Constructing Multiple-Choice Items

If you have ever tried to write multiple-choice items, you probably know how difficult that can be. Likewise, you probably know how frustrating it can be to try to figure out the meaning of an unclear multiple-choice item if you are the test-taker. You will find it helpful to use the following basic guidelines in constructing multiple-choice items.

**The stem should be significant.** Some testing experts say that the best stem for a multiple-choice item is one that would make a good completion item if you didn’t supply responses to choose from. The first item in Table 1 has a stem that fits this rule. As you can see, the item could be converted to a completion item simply by dropping the choices and adding a blank at the end.

### Table 1.

<table>
<thead>
<tr>
<th>Cognitive Level</th>
<th>Item</th>
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| Knowledge       | Frying is a form of cooking by contact with:  
1. dry heat.  
2. hot oil.  
3. flame.  
4. steam. |
| Comprehension   | A corner joint in which all crosscut surfaces are concealed is a:  
1. butt.  
2. dovetail.  
3. miter.  
4. rabbet. |
| Application     | If you have determined that you will need 10 six-foot lengths of 1” x 6” stock, how many board feet will you need to buy?  
1. 15  
2. 30  
3. 60  
4. 120 |
| Analysis        | The mare is to the stallion as the ewe is to the:  
1. ram.  
2. lamb.  
3. wether.  
4. mutton. |
| Synthesis       | If you were preparing a chocolate pudding using high heat, no stirring, and unbeaten eggs, the result would be:  
1. lumpy texture.  
2. smooth texture.  
3. curding.  
4. soft consistency. |
| Evaluation      | Which of the following breakfast menus is nutritionally well balanced?  
1. orange juice, frosted cereal, skim milk, apricot Danish  
2. fried eggs, hash browns, donuts, coffee  
3. tomato juice, coffee with cream, pancakes and syrup  
4. orange juice, soft-cooked egg, wholewheat toast, skim milk |
Not all experts agree that it is necessary to be quite this strict in writing stems, but all do agree that the stem should state the question or problem sufficiently so that only the right choice is justified as the answer. Only if the stem states the problem or question clearly can learners be sure of what the item is asking and how to answer. The following is a poor example of a stem:

**The ignition in a car:**
- a. supplies current to the spark plugs.
- b. is part of the ignition system.
- c. consists of distributor, points, and coil.
- d. is likely to be electronic today.

In fact, all the responses in this example are correct. Learners would have an extremely hard time answering the item if they had to choose the one correct response. They would have to rely on their knowledge of the teacher's own way of thinking and teaching in order to guess which of these correct responses was the "right" one. This, of course, would not test learners' knowledge of ignitions, but rather their knowledge of the teacher's personality. In other words, the item would not be valid.

This stem could be improved by asking some questions about it. For example, what knowledge about the ignition are you trying to evaluate with the item—its function, its component parts, or its technology? The stem could be rewritten as follows to evaluate learners' knowledge of the function of ignitions:

**The function of the ignition in a car is to:**

If the stem contains opinions, say so. You may have occasion to test learners' knowledge of opinion. You may justifiably want learners in an automotive mechanics program to know that some experts think that diesels will replace internal combustion engines within 25 years. Consider the difference, however, between the following two examples:

**Example 1**

**Diesels will replace combustion engines within:**
- a. 6 years.
- b. 10 years.
- c. 20 years.
- e. 25 years.

**Example 2**

**According to the June 1982 issue of Diesel Weekly, diesels will replace internal combustion engines within:**
- a. 6 years.
- b. 10 years.
- c. 20 years.
- d. 25 years.

In the first example, learners must essentially guess what your opinion would be so that they can agree with it. In the second, you have identified a specific authority as the source of the opinion, so that learners can use their knowledge of this authority's opinion as the basis for their answer.
Don't end your stem with a give-away. Sometimes, the last word in the stem can give the answer away if you are not careful in writing your responses. In the following example, notice that the stem ends with the word an.

A physician who specialize sin the structure, functions, and diseases on the eye is an:
  a. hematologist.
  b. optician.
  c. optometrist.
  d. ophthalmologist.

Many learners will be able to rule out the first response just on the basis of their knowledge of the English language—you don't say "an hematologist." One way to remedy this error is to end the stem at the word is and to include the word a or an, as appropriate, in each response.

All responses for a single stem should use the same grammatical form. This rule is closely related to the preceding one. If your stem is an incomplete statement, each response should be stated in a form that correctly completes the statement in the stem. In the following example, learners could again use their knowledge of the English language to rule out the second response.

Farmers rotate their crops in order to:
  a. spread out the work load.
  b. ease of marketing.
  c. conserve the soil.
  d. balance the diet.

Once again, the stem does not combine with the second response to form a grammatically correct sentence in English.

All responses should be about the same length. Item analysis has repeatedly shown that the correct response tends to be longer than the distracters. Often, the correct answer must be qualified with extra words and phrases just in order to make it true. If your answers are usually longer than your distracters, however, test-wise learners are provided with a clue to the correct response.

All distracters should be plausible. The correct alternative in each item is called the answer, and the remaining alternatives are called distracters (also called decoys or foils). You might, for example, be writing a multiple-choice item to test learners' knowledge of the name of an inventor (e.g., The sewing machine was invented by). If so, Christopher Columbus is not a plausible answer, at least for secondary or postsecondary learners. You could expect any teenager or adult to be able to rule out Columbus on the basis of general knowledge. You would be presenting, again, a clue to the correct response. An excellent source of plausible distracters is the incorrect answers learners have given to related completion items in the past.

Avoid using negative statements in the stem. Logically, it might well seem that there should be no problem in the following example:
Which of the following woods is not a hardwood?

- a. maple
- b. oak
- c. cherry
- d. pine

The question does not appear difficult—four woods are listed, one of them is not a hardwood, so which one is it? Research shows consistently, however, that learners do less well on multiple-choice items that have a negative statement in the stem. Apparently, the small word **not** is often simply overlooked in the pressure of the testing situation.

Furthermore, most experts agree that it is less than ideal to emphasize negative learning. Why not, they say, rewrite the previous example so that the stem asks, **Which of the following woods is a softwood?** Now, the item emphasizes the positive fact that pine belongs to the softwoods.

The same experts also agree, however, that it may sometimes be necessary to test for negative knowledge (e.g., **Which of the following things should you NOT do when using a radial arm saw?**). When this is so, you should at least underline the negative word or write it in all capital letters, to make it stand out as much as possible.

Finally, in avoiding negatives, you should never write a stem containing a double negative, especially a combination of **not** and a negative adjective (e.g., **not impossible** or **not unlikely**). This, again, only serves to introduce irrelevant difficulty into the item. Such an item may test learners' skill in using the English language more than their knowledge of technical content.

**Avoid any pattern of response.** Some teachers tend to put the correct response in the middle of the list, apparently because they feel that putting it in the first or last position will make the correctness of the answer too obvious. Test-wise learners, however, will notice this pattern and use it to rule out incorrect responses.

Likewise, learners are likely to notice any other pattern you might use. It is best to go back to each item after you have completed writing all items and to distribute all responses randomly. In that way, you can ensure that there will be no pattern of responses for learners to use as a clue.

Don't give clues to one item in another. An obvious example of this would be the following two stems:

**The catalytic converter, in common use since 1975, was invented by:**

**When did the catalytic converter first come into common use?**

The example probably seems extreme, especially since the two items are right next to each other. However, you can very easily write two such items and not notice it yourself when you have written several other items in between. It is best to review all items together to ensure that none of them contain clues to any of the others.

**Avoid all of the above and none of the above responses.** Using these responses can, once more, provide clues to experienced test-takers. Learners can assume that, if they find two responses that they know to be correct, the answer has to be **all of the above.** On the other hand,
if learners can find one answer that they know is correct, they can automatically rule out none of the above. They may, therefore, select the correct response not through knowledge, but through the process of elimination.

Fit the item to the objective it covers. If your objective is for learners to apply knowledge, then your multiple-choice item should actually test their ability to do that. The item must present a new situation in which learners are to apply knowledge. If you use the same example on the test that you used in a classroom discussion, all you are testing is learners' recall of your earlier example. You are not testing learners' ability to use information in a situation different from the original learning context.

Use four or five responses in each item. The more responses there are in an item, the less likely it is that learners will be able to get the correct answer by guessing or by process of elimination. Four or five items seems to be the best number. The element of pure chance is reduced, yet all the responses can still be read fairly quickly.

Keep all multiple-choice items together. If your test contains more than one kind of item, you should keep all the items of one kind together. This keeps to a minimum the number of times learners have to get the right mindset for the type of item. They don't have to switch back and forth from a true-false item to a multiple-choice item to a completion item and back to another multiple-choice item. If you mix your types of items all together this way, you are also testing learners' ability to switch rapidly from one mode of reasoning and answering to another.

Give clear, simple, complete directions. Your learners are very likely to know that there are different ways to answer multiple-choice items. You might want them to choose the one correct answer, the one best answer of several that are all correct to varying degrees, all possible correct answers no matter how many, and so on. Consequently, it is important that you state clearly and completely how learners are to respond.

You should also be sure to tell learners how to mark their answers. Depending on how you plan to score the finished tests, you may want learners to mark their answer sheet in different ways. For example, if tests are to be computer-scored, learners will need to be told to use the computer answer form and a #2 pencil. Or you can ask learners to place the correct letter or number in a particular blank, to mark an X through each correct response, or to circle the correct response, and so on.

Table 2 presents examples of clear and simple directions for different kinds of multiple-choice items.

You will also need to use your own judgment and knowledge of your learners to determine whether they should be given written or oral directions. If there is a chance that learners will not understand written directions, you should give directions orally, by all means. If learners are not accustomed to multiple-choice items or to taking your tests, it might be wise to provide both written and oral directions. You may even want to show learners an example of how to answer.

Prepare a scoring key. Scoring learners' responses will be much easier and more reliable if you use a scoring key. If, for example, you ask learners to simply mark an X through the number or letter of each correct response, then your key can be a stencil-type. A stencil is a copy of the test with hole punched through each correct response. When you place your key over each completed learner test, each response showing through a hole should be marked with an X or the response is wrong.
**TABLE 2:**

**Directions for Multiple-Choice Items**

**Selecting a single correct response:**

Directions: Each of the items below is followed by four possible responses. For each item, only one of the responses is correct; the others are incorrect. Select the one correct response for each item. Indicate your answer by placing an X over the number of the correct response.

EXAMPLE: The commonly accepted industry-wide standard for beginning-level typists

- a. 40 words per minute, error-free.
- b. 40 words per minute, with a minimum of five errors.
- c. 45 words per minute, with a minimum of three errors.
- **X** d. 45 words per minute, error-free.

**Selecting a single BEST response:**

Directions: Each of the items below is followed by four possible responses. For each item, any or all of the responses could be correct. Select the response that is best for each item. Indicate your answer by placing an X over the number of the best response.

EXAMPLE: You have just typed a letter for your supervisor, Mrs. Stanton. She gives it back to you and says that she has decided that she doesn't want to include the last paragraph in the letter after all. What would you do to remove that last paragraph?

1. use correction tape
2. cut and paste
3. **X** retype the letter
4. use correction tape

**Selecting ALL correct responses:**

Directions: Each of the items below is followed by four possible responses. For each item, any or all of the responses could be correct. Select all the correct responses for each item. Indicate your answer by placing an X over each correct response for each item.

EXAMPLE: You can thicken gravy with:

1. **X** cornstarch.
2. cornmeal
3. **X** wheat flour.
4. baking soda.
Activity for Lesson 6

Select one or more learning objectives from one of your occupational specialty courses (fashion, training specialist, industrial technology, technology education, etc.) that express or require cognitive learning and that lend themselves to the use of multiple-choice items to measure their achievement.

- Construct **six (6) multiple-choice items** to measure achievement of the learning objectives you selected. Number each item for easy reference during the feedback.

- **Include** directions and a scoring key.

- Be sure to **check your work** using the Multiple-Choice Items Checklist [http://www.lions.odu.edu/~dnethert/Courses/ots450/readings/multiple_choice_checklist.pdf](http://www.lions.odu.edu/~dnethert/Courses/ots450/readings/multiple_choice_checklist.pdf).

Send the answers to this lesson in an email message to your instructor for evaluation.