



a podcast about how we learn, how we teach, and how they overlap

Episode 39: How to Write Effective Multiple-Choice, True-False, and Matching Questions

Adam: Hi, I'm Adam Sanford. I'm an academic life coach and professor in Los Angeles.

Dinur: And I'm Dinur Blum. I'm a college professor in Los Angeles.

Adam: And this is Learning Made Easier, a podcast where we discuss how we learn and how we teach and how they overlap.

Dinur: Welcome back to Learning Made Easier. This is Episode 39: how to write effective multiple-choice, true/false and matching questions. This is the second part of our six-episode series on all things testing.

Adam: So the first topic we're going to cover, of course, is multiple-choice questions. And these can meet several learning goals - actually, checking goals. They can check for memorization, but they can also be worded in ways that will test understanding and application. They're really good for those first three levels of Bloom's Taxonomy.

Dinur: To create this series, Adam and I drew from several sources that are available on the web, including the Vanderbilt Center for Teaching, Kansas State University, Arizona State University, and the University of Texas at Austin. We will provide links to those sources in the show notes.

Cynthia Braeme, who's Vanderbilt Center for Teaching's Assistant Director, says that multiple-choice test questions can be an effective and efficient way to assess learning outcomes, because multiple-choice test items have several potential advantages for teachers. Adam and I will read directly from the Vanderbilt guide here, and this will also be included in the show notes. This is all about versatility, reliability, and validity.

Adam: So first, they're versatile. As we've mentioned, multiple-choice test items can be written to assess various levels of learning outcomes, from basic recall to application and analysis and even evaluation.

Because students are choosing from a set of potential answers, however, there's obvious limits on what we can test with multiple-choice items. I mean, there's not a ton of things you can test. For example, you're not going to be able to test a student's ability to, say, put their thoughts in order, or explain something, or come up with a creative idea. Multiple-choice simply doesn't allow for that.

Dinur: There's reliability. And reliability is defined as "the degree to which a test consistently measures a learning outcome." Multiple-choice test items are less susceptible to guessing than true-false questions, and

that makes them a more reliable way of assessing students. Reliability is enhanced when the number of multiple-choice items focused on a single learning objective is increased. So the more multiple-choice questions you have on a specific topic, the more reliable that score is.

In addition, the objective scoring associated with multiple-choice test items frees them from problems with score inconsistency that can plague scoring of essay questions, because in a multiple-choice question, there's only one correct answer that's offered.

Adam: And then there's validity. And this is how well a test measures the learning outcomes it says it's measuring. So, students can answer multiple-choice items a lot faster than written questions, so tests that are based on multiple-choice items - typically, you get a relatively big, or broad, representation of course material. And the more you do that, the more validity you're going to get out of the assessment.

Dinur: Now there are some stylistic concerns for when we write multiple-choice test questions -

Adam: - and, I just want to say that most of the stylistic concerns, again, came straight out of the handout that we found at Kansas State. Again, it's in the show notes; again, please download it. It's worth it! -

Dinur: And some of these concerns are: plausible distractors as wrong-response options. You want to make each of the available answers plausible or reasonable. You don't want them obviously wrong, because if it's obviously wrong, that's gearing students towards the right answer.

Adam: Now I will say, let's say there's only three possible answers - two of them distractors and one of them the right answer. Then it's okay to put in, say, a joke answer. It's all right to do that every now and then. For example, one of my test questions for sociology is "The large scale study of society is the _____ level." And then the answers are "macro," "meso," "micro" and "mondo."

"Mondo" is obviously not a technical term, but it rhymes, sort of. It starts with M and ends with O. It's an obvious joke answer. But at the same time, students will notice that that's a distractor - but really, if something only has three possible answers in your class, you can add a joke answer as a distractor. That's okay.

Dinur: And that can hopefully even help students relax, break up tension. It shows your personality a little bit.

Adam: Mm-hmm.

Dinur: And these are good things.

You want to keep your option length similar for your task questions. You want to make sure that the right answer isn't short or long compared to the others, because that length is going to either be a clue to students that it's the right answer, or it's going to read like a wall of text, and they're going to ignore it.

Adam: Another thing, and we talked about this a little bit in the test design, make sure that you vary where the right answer goes. Don't always let it be option B or option C, you know. And Dinur has noted here, don't be evil and have all of your answers be the same letter. Yeah. Make sure that about - if you have mostly four options for each of your multiple-choice answers, make sure about a quarter of them are A's, a quarter of them are B's, a quarter of them are C's, and a quarter of them are D's.

Another thing is, make sure that your grammar is clear and unambiguous. I mentioned this in a previous episode, where I wrote a question and I left out the word “only,” which was necessary in order for it to make sense. And because I left it out, it basically made the question meaningless.

Another way to make sure your grammar is clear and unambiguous: make sure that verbs and nouns match. Make sure that you're not using, say, a plural verb with a singular noun, or vice versa. Make sure that the verbs match whatever-it-is the subject is.

And don't give clues to the correct answer in the question. So, usually, using “never,” “always,” and “only” is a bad idea. There are exceptions. It doesn't help if you're using nonsense words or unreasonable statements. And try to avoid giving away the answer to, say, question 5 in a different question, like question 12. And there are professors I know who have done that. I've taken exams from them and gone, “Oh, I remember that. The answer to that is in question 4; let's go back and look at that.” Okay, you want to avoid doing that.

Dinur: You also want to avoid negative questions. When you must use these kinds of questions, capitalize or underline the negative word, to draw attention to it. So, for example, “which of these is **NOT**...” and you would underline, or bold, or otherwise bring attention to the word “not,” so students know to look for that.

Make sure that you only have one correct option in the list.

Adam: This has happened to me. I've had it where it turns out that there were two answers that could, arguably, both be correct - and in that case, “bad question.” All the students who took, who got that question got that point. But try to make sure that you don't put the same answer reworded in two different ways, which I've done more than once.

Dinur: Make sure you give clear instructions about the questions you're giving to the students. “I want you to look for the best answer possible,” things like that.

Adam: Now, avoid the “all of these,” “none of these” options. Yes, it's tempting, especially when there's only two possible answers, but if you only have two possible answers, then that should be a true/false question, not a multiple-choice question.

Make sure that the alternatives are mutually exclusive. Don't give answers like “one to two” as A, and then “two to three” as B. They overlap. This is the same thing as when you're constructing a survey. You know, “What is your income?” “\$100 to \$100,000,” and then “\$100,000 to \$200,000” - \$100,000 appears twice. What's going on here? Don't do that.

Don't repeat the same words in the answers, if they can be included in the question. So for example, instead of “In criminology, the theories...” as your stem, and then your answers are, your options are, “are used to this,” “are used to that,” “are used to the other,” use “In criminology, the theories are used to...” That's your stem, and then your options are “this,” “that,” “the other,” so that there's not a lot of extra words in the options; that your options are really just, “here's the important thing to look at.”

Dinur: Now, there are different types of multiple-choice questions. One of them is the direct question format. For example, “Which of the following cities is California's capital?” The goal here is to make the student answer a question. Avoiding filling-in-the-blank questions encourages students to think about the question and its answer, instead of searching for something to plug into the blank.

Adam: Another kind of multiple-choice question is the scenario question. So:

“Kevin steals a donut and blames it on his brother Jack. Their parents believe Kevin and punish Jack. In this scenario, Jack is...”

- A. a pure deviant
- B. falsely accused
- C. a secret deviant
- D. a conformist

Those are the four options.

The goal here is to force some critical thinking and application, so that the question’s answer won’t be obvious unless the student understands the concepts. This also makes it less likely that they’ll be able to simply find the answer in their notes, or the textbook, if you’re giving an open-book or an open-note test.

Dinur: Now you can also use scenarios as answers to a direct question. For example, based on the story of Kevin and Jack:

“Which one of these is an example of a pure deviant?”

- A. Kevin, because Kevin stole a doughnut and blamed it on Jack, and Jack got punished.
- B. Kevin, because Kevin stole a doughnut and blamed it on Jack, and Kevin got punished.
- C. Jack, because Kevin stole a doughnut and blamed it on Jack, and Jack did not get punished.
- D. Jack, because Kevin stole a doughnut and blamed it on Jack, and Kevin did not get punished.”

The scenarios can be several types - a scenario that matches a definition of a term, a scenario that requires understanding of cause-and-effect relationships, a scenario that requires explaining a method or a procedure.

Adam: Now let’s get into true/false questions.

Now, the goal of true/false questions is to make sure that students can recognize when information is correct or not correct. This works really well for concepts that have two obviously logical responses, but it’s better to only have a smattering of them in a test, because they’re pretty easy for students, and it’s easy to guess the right answer - and they have a 50/50 chance of getting the right one, even if they don’t know the answer. So generally the only level of Bloom’s Taxonomy we’re talking about here is “knowledge.” True/false questions rarely go beyond that point.

Dinur: And there’s stylistic concerns here, as well. You want to base true/false items on questions that are absolutely true or false, without any qualifications or exceptions. For example, “In differential association theory, crime is learned through interaction with criminal peers,” is a better question than “Crime is learned through interaction with criminal peers.” Specifying the theory makes this statement absolutely true.

Adam: Make sure, also, that you express the true/false statement as simply and clearly as you can. Adding in more information actually makes it more confusing and less fair. So, for example - and we’re using criminology examples because that’s what Dinur and I teach - “A secret deviant is someone who committed a crime but was not caught or labeled as a deviant,” that works better than “Secret deviants commit crimes, get away with them and profit off of them to our detriment.”

Dinur: Don't ask double-barreled questions. This is when you express two items in the test question. Keep each of your true/false questions to one, and only one, item. So for example, "Juvenile delinquency and murder are index crimes." Only murder is an index crime. Juvenile delinquency is not. That means that one item in this statement is false and the other is true, and thus, the question is unanswerable. Break it into two different questions: "Juvenile delinquency is an index crime" and "Murder is an index crime."

Now, the one exception I would say is if you're saying "Both juvenile delinquency and murder are index crimes," true or false - but without that qualifying word, "both," that question is not answerable.

Adam: Now removing to extreme modifiers, like "all," "always," "never," helps, unless they are directly tied to the truth or falsity of the question. So, for example, "All criminals plan their crimes in advance" versus "The definition of first-degree murder always includes premeditation." The first one's not true, and the second one is. Students would be able to guess the first one pretty easily. It says "all"? Can't be true. But the second one? Oh, we've got to know what the definition of first-degree murder is in order to answer that question, and that question is actually true.

Dinur: Don't quote directly from books, lectures, or other materials. Make sure the question always requires some application. For example, "For every action there's an equal and opposite reaction" does not work as well as "If you shove another person, you'll probably have to take a step backwards to keep your balance."

Adam: Also, avoid negatively worded statements. We've talked about this with multiple-choicers; same thing here. Example, "The American approach to crime is not rehabilitation." That doesn't work as well as "The American approach to crime is punishment."

Dinur: Avoid slang, uncommon phrases, and other unfamiliar terms, unless the test is about those phrases and those terms. And these are things like - using phrases like "vis-a-vis," "raison d'être," "cooking the books," right? It's stuff that we might use in passing, or to sound "fancy," but unless you're teaching your students or testing your students on what these terms are, don't use them in your tests. Make sure you're using clear and concise language in what you write.

Adam: Now, there are several types of true/false questions, including one that surprised both me and Dinur, because we'd never heard of it.

So the first one is "true/false." You have a statement, and then the option "true" and the option "false," and that's it.

Then there's also "yes/no." Again, the statement, and the options are "yes" (basically "true") and "no" (basically "false").

Then there's the forced choice. Instead of "true" and "false," students have to choose option A or option B to categorize the statement or item in question. For example, there might be a list of 10 statements, and then there's A and B next to those statements, and the directions say "For each item listed below, choose A if it's a concept from differential association theory, and B if it's a concept from control theory." So they have to identify: is this control theory or is it differential association theory? That's basically a two-item possibility. So again, this is like a true/false question.

Now the one that surprised us both, I'm going to let Dinur talk about, because this, actually, we both looked at it and said, "I'm going to start putting these in some of my exams!"

Dinur: And these are called "correction questions." You present a false statement, and underline a key word in it. The student has to provide a word or phrase to replace the underlined word and make the statement true. This can be either a fill-in-the-blank question, or a list of options to replace the underlined word.

For example, "Darwin's research showed that evolution is imaginary." In this question, the student would have to replace the word "imaginary" with "supported" or something similar, to change it to a true statement.

Try to avoid underlining words that can be changed to their opposites. The goal is to make students show that they know the right answer, not that they can guess it.

Adam: Now, the last type of question we're going to talk about in this episode is matching. And the goal of matching questions is for the student to demonstrate their knowledge, and possibly their comprehension, of the material. It works really well for terms and definitions, phrases that have to go with other phrases, causes and effects, pieces of larger units, and problems with solutions.

But matching questions are time-consuming and they may not actually measure much beyond memorization.

So matching questions are normally presented as two columns: a list of stimuli and a list of matches, and the stimuli serve as the question stem for matching questions.

Dinur: Matching questions should be similar items: a list of presidents, a list of chemicals, a list of books. Mixing events, people and objects in a set of matching questions give students big hints about which answers are correct matches. Both the list of stimuli and the list of matches should follow this rule: a list of books and a list of characters, for example.

One way to prevent students from using the process of elimination to identify all matches is to provide more matches than stimuli. For example, five book titles and seven characters.

Adam: And it's important to make sure you include clear directions for matching questions - so, be very specific: "On the line to the left of the book title, write the letter of the character who is the protagonist of that book. Do not use any character more than once." Now you've got very specific directions.

And avoid giving clues to the right answer in the stimuli part. So, instead of "Darwin was known for the concept of...." as a stimulus with "evolution" as the match, make the stimulus: "Developed the concept of evolution" and use "Darwin" as the match.

Now there are some variations on matching questions, and some of them seem to be very discipline-specific.

Dinur: One of these is key lists, or master lists. Make a list of three items and several of their key characteristics. Then, ask questions about the characteristics. Students have to find the correct answer in the answer choices of presented characteristics.

This does seem to be geared more toward the hard sciences. So for an example here, we're going to direct you to the Kansas State PDF - which again, Adam and I strongly encourage you to look at and download. It's

linked to in the show notes - there's an example on page 33, if you're looking at the numbering at the bottom of the page. If you open it in a browser or a PDF reader like Adobe Acrobat or Preview, it may say page 39.

Adam: Now there's also ranking questions. You give a list of events, and you have the student number the list - that's the match - to put the events in the correct order. And ranking questions are pretty simple: you know, "The Revolutionary War, the Civil War, The Vietnam War." Obviously those are going to be one, two and three, right?

So, ranking questions, it depends on how you want them to rank them. I mean, you could also, let's say that you are doing this, you know, you could list by "the number of atoms in this molecule," right? Rank them by the number of atoms in the molecule.

There's a number of ways to do ranking questions, but they are, essentially, a set of matching questions.

Dinur: So that's what we have for you in Episode 39. If you're finding this podcast helpful, please share it with your friends! We're always hoping to get new subscribers, so we can help more people. You can find us on Apple Podcasts, Spotify, and Android. We're hosted on Blubrry.com. Also, we'd appreciate it if you wrote a review of this podcast on Apple Podcasts.

Adam: Be sure to join us next week for episode 40, when we'll have Professor Thomas Norman talk to us about how he uses class time to help his students practice for the expectations of life after college.

You've been listening to Learning Made Easier, a podcast about how we learn, how we teach, and how they overlap.

Dinur: We want to say thank you to all of our supporters on Patreon, who make this podcast possible.

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Dinur: We look forward to seeing you next week!