Writing Good Multiple Choice Questions

Is this a trick question?

Charles Bloch, Ph.D.
Associate Professor

UNIVERSITY OF WASHINGTON MEDICAL CENTER
UW Medicine

Chuck Bloch

- Chair of online learning services subcommittee
  - Review all multiple choice questions in the online learning services continuing education database
- Member of MOC Subcommittee and Summer School Subcommittee
  - Review SAM questions before AAPM and Summer School meetings
- My Goals:
  - Improve the quality of questions I have to review.
  - Improve the quality of the AAPM online CE quizzes.

AAPM Online Learning Center

- Currently ABR does not require SAMs!
- ABR requires "self assessment"
- Self Assessment includes
  - SAMS
  - All quizzes in the online learning center

Don't worry if you can't find enough SAMs. All the quizzes count as self assessment too. (You need 75 SA over 3 years. Any type of SA counts).

1. Why do we have exams?

a) We wish to measure something about people (e.g. did they learn what we wanted them to learn)

b) To justify giving credit for participation

c) To enhance learning (making them pay attention because they know there is a quiz; reinforcing concepts through repetition).

d) All of the above

2. Why have Multiple Choice Exams?

a) Objective (one answer is right, the rest are wrong).

b) Can test for many things (content and ability).

c) Easy to grade (but hard to write).

(This last part is what we want to discuss.)

Definitions

- Item – The question plus all of the multiple choice answers
  - Stem – this is the question part of the multiple choice question
  - Key – this is the correct answer
  - Distractors – these are the choices which are not correct

3. Why is writing good MCQ difficult?

a) As physicists, we know a lot of detailed technical information and tend to want to check that our colleagues do too.
b) Communication (including writing) is not necessarily our strong suit.
c) We make sure the key (the correct answer) is worded very precisely because we are always precise
d) We are dismissive of wrong answers, and spend little time making sure our distractors (wrong answers) are plausible.
e) We know what we mean even if others don't get our message.
f) All of the above.

Psychometrics (Item analysis)

- **There is a scientific field (psychometrics) which uses statistical analysis to determine which MCQs are bad.**
- **The analysis is very specific and can determine whether the problem lies with the stem, the key or one or more distractors.**
- **Additionally, the analysis can help identify *what* is wrong with the stem, key or distractor(s).**

Common difficulties

- **Stem – poorly worded, ambiguous, overly complicated**
- **Key – different (in some way) from all the distractors that makes it seem like the obvious answer**
- **Distractors – not plausible**
  Physicists tend to spend a lot of time thinking up the stem (i.e. what they want to ask) then writing a detailed answer (key). However, there needs to be reasonable thought put into coming up with plausible distractors.

4. How many options should a multiple choice question have?

a) Three is enough
b) Four or Five
c) More than five

(Hint:…)

4. How many options should a multiple choice question have?

a) Three is enough
b) Four or Five
c) Five or Six
d) 7 to 19
e) More than 19

Number of options: 3 or more

- 3 is enough.
- If you have 4, look at the exam results. Drop the distractor than no one picked and give the exam again. The results will be the same.
- Quality over quantity.
- References:
  - S Redmond et al, International Journal of Nursing Education Scholarship 9 (1), 2012.
  - M.C. Rodriguez, Educational Measurement: Issues and Practice 24(2), 2005.
  - S.V. Owen and R.D. Froman, Educational and Psychological Measurement 47, 1987
  - K.A. Piasentin, Clear Exam Review XXI(1), 2010

5. A non-distractor is:

a) A distractor that is obviously wrong

b) A distractor that is not chosen by anyone

c) A distractor that should be in every MCQ

d) $4/3\pi r^3$

e) a) and b)

f) None of the above

6. ~90% of the physicists get the right answer during SAM sessions because:

a) Physicists are really smart

b) The correct answer is always "c"

c) The questions are easy

d) The speaker was excellent

Item analysis (psychometrics)

- Computerized statistical analysis of the MC answers given can determine which questions are good and which questions are flawed.
- That analysis can also identify the nature of the problem with the flawed questions:
  - Key is wrong
  - More than one correct answer
  - One or more distractors is not plausible
  - Question is too easy
  - Question is too hard
- This analysis does not work before the exam is given. ⊗

Item analysis (continued)

- Item analysis can be used to:
  - Throw out the bad questions so they don't count against students
  - Accept more than one answer as correct if that is the case
  - Improve the exam before it is given again
  - Educate the exam writer on their shortcomings

Item analysis (continued)

- Item analysis cannot be used to help you write good questions
- Item analysis cannot evaluate your questions before the exam is given
- Writing good multiple choice questions is hard work and takes time.

7. Then how can we write good MCQs?

a) Listen to the next speaker's talk

b) Read some of the references from this talk

c) All of the above

d) None of the above

References

- ABR Updated guidelines for Presenters of SAMs
- Ben Clay, A Short Guide for Writing Effective Test Questions (69 pages)
- https://cft.vanderbilt.edu/guides-sub-pages/writing-good-multiple-choice-test-questions/
- Constructing Written Test Questions For the Basic and Clinical Sciences. National Board of Medical Examiners
- Cathy Moore, Common mistakes in writing multiple-choice questions
- Donna Breckenridge, Writing Exam Items (AAPM virtual library)
- ABR Radiologic Physics Item-Writing Guide (2004)

More references

- Mike Dickinson, A Quality Scorecard for Multiple-choice Tests, Learning Solutions Magazine
- Understanding Item Analysis, UW Office of Educational Assessment
- https://www.washington.edu/assessment/scanning-scoring/scoring/reports/
- https://www.google.com/