



Writing Effective Test Questions Series

PART 1: Basic Principles for Designing Effective Exam Questions

Tests and quizzes are among the most prevalent forms of assessment instruments in use on college campuses. Whether **summative** (assessment of student learning at the conclusion of a unit, course, or program) or **formative** (assessments meant to *provide* timely and effective feedback during the term or class), tests and quizzes represent a key form of information for students and instructors about learning in the classroom (McKeachie & Svinicki, 2013). Ultimately, the goal of any assessment should be to *promote* students’ learning of course content and improve students’ performance in the classroom (e.g., Handelsman, Miller, & Pfund, 2007; McKeachie & Svinicki, 2013). Therefore, assessment design is of paramount importance. This resource series will provide you with strategies and suggestions for writing effective test questions and designing assessment instruments that will enable you to better monitor your students’ progress throughout the term.

Best practices for assessment design

The first step in designing equitable and transparent approaches to assessing student learning is to examine the constructive alignment of the course: “In this model, each individual assignment within a specific course hits on particular course outcomes in a vertical relationship; the learning expressed in the course outcomes is related to the assignments, and expectations for course-embedded assignments are related to course activities that allow students to develop learning prior to assessment” (Jankowski & Marshall, 2017, p. 57).

There are a few skills that instructors need when writing tests questions (Nilson, 2016; Suskie, 2010):

- A thorough grasp of the subject matter and the content meant to be assessed
- A clear understanding of the instructional goal for the course and/or unit
- An ability to write both clearly and concisely when needed

Additionally, effective exams exhibit four main characteristics (CRLT, “Framework,” n.d.). Specifically, exams should be:

- **Valid**, with answers that are aligned with the learning objectives of the course, and that provide instructors with “useful information about student learning,”
- **Reliable**, with test questions designed to “consistently measure student learning and distinguish between levels of achievement,”
- **Recognizable** to students, in that prior instruction (both inside and outside of class) “has prepared students to expect and perform well on required tasks,” and
- **Realistic**, so that students can complete the required tasks of the exam in a realistic amount of time, employing a reasonable amount of effort.

Here are a few general best practices for designing effective tests and quizzes:

Strategies	Explanation	Teaching Suggestions
Develop clear scoring keys, rubrics, and/or other guidelines for yourself and your TAs	Clear scoring keys, grading criteria, and/or rubrics are essential to creating equitable opportunities for students to demonstrate their learning; to that end, use a “norming” process to increase consistency across graders (McKeachie & Svinicki, 2013) as well as reliability of the instrument. Clearly explain your exam expectations to students (Nilson, 2016).	It is important that you “norm” yourself and your TAs to the rubric. Additionally, to ensure that students understand your expectations, Handelsman, Miller, & Pfund, (2007) suggest providing students with copies of the grading criteria/rubrics along with the test or study guide, if possible (for example exam rubrics, see below).



<p>Test students early and often</p>	<p>Testing students early and often reduces the impact of a single poor performance on a student’s cumulative grade, while also giving them valuable feedback that they can use to improve their outcomes later on, and you valuable information about students’ progress (Handelsman, Miller, & Pfund, 2007; McKeachie & Svinicki, 2013; Nilson, 2016). McKeachie (2013) also suggests gradually reducing the number of assessment tasks throughout the term, so that students learn to consider course content beyond just studying for an exam.</p>	<p>Rather than relying on 1-2 midterms and a final, consider employing smaller weekly or biweekly exams. This will spread the time you and your TAs spend designing and grading exams more evenly throughout the course, especially if you develop a bank of test questions to pull from (see below). Additionally, research has shown that this model improves students’ outcomes and retention in courses (Myers & Myers, 2007).</p>
<p>Link test questions to specific course learning outcomes</p>	<p>The type of question you employ should depend on the kinds of thinking you’re asking students to do (McKeachie & Svinicki, 2013). Therefore, an effective exam will employ a variety of different question types, so as to provide students with the opportunity to demonstrate their grasp of course content in a variety of different ways.</p>	<p>Consider consulting <i>Bloom’s Taxonomy</i> to help you identify the types of thinking you’re interested in having students engage in (Freeman, Haak, & Wenderoth, 2011; O’Neill, Birol, & Pollock, 2010). Barbara Mills, Test Specialist with CEE, notes that multiple-choice questions can be useful when testing on a large body of material, and for a range of Bloom’s levels (see also, Clegg & Cashin, 1986). Constructed response questions are also useful when asking students to analyze and synthesize course information (see Parts 2 & 3 for more on multiple-choice and constructed response test items).</p>
<p>Preview test expectations</p>	<p>It can be helpful to preview the test structure with students a few days prior to the exam, so that they can study with test conditions in mind. This can be done in class, through a Canvas message, on a study guide, or through other means.</p>	<p>For example, notify students of whether notes, calculators, dictionaries, books, or other materials are admissible prior to the exam so that they can study with or without these materials.</p>
<p>Give clear, detailed written instructions on all tests</p>	<p>Make sure all key, relevant exam instructions are clearly written on the exam itself, and that students have time or the ability to ask questions if necessary.</p>	<p>For example, Nilson (2016) suggests notifying students of how many questions of each type there are and where their responses should be recorded, how much total time is allotted for the exam, as well as recommended time limits for each section, and how many points will be awarded for each test item.</p>
<p>Develop a “bank” of questions, in a variety of formats, that you can draw from</p>	<p>Developing a “bank” of test questions that you can pull from and adapt when designing assessment instruments can make the process of test design both easier and quicker.</p>	<p>Try developing several test questions immediately after you’ve covered the requisite material in class, when it is fresh in your mind (Nilson, 2016; Weimer, 2014). Doing this with books and notes closed can also help ensure that your questions don’t focus on minute details. Nilson (2016) also suggests employing a variety of</p>



		question types to provide multiple pathways for students to demonstrate knowledge, and so that students can feel more comfortable with the test format.
Create more than one version of an exam	Creating several versions of an exam to use within a single term, and/or over several terms, is key for avoiding cheating or other academic integrity violations.	To prevent cheating, distribute different versions of the exam to each course section, and/or alternate from desk to desk so that students sitting next to each other have different versions (McKeachie & Svinicki, 2013). Also, developing a “bank” with several versions of the same question using different examples, scenarios, or number sets can make it easier to create several versions to hand out.
Carefully consider what is a realistic amount of time and effort for students to complete the assessment task	Asking too many questions might increase students’ anxiety and cause them to perform in ways they might not normally (McKeachie & Svinicki, 2013). Additionally, different types of questions will require different lengths of time for students to complete. For example, international or multilingual students may need more time for questions that require a lot of reading.	Consider asking your TAs for their perspective on what is reasonable, in terms of the amount of time to budget per question, and how many questions to ask on the exam. Barbara Mills notes that “some test designers say to allow 45 seconds per question, but this depends on how much reading and how much calculating is required.” She also suggests having your TAs or another instructor take to test, and then budgeting at least double that time for your students.

Additional resources

- For example exam rubrics, see Handelsman, Miller, & Pfund, 2007; Nilson, 2016; Tierney & Simon, 2004; Walvoord, 2010.
- At UC Davis, instructors can contact Barbara Mills, Testing Specialist (bjmills@ucdavis.edu) in the Center for Educational Effectiveness for support in designing test questions.
- This resource was designed with the help of Kara Moloney, PhD, Assessment Lead in the Center for Educational Effectiveness (kmoloney@ucdavis.edu).

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Writing Effective Test Questions Series
PART 2: Writing Selected Response Exam Questions

Selected vs. Constructed Response Test Questions

Selected response test questions are those to which there is typically a single correct answer, and comprise fill-in-the-blank, true-false, multiple choice, and/or matching tasks. Nilson (2016) notes that these questions are good for assessing students’ ability to remember and understand course concepts and materials, but cannot “measure students’ abilities to create, organize, communicate, define problems, or conduct research” (p. 291). Selected response questions are easily scorable using a machine like a Scantron, which makes them seem like a good choice in large-enrollment courses.

Constructed response questions ask learners to *generate* (or construct) an answer. Constructed response items can measure knowledge, comprehension, application, perspective, and/or self-awareness. Examples of constructed response assessment tasks include: listing, defining, providing reasoning, short answer questions, and essay exams. Their primary types of constructed response, restricted and extended, are described below.

Constructed Response Type	Sample Prompts	Pros	Cons
Restricted	Provide reasons for... List... Define ...	Allows for faster grading	Does not measure higher-level thinking.
Extended	During this unit, we have discussed both the evolution of American literature and the changing political climate of the twentieth century. Analyze these two dimensions of life in America, citing instances where literature and politics may have influenced each other. Describe those influences in specific terms. In planning your response, think about what we learned about prominent novelists, political satirists, and prominent political figures of the last half of the century. (5 points per instance, total = 15 points).	Measure complex, interrelated skills such as synthesis, evaluation, and expression; as well as knowledge mastery and reasoning proficiency.	Difficult to write well. Challenging to score equitably; requires written English proficiency.

This resource will focus on suggestions for designing multiple choice questions (MCQs). For strategies for designing other types of selected response assessment questions, see Nilson (2016).

Strategies for writing multiple choice test questions

Research suggests that while well-designed multiple choice questions (MCQs) can be used to assess multiple dimensions of [Bloom’s Cognitive Process Domains](#), most MCQ tools focus on lower-order skills like remembering and understanding (Momsen et al., 2010). However, well-constructed MCQs can be used to assess higher-level thinking such as apply or analyze (Clegg & Chasin, 1986). One example would be to ask students to apply course concepts through realistic problems or scenarios (see below; see also: Suskie, 2010). For example, Crowe, Dirks, & Wenderoth (2008) developed the “[Blooming Biology Tool](#)” to help instructors align their assessments with higher order teaching activities. Nilson (2016) and Suskie (2010) note that effective MCQs must be phrased carefully to avoid accidentally steering a prepared student away from the correct response, or alternately steering an unprepared student to the correct answer. Following are suggestions for designing effective MCQs:



Strategies	Explanation	Teaching Suggestions
<p>Make sure the statement or question is clear and concise.</p>	<p>Lengthy, unclear multiple choice questions can easily direct even prepared students to the incorrect answer, and produce considerable anxiety and frustration for students (Suskie, 2010).</p>	<p>Barbara Mills, Test Specialist with CEE suggests avoiding overlapping answers (a particular issue when numbers are the answer choices) and numerical answers that are too close (such as those distinguished only by rounding). Additionally, to avoid overlap, it's best to use mutually exclusive response options, and to include only one correct, clearly best answer.</p>
<p>Use consistent and clear language</p>	<p>Write a simple, straight-forward question or prompt. Use language consistently. Be concise. Avoid turning your content test into a test of reading comprehension. Give students the opportunity to focus on the task itself and not on puzzling through the question (Suskie, 2010).</p>	<p>Examples of inconsistent language usage include: alternating verb tenses within the question and or using different pronouns in the response choices from those in the question stem (see below for example).</p>
	<p>It's important to write items that are clearly written, precise, and accessible. To do this: use sentence structures and vocabulary that are appropriate for the audience; eliminate difficult or unclear terminology (OR undefined acronyms!); and avoid potential cultural and/or linguistic issues.</p>	<p>Read each stem out loud, followed by each response. <i>Listen</i> for language "bumps" and address them. Also, consider asking your TAs or another instructor to read through your questions for clarity.</p>
<p>Tie questions to specific learning goals for the course/unit</p>	<p>An intentionally aligned instructional approach "provides students opportunities to synthesize, practice, and develop increasingly complex ideas, skills, and values" (Allen, 2004, p. 40). In addition, if teaching and learning activities, including modes of instruction and assignment design, are not aligned to the goals set for students, instructors will be unable to demonstrate the excellent work in teaching that they do (Jankowski, 2017).</p>	<p>All assessments in a course should derive directly from the course learning outcomes. Remind students <i>throughout the course</i> to use the course outcomes as reference points for their own learning.</p>
	<p>Begin with the course learning outcomes to ensure that assessment activities are directly aligned to your goals for student learning. Design test questions that assess what students should be learning in your course (Handelsman, Miller, & Pfund, 2007; McKeachie & Svinicki, 2013; Suskie, 2010).</p>	<p>Zimmaro (2004) suggests avoiding asking about trivial information or unimportant facts, as doing so can lead to further test anxiety when students don't know what information is actually important.</p>
<p>Employ "stimulus-based" multiple choice questions as a way to tie the assessment to interpretive or</p>	<p>Nilson (2016) describes these items as a series of multiple choice questions corresponding to a realistic stimulus like a text passage, table, graph, image, equation, description of an experiment or short case example, etc. For an</p>	<p>When designing these types of questions, make sure to give students prior practice (in class, on homework, or on a study guide) in interpreting the types of stimuli you intend to use on the exam. But, make sure the scenarios and examples are new to students (Suskie,</p>



applicative thinking skills.	example of this type of question, see “Example Questions” below.	2010). Additionally, the longer or more complex your stimulus is, the more questions you should include in your corresponding series.
Avoid assigning “all of the above” and/or “none of the above” options as the correct response	Most test designers (e.g., Haladyna, 2004; Nilson, 2016; Suskie, 2010) agree that when “all of the above” or “none of the above” options are the correct response, this makes it easier for students to select the correct answer without actually knowing the material. Barbara Mills also suggests avoiding choices such as “A & C” or “B & D,” as these can also make it harder to distinguish between students who know the material and those who don’t.	Nilson (2016) suggest using “all of the above”/“none of the above” options as distractors, as this can make a question more challenging to students, and ensure that they actually need to know the material to find the correct response. You can also use common mistakes, misconceptions, or mis-associations that students make (Suskie, 2010), or alter elements of or variables within the correct response to design distractors.
Avoid using negative phrasing, or clearly signal the negative word to students.	Using negative phrasing can confuse a student, even if they know the material, especially if they are short on time (Clegg & Cashin, 1986; Haladyna, 2004; Suskie, 2010).	For example, “Under which of the following conditions is X not true?” can be easily misread by students. A better version would be “Under which of the following conditions is X true?” Additionally, highlight, bold, all-cap, or underline negative words to signal to students what is being asked (e.g., Zimmaro, 2004). For example, “Which of the following countries is not on the UN Security Council?”

Example Questions

Examples in this section come from Nilson (2016), and [this resource](#) from the Vanderbilt University Center for Teaching.

Item responses use inconsistent language and negative phrasing

Which of the following is not true about mitochondria?
a: They contain DNA
b: Mitochondria made some of their own proteins
c: They are static
d: none of the above

The negative phrasing can be easy for students to miss, especially if they are worried about time. Additionally, the phrasing for option “b” is inconsistent from the rest of the questions as it uses past tense (while the other options are phrased in the present) and it uses the word “Mitochondria” instead of the pronoun “they.” A better phrasing would be:

*Which of the following is **not** true about mitochondria?*
a: They contain DNA
b: They make some of their own proteins
c: They are static
d: none of the above

Example of “stimulus-based” test items

Two researchers were studying the relationship between amount of sleep each night and calories burned on an exercise bike for 42 men and women. They were interested if people who slept more had



more energy to use during their exercise session. They obtained a correlation of .28. With a two-tailed probability of .08, and the alpha was .10.

What is the correct statistical null hypothesis?

- a: There is no correlation between sleep and energy expended.
- b: rho equals zero.*
- c: R equals zero.
- d: rho equals r.

What conclusions should you draw regarding the null hypothesis?

- a: Reject*
- b: Accept
- c: Cannot determine without more information. (Nilson, 2016)

For this stimulus-based question, the test designer wrote out a research scenario for a statistics class, then designed a series of questions referencing several different course concepts (i.e., the null hypothesis). (For the full set of questions related to this scenario, see Nilson, 2016)

Additional resources

- At UC Davis, instructors can contact Barbara Mills, Testing Specialist (bjmills@ucdavis.edu) in the Center for Educational Effectiveness for support in designing test questions.
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Writing Effective Test Questions Series **PART 3: Writing “Constructed Response” Exam Questions**

Multiple choice tests can yield useful information about students’ knowledge of course content. However, these tests are invalid measures of learners’ capacity to engage in higher-level cognitive processes, such as analysis, evaluation, and/or creation. As noted in [Part 2](#), constructed response questions are more effective than selected response items at creating opportunities for students to demonstrate their reasoning, argumentative, and problem-solving skills or their ability to apply course concepts and content in authentic, real-world situations. However, because these responses require more time to generate (students) and assess (instructors), Nilson (2016) suggests using constructed response questions sparingly if possible, particularly “when the learning outcomes you are assessing requires students to generate, as opposed to select, and answer. If your outcome calls only for selection, then you might as well use [selected] items” (p. 299).

Designing effective constructed response questions

Including constructed response questions on an exam with selected response items enhances students’ opportunities to accurately demonstrate their learning. Responses to these types of questions are usually structured individually by students and are typically several sentences or several paragraphs in length, depending on the question asked or task assigned. Additionally, a well-designed constructed response question should invite several different possible answers or responses. Here are a few suggestions for how to design constructed response questions:

BEFORE you write a question:

1. Know what you hope students will be able to demonstrate.
2. Write a prompt (or question) that describes a single, complete, and novel task
3. Devise clearly articulated evaluation criteria

Strategies	Explanation	Teaching Suggestions
Clarify expectations to ensure transparency and equity	Nilson (2016) notes that each grader may prioritize different criteria, which makes having a clear rubric for graders to reference particularly important. Having clear rubrics and grading criteria is essential to ensuring that tests are graded fairly and with consistency between evaluators (McKeachie & Svinicki, 2013).	Nilson (2016) suggests discussing grading criteria for constructed response questions with the TAs and suggesting that they norm their evaluations together to ensure consistency before grading. Additionally, she suggests outlining these criteria to students prior to the exam, so that they can better prepare (for example exam rubrics, see below).
Design specific questions that ask for specific responses	Unspecific questions can lead to long “kitchen sink” responses, or conversely, very short responses as students attempt to puzzle out what your expectations are (McKeachie & Svinicki, 2013). They may also interpret the question very differently from you, especially if your question is unclear.	Nilson (2016) suggests identifying key ideas or concepts students should reference in their responses, if possible. She also suggests avoiding simple interrogative words like “how,” “what,” or “why,” and instead using descriptive verbs like “describe,” “explain,” or “evaluate.” For example, “ <i>Describe three ways that social integration could break down in the modern world, according to Durkheim. Then assess how closely each one applies to the United States today</i> ” [emphasis original] (Nilson, 2016, p. 300).



<p>Make your expectations clear</p>	<p>Prompts should align with course learning outcomes <i>and</i> the assessment criteria you provide to students. Handelsman, Miller, & Pfund, (2007) suggest providing students with copies of the grading criteria/rubrics along with the test or study guide, if possible.</p>	<p>Nilson (2016) suggests identifying the ideas, concepts, or other course material you want students to reference in their responses. For example, you could ask students to apply a course concept to a real-world scenario or provide two passages with two scholars perspectives on a particular theory or idea covered in your course, and ask students to compare. For example, “Read the two passages above from Michel Foucault and Jacques Derrida. Then, explain three key differences between these two theorists’ conceptions of the historicity of thought.”</p>
<p>Use short answer questions in place of an essay</p>	<p>Well-constructed and polished academic essays take time to write. If the purpose of the writing task is to ascertain whether students can engage meaningfully with course content, create assessment opportunities that students are actually able to accomplish.</p>	<p>Be intentional about assigning in-class writing tasks. Keep in mind that the timed nature of the task limits the validity of the assessment. In-class essay exams leave students with little opportunity for revision, which is essential to writing effectively. Therefore, expecting students to produce academic prose in a timed-writing sets everyone up for potential failure.</p> <hr/> <p>Consider employing several short answer responses that call for only a few sentences, rather than longer essay responses that call for several paragraphs (McKeachie & Svinicki, 2013). For example, you could provide a passage or scenario for students to read, and then assign several short answer questions regarding that passage.</p>
<p>Be realistic about syntax mechanics (e.g., spelling or sentence-level issues)</p>	<p>Due to the timed nature of in-class written exams, instructors need to accept that, for most learners, sentence-level writing issues (e.g., misspellings, punctuation errors) will occur. With limited time, most writers will focus on conveying their grasp of course content, and don’t always have time to edit. Take this into consideration when developing and explaining the assessment criteria for in-class writing exams.</p>	<p>To ensure validity of the assessment, focus on the <i>content</i> of students’ responses, rather than sentence-level issues—unless sentence-level issues significantly impede students’ expression of what they know.</p> <hr/> <p>Another option is to assign constructed response questions as part of take-home exams, so that students have time to carefully proofread their responses. If you choose the latter option, let students know ahead of time that the expectations include appropriate control of syntax and mechanics.</p>

Additional resources

- For example exam rubrics, see Handelsman, Miller, & Pfund, 2007; Nilson, 2016; Tierney & Simon, 2004; Walvoord, 2010.
- At UC Davis, instructors can contact Barbara Mills, Testing Specialist (bjmills@ucdavis.edu) in the Center for Educational Effectiveness for support in designing test questions.
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