Magna 20 Minute Mentor

Transcript

How Can I Assess Critical Thinking with Objective Items?

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MAGNA

Linda Nilson, Ph.D.: Welcome to this Magna 20-Minute Mentor, How Can I Assess Critical Thinking with Objective Items? And you really can. My name is Linda Nilson, and I direct the Office of Teaching Effectiveness and Innovation at Clemson University.

So what are the outcomes for you? What will you be able to do at the end of this 20-Minute Mentor? First of all, you are going to be able to formulate discipline relevant student learning outcomes that involve critical thinking and are suitable for you to assess. So we're talking about assessment here, we've got to figure out what you want to assess. You're going to be able to compose matching, multiple choice, and multiple true/false items, that assess your students' targeted critical thinking skills, the ones you target.

And let's look at first of where critical thinking applies because it doesn't apply to all kinds of material. It applies where a claim may or may not be valid, complete, or the best possible. And a claim can be all sorts of things. It can be a belief, a value, or an assumption. Or it can be a theory, a generalization, an analysis, a viewpoint, an opinion. It can be a hypothesis, a solution, an inference, a decision, a prediction, a conclusion, as long as it's not a fact or a definition of a concept or term or a law, a law at least at the undergraduate level.

So it's got to be somewhat disputable. It's got to be somewhat questionable in some way or another. But you've got to have critical thinking learning outcomes. And outcomes are statements of what students should be able to do by the end of some time unit or by the end of the course.

And across the disciplines, critical thinking involves at a minimum, interpretation and/or analysis and evaluation. That's the absolute bottom line of critical thinking. And these outcomes, you should think of as performances that you can observe in some way. So you can assess and set standards for them. Now, observe, what does that mean to observe a performance? Well, maybe you read a student paper or you can watch the student perform in a play. Or you can listen to a discussion, and you can also assess that way, assess on the basis of that.

You can, in the culinary arts, you can taste and smell a student's performance. What you have to avoid are internal states of mind in describing your performances. These are not the verbs to use, know, learn, feel, understand, appreciate. You can't assess those, not directly. You've got to figure out how you want students to manifest knowledge. You want them to be able to recognize or like on a multiple-choice test. You want them to be able to reproduce. You want them to be able to reproduce in

their own words. How do you want them to show this knowledge? Maybe you really want them to apply after all?

Understand, well, really, you're talking here about, you want them to be able to describe or explain. Feel. You'll never know how your students feel, but you can observe how your students demonstrate appropriate feelings, let's say empathy or conviction or confidence. And appreciate, well, we'll never know, really. But we certainly don't assess our students on appreciate. And we certainly don't assess them for a grade.

Okay, so let's look at discipline relevant critical thinking skills and outcomes for you. These are in your packet of supplemental materials along with a list of verbs that I commend to you. These are active verbs. They get you away from the know and learn and understand. So you should be using these. And they cover application, analysis, synthesis, and evaluation. And also in your packet, right after those verbs, you will see discipline relevant critical thinking skills and outcomes, organized by types of discipline.

So the first group has to do with the basic and applied sciences, so you see, including the social sciences, by the way. So you see a lot of outcomes that have to do with scientific reasoning and the scientific method. The next group has to do with technical and problem-solving fields. And some of them are unique to, the outcomes are unique to those sort of fields, but you might also have to look at some of the science ones as well.

You will find a group for rhetorical fields, like the humanities and some slices of the social sciences. And then there is another group, entirely for the arts. So check those that are relevant to your course. Adapt them to your content. Add more, if you'd like, because this is not an exhaustive list. Write some critical thinking outcomes. And then start thinking about how to sequence them. In what order will your students achieve them?

I mean, after all, you can't teach them everything all at once, right? They're going to be learning some things that will enable them to meet further outcomes along the line, that will enable them to meet additional outcomes later on in time. So think of this as putting together a learning process.

Now, let's talk about assessments. Assessments should mirror outcomes. That is, if you want your students to be able to do X, Y, and Z, to assess them, you have them do X, Y, and Z. And that's the simplest golden rule of assessment that I can possibly give you.

Now, most types of objective items should or can require and assess these particular collections of cognitive operations. Things like interpretation, generalization, inference, problem solving, conclusion drawing, comprehension, application, analysis, synthesis, and evaluation. So the higher order in Bloomian verbs that we're interested in or cognitive operations.

So you can design objective items, most objective items, to do this, to assess these particular cognitive operations in critical thinking skills. Now, the types of objective items, I'm sure you've all heard of these, fill in the blanks, true/false, matching, multiple choice. Multiple true/false, maybe you haven't heard of, and I'll be able to acquaint you with them in this mentor.

Fill in the blanks and completions, you really can't do critical thinking with that. This type of question focuses on memorization, which by the way, you might want. There is a time and place for that. That's fine, but not critical thinking.

So this is really good for, let's say, math problems or math solutions or foreign language tests, where there is one right answer, and it has to be just so, just perfect, where you can't drop a sub script or drop an accent mark. True/false can assess critical thinking if the question is stimulus based. And I'm going to talk about stimulus-based multiple choice and multiple true/false items in a bit.

Matching items. We all know what matching items are. They're two sets of items and within each set, there are homogenous items, and every option is plausible for every item on the opposite list. So classic ones, match each theory with its originator, a cause and effect, definition of the term, an achievement with the person or author, a foreign word with a translation, pictures of objects with names, symbol with concepts, some kind of equipment or organ or tool or apparatus with the use or the function, labeled parts in a picture with a function.

And you can even test students' knowledge of processes and sequences. Usually this is a less known use of matching test where you can have students put down several answers and definitely a set sequence. But for assessing critical thinking, you have to have students match up other things, as in causes with likely effects, concepts with new examples of them, new hypothetical problems with tools concepts or approaches needed to solve them, different kind of thing of what we usually see in matching tests.

Now, here are the guidelines for writing matching items. You want an imperfect match between items. You want to be able to say some items

will be used more than once and others not at all because otherwise, students will rely on the process of elimination. You won't really be testing their mastery of content or thinking processes at all. You should keep the options in the list that's going to be matched to the first list short. They should be one to three words and maybe a short phrase, so students can glide down that column to find the correct answer.

Matching tests should be all on one page. So you're usually limited to 15 to 17 items. And what you want to do is, you want to list the options alphabetically, numerically, or chronologically so you don't tip off students by the order. So think about what two sets of items could you have your students match to assess their critical thinking skills? Pause.

Okay. Let's look at multiple-choice items. We all know multiple-choice items. And there are certain guidelines for writing them. First of all, you want to avoid phraseology and distracters, those are the wrong answers, that could throw off a knowledgeable student. On the other hand, you also want to avoid giving clues to students who are poorly prepared. So you don't want to give any hints.

Now, specifically, what you want to do, is you want to list the options alphabetically, numerically, chronologically, some way that doesn't tip off that student who's not that knowledgeable. You want to make all the wrong answers, all the distracters plausible, grammatically parallel, and just as long as the correct response. And you could always create distracters from the elements of the correct responses.

Oftentimes the correct responses you have two, three, four variables, and you can just juggle those variables or variables that students mix up with those variables. So if you're talking about mortality rates and birth rates, well, sometimes students will mix up population growth with that variable. You want to use certain terms sparingly, no, not, never, none, except. It's okay to use them, but when you do use them, you put those negative terms in bold, italics, underline them, anyway you can make them stand out. Now you want to use generously and not just when it's the correct answer, all of the above and none of the above. This really helps to test students' knowledge and thinking skills.

Now, multiple true/false. If you've never heard of them, with multiple true/false, it looks like a multiple-choice item, in that there is a stem. But each item below the stem, below the first statement is a true/false item. So you don't have to have just four or five options. You can have six, seven, eight. Each option is a decision point for students. So you make a test that's more reliable because there are more decision points. And it's also more efficient.

You're testing more knowledge, more thinking skills. These are much easier and quicker to develop. They involve more challenge because students can't use the process of elimination, as long as the stem is clear. To assess critical thinking, what you want to do is compose what are called stimulus based items. And what are these? There's a series of multiple choice or multiple true/false items or both, around a new, to the students, realistic stimulus that students must interpret or analyze correctly, in order to answer the items accurately.

So what kind of stimuli are we talking about here? Well, we've got two different kinds. We've got text based, which, you know, there might be a claim for students to analyze, a statement, a passage, a mini case, a quote, a report, a data set that's text based or description of an experiment. As long as you don't make these too long, these are great stimuli.

Graphically, also an option, you might have a chart, a graph, a table, a map, a picture, a model, a diagram, a drawing, a schematic, or a spreadsheet, that students have to analyze correctly. And I'll give you some guidelines for writing these items before we look at some examples. First of all, yes, it's got to be a new stimulus that students haven't seen before. But students must have had prior practice in the critical thinking skills that you're assessing. You don't want to give students a stimulus, they've never seen before.

So let's say you want to give students a table. No problem. You can do that, as long as you've had students analyzing tables previously. This is the sort of practice that I'm talking about. So if you're giving them, let's say, a piece or a statement out of a speech that's been made, hopefully, you've had students analyzing quotes or parts of speeches or passages before. So you shouldn't spring on a whole new stimulus on students, not in a test.

You want to minimize, as much as possible, interlocking items. Interlocking items are those where you have to answer a previous question correctly, in order to get this one correct. So you want to make as few of those as possible. It might be avoidable under some circumstances. But you want to be creative with the stimulus as well.

So what I want you to do is look at some examples that are in your supplemental materials. The first example you see, there are just a couple of them, there are two graphs here. One of average household income before taxes, and the other one is of change in share of income after taxes. And this goes from 1979 to 2007. And the first several questions or several items are multiple true/false.

And I recommend that you say this. Which of the following statements is or are valid conclusions you can draw from the graphs above? There are

six statements, I'm just telling you, two of them are correct. If you want to specify to the students there's so many correct, you can do that. But anyway, just for your information, three and five happen to be correct. But you can see how the question is structured.

The second one is also multiple true/false, same kind of statement. You can't go wrong with this sort of statement. Which of the following statements is or are valid conclusion you can draw from the graphs above? And so I commend this sort of stem to you. And there are four statements that could be made, using the variables of the graphs. And the last two happen to be correct. You might want to study those in your free time.

The next stimulus is a, what's called a path analysis diagram, predicting to the student rating the instructor, the overall rating. And there are a number of variables in here. Now, the first four items are multiple choice. And so it just says mark the letter of the correct answer. The diagram above shows the results of a large study. What are the study' unit of analysis? What's the sample size of the study? What does P equal to or less than .01 mean, which is basic for this kind of work. And then finally, which of the following is the best label for the figure?

Because you will notice in that example, the figure is not labeled in any way. There is no title there. And then there are a number of multiple true/false items. So to the left of each statement, put a T if it's true, F if it's false. And so there are a number of them here. There are in fact eight of them here. That's all right. Not too many. The first two happen to be true, the last two happen to be true.

So you can structure these in many different ways. So what I want you to realize though, that there are limits to stimulus-based items. Yes, it can assess many, many critical thinking skills, and do so more efficiently than constructed responses. That's like essay tests or designs or something that students create.

However, stimulus-based items cannot assess all critical thinking skills. It cannot assess anybody's ability to communicate, to create, to organize, to define problems, or to conduct research. Only constructed responses can do this. So what I want you to do is think about what kind of a stimulus you could use for a series of multiple choice and/or multiple true/false items, to assess your students' critical thinking skills.

I'd like to thank you very much and ask you to please tell us what you think about this 20-Minute Mentor. We are very interested in your opinion. There is a link that you can click on, that will take you to a survey. And again, hopefully you now feel a lot more comfortable with the

idea of assessing your students' critical thinking skills using objective items. Thank you.