Writing Objective Test Items That Assess Thinking Skills

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Learning Outcomes for You

• Prepare students for a test in the most helpful way
• Identify the types of objective items that can assess lower- and higher-level thinking
• Distinguish between multiple choice and multiple true-false items
• Define and explain the advantages of multiple true-false items
• Compose cleanly designed matching, multiple choice, and multiple true-false items that can distinguish the knowledgeable from the poorly prepared students
• Compose matching items that can assess higher-level thinking
• Explain what stimulus-based items are
• Compose stimulus-based multiple choice and multiple true-false items that can efficiently assess higher-level thinking
• Select from a wide variety of stimuli to compose these items
Assessments should *mirror* outcomes.

If you want your students to be able to do X, Y, & Z, assess them doing X, Y, & Z.
To prepare students for a test, tell them what they will have to be able to **do/demonstrate** on the test (your “micro” learning outcomes).

- Use “active” verbs.
- Avoid internal states you cannot observe (“know,” “feel,” “understand,” “appreciate”).
Types of Objective Items

• Fill-in-the-Blank/Completion
• True/False
• Matching
• Multiple Choice
• Multiple True/False
Most types of objective items can require and assess these higher-level thinking skills:

- Interpretation
- Generalization
- Inference
- Problem solving
- Conclusion drawing
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation
Fill-in-the-Blank/Completion

- Focus on memorization (which you may want)
- Too many options possible for computer scoring
- Good for foreign languages and math (can’t work backwards)
True/False

• Focus on memorization, trivia
• Encourages guessing (50/50 chance)
• Good to have students correct F statements, but then grading corrections takes time
• Can assess higher-level thinking IF “stimulus-based” (defined later)
Matching Items

Homogenous items within set—every option plausible for every item in list

—“Match each theory with its originator.”
—Cause with effect
—Definition with term
—Achievement or work with person or author
—Foreign word with translation
– Symbol with concept
– Organ/equipment/tool/apparatus with use or function
– Pictures of objects with names
– Labeled parts in a picture with function
– Processes, sequences (less known and used)
To assess higher-order thinking:

– Causes with likely effects
– Concepts with new examples of them
– New, hypothetical problems with tools, concepts, or approaches needed to solve them
Guidelines for Writing Matching Items

• Imperfect match between columns: “Some options may be used more than once, and others, not at all.”
• Short options (1-3 words, phrase)
• Up to 15-17 items, all on one page
• List options logically (alphabetically, chronologically, or numerically).
What two sets of items can you have your students match to assess higher-level thinking in one of your courses?
Guidelines for Writing Multiple Choice Items

- Avoid phraseology and distracters that would prevent a knowledgeable student from answering the item correctly.
- Avoid giving clues that would help a poorly prepared student answer the item correctly.
More specifically:

• List options logically (alphabetically, chronologically, or numerically).
• Make all distracters plausible, grammatically parallel, and just as long as correct response.
• Create distracters from elements of correct response.
• Use carefully:
  - no, not, never, none, except
• Use generously (not just when correct):
  - all of the above
  - none of the above
Multiple True/False

• Each option below stem is a T/F item.
• Superior flexible, efficiency, reliability
• Easier and quicker to develop
• More challenge, no process-of-elimination
• Stem must be clear.
To assess higher-order thinking

Compose *stimulus-based* multiple choice or multiple true/false items

= a *series of items around a new*, realistic *stimulus* that students must interpret or analyze accurately to answer the items correctly.

* New to the students
Possible Stimuli

• *Text*: claim, statement, passage, mini-case, quote, report, text-based dataset, description of an experiment

• *Graphic*: chart, graph, table, map, picture, model, diagram, drawing, schematic, spreadsheet
These items *require* and *assess* one or more of these higher-level thinking skills:

- Interpretation
- Generalization
- Inference
- Problem solving
- Conclusion drawing
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation
Guidelines for Writing Stimulus-Based Items

• New stimulus, but students must have prior practice in the thinking skills

• Few interlocking items

• Length/complexity of stimulus ≈ # MC or MT/F items possible
• Be creative with stimulus! chart, graph, map, picture, diagram, drawing...

• To approach the writing task:
  • Start with your learning outcomes.
  • Choose a (type of) stimulus.
  • Write stem and options.
What kinds of stimuli would work well in your courses?
Strengths and Limitations of Stimulus-Based Items

+ Assess more skills more efficiently than student-generated work

- *Cannot* assess abilities to communicate, create, organize, define problems, or conduct research

  For these outcomes, assess with student-generated work.
Simple Item Analysis

• Best test items are **highly discriminating** and **moderately difficult**.
  • Programs calculate Discrimination Index and Difficulty Index for each item.

• An item is *poor* if:
  • it fails to differentiate among the stronger (more able, better prepared) and weaker students, *and*
  • almost all students get it either right or wrong, especially if the stronger students get it wrong.