

Developing Multiple-Choice Questions

HOW TO DEVELOP EFFICACIOUS ITEMS AND AVOID COMMON ERRORS

A WORKSHOP PRESENTED TO UNE'S COLLEGE OF OSTEOPATHIC MEDICINE

Workshop Objectives

Articulate the importance of linking student learning outcomes to assessment.

Using a taxonomy, generate clear student learning outcomes that reflect the goals of your course and provide a window to what should be assessed.

Analyze sample questions from the *Comprehensive Osteopathic Medical Licensing Examination* and also some COM questions using a standard taxonomy.

Identify common errors made in developing multiple choice questions.

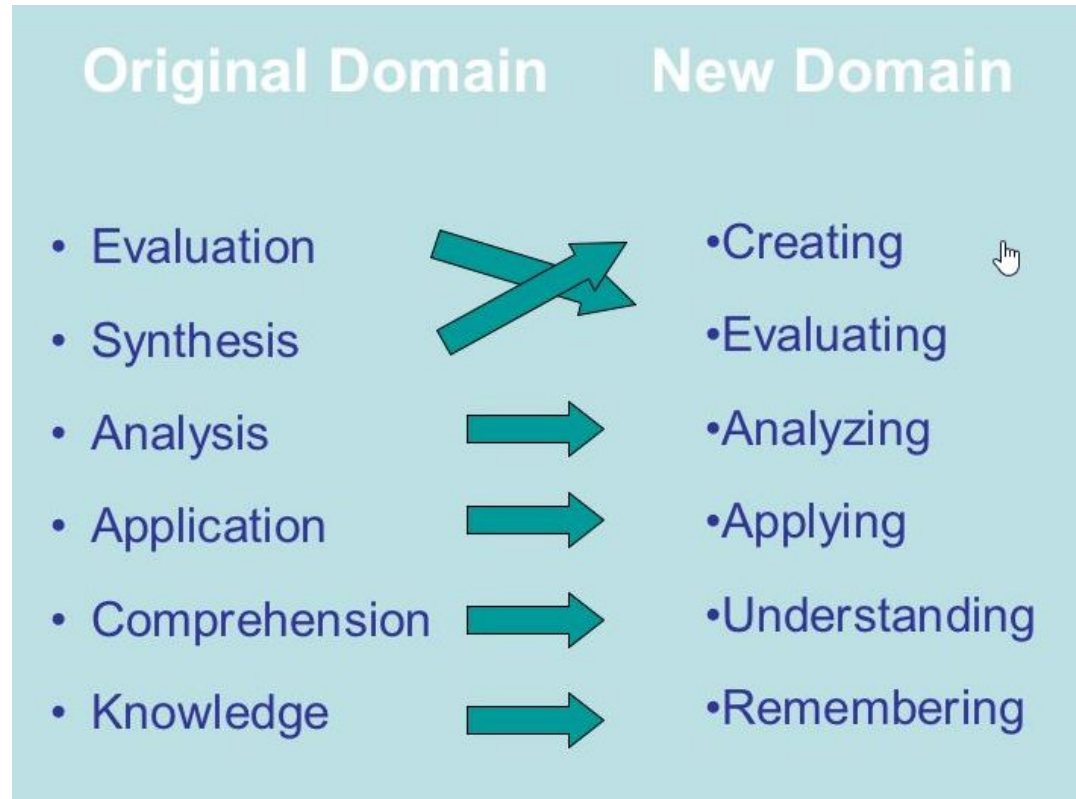
Evaluate and edit sample exam questions according to:

- whether they reflect a COM student learning outcome (as well as consider % weight given to such questions), and
- whether they contain any common mistakes.

Before writing multiple choice questions...

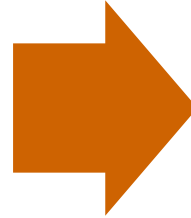
Develop clear student learning outcomes for your course

- Consider linking them to Bloom's Taxonomy
- Then consider what % of your course is at each level?



Student Learning Outcomes will dictate assessment, e.g., Immunology at Purdue

Students will be able to identify the basic components of the immune system and their roles in innate and adaptive immunity.



Multiple choice questions that are recall-based (knowledge/remembering level).

Students will analyze how an infection with HIV affects the immune system.



Multiple choice question listing several effects and they must select the most viable one (analysis/analyzing level).

Students will be able to evaluate what steps/questions should be followed in clinical situations involving immunology.



Provide a clinical scenario in which next steps or questions to be asked must be selected (evaluation/evaluating level).

Let's try assigning some sample
*Comprehensive Osteopathic Medical
Licensing Examination* and COM
questions to Bloom's Taxonomy.

What should be Tested?

- Exam content should match course objectives
- Important topics should be weighted more heavily than less important topics
- The testing time devoted to each topic should reflect the relative importance of the topic
- The sample of items should be representative of the instructional goals

“The amount of attention given to evaluating something should reflect its relative importance.”

Case, S. M., & Swanson, D. B. (2002). *Constructing written test questions for the basic and clinical sciences*. National Medical Board Examiners, p. 9. See http://www.nbme.org/pdf/itemwriting_2003/2003iwgwhole.pdf

Rule of thumb...

STUDENT LEARNING OUTCOMES

% weight on lower level understanding
(knowledge and comprehension)



% weight on higher level thinking
(application, analysis, synthesis,
evaluation)



ASSESSMENT

% of multiple choice questions or relative
scoring of recall or fact questions.

% of multiple choice questions or relative
scoring focused on clinical based
scenarios.

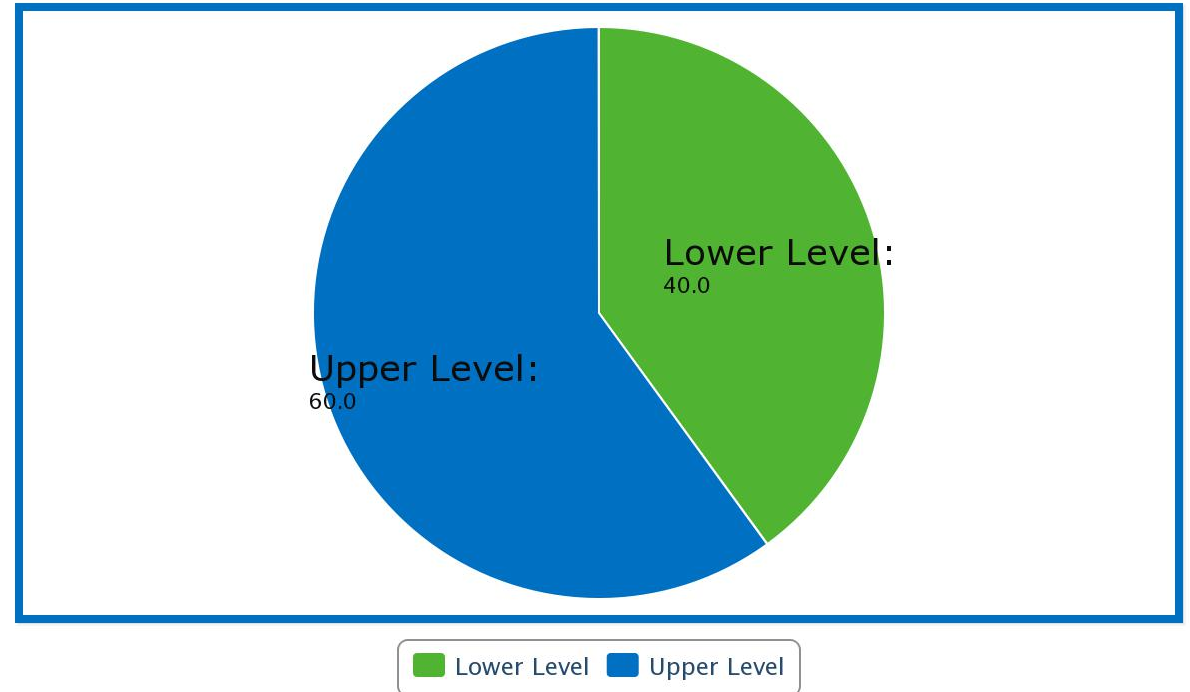
So consider a course or an exam...

Sketch out student learning outcomes.

Then determine roughly the percentage weight of upper level and lower level questions.

Example:

Percentage Weight of Questions



meta-chart.com

Now you are ready to start writing items.

First, what are the components of a multiple-choice question?

The complete question is called the **item**.

Susie Science has discovered a mutant form of insulin that lacks a signal peptide. What will be the final cellular destination of the mutant insulin?

Answer
Distractor
Distractor
Distractor
Distractor
Distractor

A. Cytosol
B. Endoplasmic reticulum
C. Extracellular space
D. Golgi apparatus
E. Peroxisome
F. Plasma membrane

Stem

Alternatives also called options

The diagram shows a multiple-choice question item enclosed in a blue box. The question text is at the top, followed by a list of six answer choices. To the right of the question text is a blue bracket labeled 'Stem'. To the right of the answer choices is a blue bracket labeled 'Alternatives also called options'. On the left side of the answer choices, the word 'Answer' is written in green, and the word 'Distractor' is written in red five times, corresponding to each choice.

Reproduced from

<http://cft.vanderbilt.edu/guides-sub-pages/writing-good-multiple-choice-test-questions/#alternative>



Recognizing Test Savvy Cues

The fribbled breg will ninter best with an:

- A) mors.
- B) ignu.
- C) derst.
- D) sortar.

ANSWER: B

Only option that grammatically flows from the stem.

What is the primary purpose of the class in frumpaling?

- A) remove class-prangs.
- B) patch tremails.
- C) loosen cloughs.
- D) repair plumots.

ANSWER: A

Only option to include a word (class) found in stem.

Why does the sigla frequently overfesk the trelsum?

- A) All siglas are mellious.
- B) Siglas are always votial.
- C) The trelsum is usually trarious.
- D) No trelsa are directly feskable.

ANSWER: C

All the other options contain words (e.g. all, always, no) associated with false statements.

Trassign normally occurs under which of the following conditions?

- A) when dissles frull.
- B) when lusp trasses the vorn.
- C) when the belgo lisks tarious.
- D) when the viskal flans, if the viskal is zortil.

ANSWER: D

Only option to specify a condition and the stem directs the student to look for a condition.

What probable causes are indicated when dross occurs in a compots?

- A) The sabs foped and the doths tinzed.
- B) The kredges roted with the rots.
- C) The rakogs were not accepted in the sluth.
- D) The polats were thenced in the sluth.

ANSWER: A

Only option with multiple causes (sabs and doths).

The nintering function of the ignu is most effectively performed in connection with the:

- A) arazma bal.
 - B) fribbled breg.
 - C) groshing statol.
 - D) frallied stantels.
-

ANSWER: B

Answer is cued by a previous question. Students will likely remember that ignus and fribbled bregs are linked in a previous question.

Stem suggestions

Multiple-choice items should be questions (rather than incomplete statements).

Incomplete Statement Format:

The capital of California is in _____

Direct Question Format:

In which of the following cities is the capital of California?

May include a chart, table, or graphic.

The stem should be meaningful by itself and should present a definite problem.

STEM IS NOT MEANINGFUL

Which of the following is a true statement?

- A. Mitochondrial genomes are relatively constant in content (i.e., types of genes present).
- B. Mitochondrial genomes are relatively constant in organization.
- C. Mitochondrial genomes are relatively constant in size.

BETTER STEM


What characteristic is relatively constant in mitochondrial genomes across species?

- A. Content (i.e., types of genes)
- B. Organization
- C. Size

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The stem should be positively worded (e.g. true, best, most appropriate) whenever possible.

However, experts will indicate that IF there is a significant learning outcome that requires it (there are multiple correct responses), then there could be an exception.



Try to word it with a statement of something happening and then add **EXCEPT**

A water-type extinguisher is suitable for putting out a fire caused by burning all of the following **EXCEPT**

- A. Alcohol
- B. Cotton
- C. Paper
- D. Wood

Note: Bold and underline the negative word/s.

Note: This is an exception to the rule of having a stem be a stand-alone question.

Stems should be long and Options short.

If key words appear consistently in the options, try moving them to the stem.

Number of **options** can vary

- There is little difference in difficulty, discrimination, and test score reliability among items containing two, three, and four distractors.
- Most important is that all options are plausible, but incorrect.
- The difficulty of the question largely depends on the quality of the options that are distractors.

Options should be consistent in length.

Options should be grammatically consistent with stem.

Options should be homogeneous.

Options should avoid repeating words across choices.

Options should avoid absolute words (“never true” or “always true”).

Options should avoid “All of the above” and “None of the above.”

Options should be presented in logical order to avoid bias.

