Writing Effective Multiple Choice Exams– Vet Med Education Day

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We will focus on multiple choice tests
How are standards different than objectives?

a. As opposed to objectives, standards include a description of the task that will be used to demonstrate successful attainment of the standard alternatives

b. As opposed to standards, objectives are written in observable and measurable terms

c. Standards are broader statements of what students will know and be able to do than are objectives

d. All of the above

From: J. Mueller, Authentic Assessment Toolbox – Constructing Good Items jfmueller.faculty.noctrl.edu/toolbox/tests/gooditems.htm
MCQ writing guidelines

1. Ask questions at higher cognitive levels that combine more than one fact
2. The items that you construct should align with your intended course outcomes
3. Use 3 alternatives
4. Selection of the correct answer reflects mastery of the material
5. Prepare students to succeed on your exams
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Can the student create a new product or point of view?
Can the student justify a stand or decision?
Can the student distinguish between different parts?
Can the student use information in a new way?
Can the student explain new ideas or concepts?
Can the student recall or remember the information?
Guidelines for writing effective critical thinking multiple choice questions

• Write questions at the application or above cognitive level

• Require multilogical thinking to answer questions – thinking that requires knowledge of more than one fact to logically and systematically apply concepts to a clinical problem

• Require a high level of discrimination to choose from among plausible alternatives

Morrison & Free 2001
A 4-year-old intact female Maltese dog has anorexia, fever, severe trembling, and stiffness of the limbs three weeks post partum. Which of the following is the most appropriate emergency therapy?

(A) Intramuscular calcium chloride
(B) Intravenous calcium gluconate
(C) Intravenous dexamethasone
(D) Intravenous 50% glucose
(E) Oral calcium lactate
What is the most popular dog breed in the U.S.?

1. American Pit Bull Terrier
2. Bulldog
3. Labrador Retriever
4. Shih-Tzu
Which of the following subpopulations is **at greatest risk** for developing clinical toxocariasis?

(A) Children with a history of pica  
(B) Dog trainers  
(C) Slaughterhouse workers
Base distractors on common student misconceptions
Use concepts from the instructional material that have similar vocabulary or were used in the same context as the correct answer.
Have more than one question relate to the same case study

- What is the diagnosis?
- What is the first test you would order?
- You have this lab result. What is your diagnosis?
- Patient exhibits this additional symptom. What is your diagnosis?
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What does it mean to have an aligned course?

Learning Outcomes

Assessments

Class Activities
## Indicators of alignment

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<th>Assessments are aligned with outcomes</th>
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If your answer is **NO** to any of these, it suggests you may need to modify your assessments, your activities, or both.
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3. **Use 3 alternatives**
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3 options are optimal for multiple-choice tests

Three Options Are Optimal for Multiple-Choice Items: A Meta-Analysis of 80 Years of Research

Michael C. Rodriguez, University of Minnesota

Multiple-choice items are a mainstay of achievement testing. The need to adequately cover the content domain to certify achievement proficiency by producing meaningful practice scores requires many high-quality items. More 3-option items can be administered than 4- or 5-option items per testing time while improving content coverage, without detrimental effects on psychometric quality of test scores. Researchers have endorsed 3-option items for over 80 years with empirical evidence—the results of which have been synthesized in an effort to unify this endorsement and encourage its adoption.

Keywords: multiple choice, item writing, item analysis, meta-analysis

Item writing has been, and always will be an art. However, more sophisticated, technically-oriented, and computer-generative techniques have been developed to assist the item writer (see Baker, 1989; Bejar, 1993; Haladyna, 2004; Reid & Haladyna, 1982). Nonetheless, the essence of item writing remains largely unaltered. Many item-writing rules may be nothing more than “item writing niceties” (Mehrens, personal communication, April 21, 1987). The lack of rigorous empirical study on item writing has troubled measurement specialists. Since it has not sparked enough interest to motivate the field to engage in extensive study. Virtually all the authors of empirical studies investigating item format effects have expressed discontent with the amount of systematic study of item construction (Rodriguez, 1997).

One item-writing guideline has undergone a relatively substantial amount of empirical research, answering the question: How many options should a multiple-choice item have? The advice as stated by most measurement text-book authors is to write as many options as feasible (Haladyna & Downing, 1992a). After their review of the empirical literature, Haladyna and Downing (1988) recommended a slight revision: “develop as many functional distracters as are feasible.”

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Useful because it saves time

1. It takes students significantly less time to answer the questions.
2. It takes instructors significantly less time to write the questions.
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Reduce cognitive load

• Avoid elements of instruction or assessment that will overload students’ capacity to consciously process the immediate task
• Limit the use of negatives
• Put alternatives in relative order
• Keep alternatives simple by adding common words to the stem
Reduce chance of guessing

• Make all distractors plausible
• Limit the use of all of the above or none of the above
• Avoid complex choices for answers
• Avoid giving away the answer to one question in another question
ACTIVITY 3 – Ensure your question measure what you want to assess

• Go through your questions and eliminate:
  – Implausible distractors
  – Ineffective distractors (if data available)
  – Unnecessary (extrinsic) cognitive load
  – Wording that increases the chances of correct guessing

ADVANCED LEVEL

• Write a new test question:
  – With 3 plausible distractors, one of which is incorrect
  – With no unnecessary cognitive load
  – That can’t be easily guessed
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Which of the following is the most common cause of maxillary sinusitis in the horse?

(A) Bacterial lower respiratory tract disease extending into the sinus

(B) Infection and abscessation of a tooth root extending into the sinus

(C) Inhaled foreign bodies lodging in the sinus

(D) Puncture wounds extending into the maxillary sinus
Test-item rationales should contain information as to why a choice is correct as well as why distractors are incorrect.
In-class activities that prepare students for exam

• Provide students with a case study and ask a series of questions about it. Tell them this is the kind of question you would put on an exam (but about a different disease or topic)
• Have students draw out a process. Provide different scenarios that would impact the process and ask them what would change. Tell them you will have exam questions that will ask them to use the same logical process.
Make your exam standards transparent

• Be able to draw a synapse and label all of the major molecules involved in every step of neurotransmission
• Given this list of drugs, be able to indicate the target of each one in your drawing and its effect on the target
• If you can do that, you are able to predict the effects of
  – a perturbation in the system and predict the effects of
  – an unknown drug given its target and target effect
Telegraph the level of detail that you expect students to know.
Have a bank of practice questions
Conclusions

• Ask questions at higher Bloom’s levels that combine more than one fact
• Construct exam questions to align with your outcomes and class activities
• Use 3 alternatives
• Ensure selection of the correct answer reflects mastery of the material
• Prepare students to succeed on your exams
Resources


