical order—numerical.
6. Responses must show a grammatically correct relationship to the stem.
7. Avoid overlapping alternatives.
8. Generally avoid using the options “None of the above” and “All of the above.”
9. Avoid verbs:
 - of words in stem and answer (b) specific determiners like “all,” “never,” “none,” “only” (c) textbook phrasing, and (d) presenting the correct alternative in greater detail.
10. Use common misconceptions or errors as distractors.
11. Vary the position of the correct answer in a random way.
12. Use capital letters in front of alternatives. When the stem is a question, each alternative starts with a capital letter and ends with a terminal punctuation mark. When the stem is an incomplete sentence, each alternative starts with a small letter and ends with a terminal punctuation mark. However periods should NOT be used since they are confused with decimal points.

PART B
ITEM WRITERS' WORKSHOPS

Test Blueprint

The test blueprint shown below guides item writing. It is a two-dimensional chart or grid, with the horizontal dimension showing content units and the vertical dimension showing levels of learning. There are eleven content units and four levels of learning.

The numbers in the grid indicate how many items are to be written for each cell, for each unit, and for each level of learning. Altogether, 110 items will be written: 10 items for each unit (one item for higher-order skills, two application items, three comprehension items, and four knowledge items). In total, eleven higher-order skill items will be written, 22 application items, 33 comprehension items, and 44 information items.

Levels of Learning	Content					Totals
	Unit 1	Unit 2	Unit 3	—	Unit 11	
Higher-order skills (Problem solving)	1	1	1	---	1	11
Application (Rules, principles)	2	2	2	---	2	22
Comprehension (Concepts)	3	3	3	---	3	33
Knowledge (Information)	4	4	4	---	4	44
Totals	10	10	10	---	10	110

- | | |
|---|---|
| 2. Identify instances of the defined concept. | (Given short descriptions of situations that show cooperation or non-cooperation.) The student identifies each as cooperative or non-cooperative. |
| 3. Produce new examples. | Describe an example of <u>cooperation</u> that you witnessed during the past week, but was not discussed in class. |

Application (Rules and Principles). Learning a principles means that a student can apply a rule in many “new” situations. The student must be able to apply a rule and not merely be able to verbalize it. Two kind of items are best to test whether a student understands a principle.

- (1) An item that presents preceding conditions (specified by the principle) — and the student produces or selects an example of consequences that would follow if the principle is operating.
- (2) An item that presents a consequence (specified by the principle), and the student produces or selects an example of preceding events or causal conditions that, according to the principle, could have led to the consequence.

Items testing principle learning require students to:

- identify predictions consistent with the application of the principle in a given situation.
- produce a new example of a consequence consistent with the application of the principle in a given situation.
- produce a statement of the principle which explains a situation or set of events.

As with concept learning, items for principle learning present students with situations that are different from those used during instruction, and are phrased in language different than that used during instruction.

Specific Higher-Order Skills. Two specific higher-order skills are discussed below.

Graph and Table Reading. Skills tested using items that present graphs, tables, or charts as part of an interpretive exercise are:

1. To identify a topic from the title.
2. To recognize information given in parts of a table or chart from subtitles or row and column headings.
3. To read amounts.
4. To compare two or more values.
5. To determine relative rates or trends.
6. To determine underlying relationships.
7. To grasp outstanding facts.

Map Reading. Skills tested are:

1. To determine direction.
2. To compare directions and distances.
3. To locate or describe places on maps using symbols, a key, latitude and longitude, or distance and direction.
4. To determine routes of travel.
5. To understand seasonal and time differences.
6. To visualize land features.
7. To infer man's activities or ways of living from maps.

Some Item Writing Suggestions

Multiple-choice items consist of one or more introductory sentences (the stem) followed by two or more suggested responses (called options, alternatives, or responses), from which the student chooses one as a correct answer. The stem asks a question, sets a task, or states a problem. Only one response is scored as the correct or best answer; other incorrect responses should be plausible and are called distractors.

An Example: What is chiefly responsible for the increase in the average length of life in the USA during the past fifty years?

STEM which sets the problem or asks a question.

A. The safety movement which reduced accidents.

OPTIONS: A, B act as plausible answers those who lack enough knowledge.

B. Compulsory health courses in public school

C. Reduced death rate among infants and young children.

The CORRECT ALTERNATIVE

Use three steps to write a multiple-choice item: (1) form a question or an incomplete statement about a main idea; (2) write the correct answer to the question; and (3) write distractors that are plausible to students.

Writing the Stem. Here are short rules for writing stems.

1. The stem should present a single problem. If possible, write a direct question.
2. Put alternatives at the end of incomplete sentences.
3. Use suitable vocabulary and language level; control sentence length and structure.
4. Do not generally use negatively worded stems. If you must use a negatively worded item, put the negative in either the stem or the options (not both), and either underline the negative or CAPITALIZE it.
5. Do not ask for personal opinions in multiple-choice tests.
6. Do not use textbook wording or situations.
7. If you test students' knowledge of special terms and definitions, put the definition in the alternatives.

Some hints on writing stems for various testing objectives:

Purpose What purpose is served by ...? What is the most important reason for ...? What principle is shown by ...?

Cause What is the case of ...? What conditions are needed for ...?

<u>Effect</u>	What is the effect of ...? If ... (this) ... is done, what happens? What should be done to make (A) happen?
<u>Seeing</u>	Which of the following is wrong?
<u>Error</u>	What mistake has been made in the following procedure?
<u>Difference</u>	What are the important differences between...
<u>Similarity</u>	What is the important similarity between...
<u>Association</u>	What tends to go with ...? If we do ... to A, what happens to B? How often do A and B go together?

Writing Alternatives

Here are short rules for writing alternatives:

1. Write three to five functional alternatives — those that attract students who do not have the requisite knowledge.
2. Each alternative should be grammatically appropriate to the stem.
3. Put repeated words in the stem.
4. Arrange options in a logical order—numerical, alphabetical, size, etc.
5. Avoid overlapping alternatives.
6. Avoid using the options “None of the above” and “All of the above.”
7. Avoid verbal clues that give away the answer — (a) association of words in stem and answer, (b) specific determiners like “all,” “never,” “none,” “only,” (c) textbook phrasing, and (d) presenting the correct alternative in greater detail.
8. Use common misconceptions or errors as distractors.
9. Vary the position of the correct answer in a random way.
10. Use capital letters in front of alternatives. When the stem is a question, each alternative starts with a capital letter and ends with a terminal punctuation mark. When the stem is an incomplete sentence, each alternative starts with a small letter and ends with a terminal punctuation mark. However, periods should NOT be used since they are confused with decimal points.