

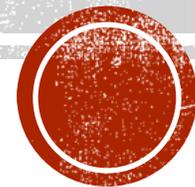
CREATING MULTIPLE-CHOICE QUESTIONS THAT TEST CRITICAL THINKING

Dr. Lisa Liseno and Kate Pierson

PIE Coffee Hour & Teaching Workshop

June 25, 2018

A special thanks to Dr. Stephanie Bradley, Assistant Professor of Sociology at Radford University and a PIE Associate alumna for providing the basis of the workshop materials!



INTRODUCTIONS

- Name
- Department
- One unique fact about yourself?
- What brought you here today?
- Confidence in creating good MC questions?
 - A=not at all confident
 - B=some what confident
 - C=pretty confident
 - D=very confident



AGENDA

- Multiple-choice question (MCQ) basics
- Bloom's Taxonomy
- Incorporating Bloom's Taxonomy into MCQs for higher-order (critical) thinking

LEARNING OBJECTIVES

- Identify components of MCQs
- Understand & apply the different levels of Bloom's Taxonomy
- Create MCQs that contain higher levels of Bloom's



CREATE YOUR OWN MCQ

- Take a moment and create you own multiple choice question.
- Some ideas for topics:
 - You!
 - Florida State University
 - Your research area

Multiple choice question

1. Rick Astley's never gonna:

← Question Stem

Options

- Give you up
- Let you down
- Run around and
- Desert you
- All of the above

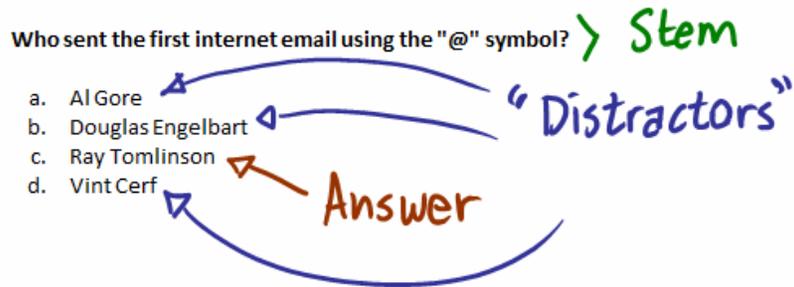
← Distractors

← Correct



MCQ BASICS

Parts of a Multiple-choice Question



To ensure the quality of multiple-choice questions, _____.

- A. include several correct answer options
- B. include qualifiers and absolutes
- C. make some of the options and distractors negative
- D. make all options and distractors similar in length



MCQ BASICS

- Stem/prompt



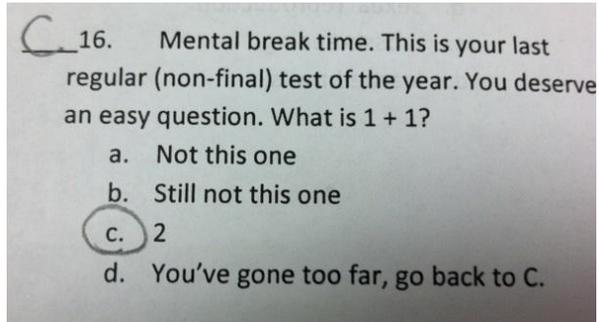
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MCQ BASICS

- Responses, options, choices



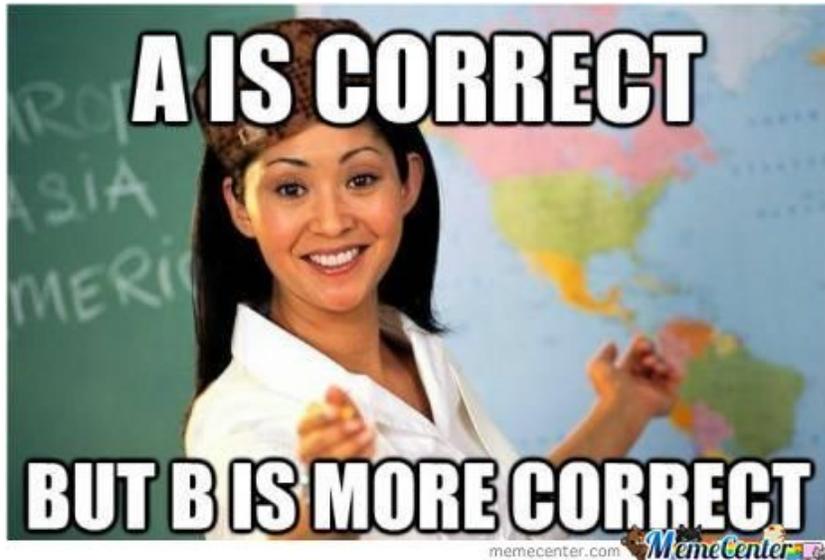
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MCQ BASICS

- Distractors



To ensure the quality of multiple-choice questions, _____.

- A. include several correct answer options**
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MCQ BASICS

- The correct answer

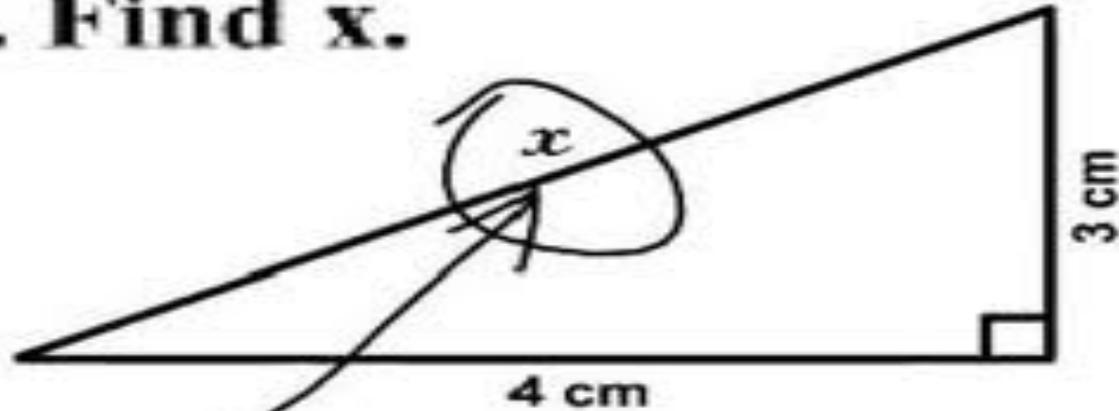
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PROVIDE CLEAR DIRECTIONS

3. Find x .



Here it is



MC ITEM FORMATS: INCOMPLETE STATEMENT

- Two formats
- Format 1: The student must select the option that correctly completes the stem

The capital of Florida is located in

- a. Orlando.**
- b. Miami.**
- c. Jacksonville.**
- *d. Tallahassee.**



MC ITEM FORMATS: INCOMPLETE STATEMENT

- Format 2: The student must select the word or words that are missing from the statement

The capital of _____ is located in Tallahassee.

- a. Alabama
- *b. Florida
- c. Georgia
- d. Mississippi



MC ITEM FORMATS: SCENARIO

- The student must answer by evaluating and drawing conclusions about the scenario provided

John and Mary Smith left Jacksonville, Florida headed for Miami, Florida at 8:00 am. They are traveling in a car at a speed of 50 miles per hour. Assuming they drive straight through without any stops, and the distance between Jacksonville and Miami is 250 miles, at what time will they arrive in Miami?

- a. 12:00 noon
- *b. 1:00 pm
- c. 2:00 pm
- d. 3:00 pm



MC ITEM FORMATS: GRAPHICS

- Students must reference the provided graphic to answer



In the map of Florida depicted above, which city is the arrow pointing to?

- a. Orlando
- b. Miami
- c. Jacksonville
- d. Tallahassee

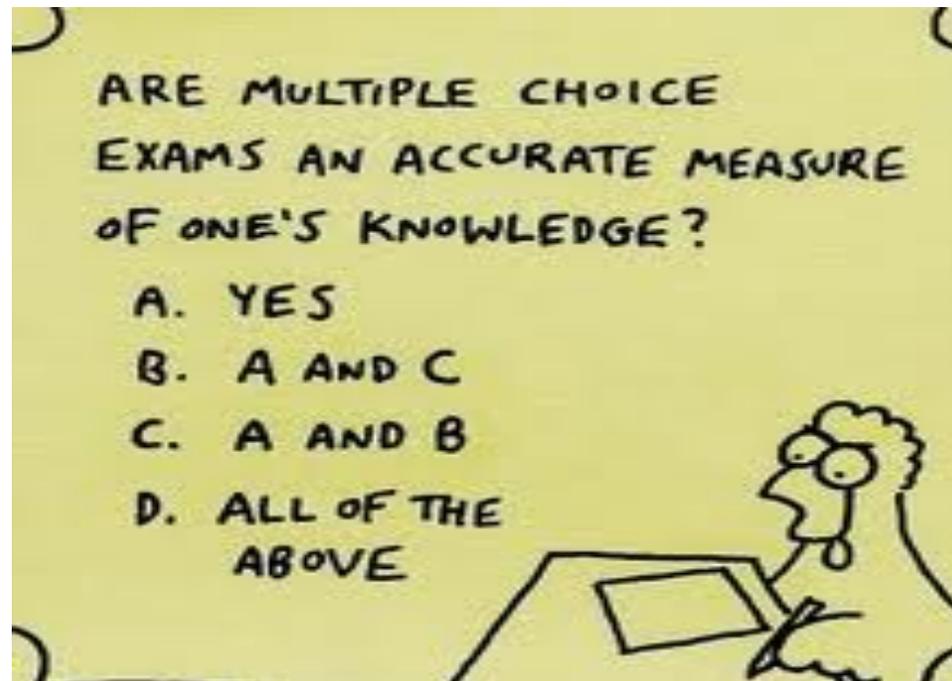


LET'S REVIEW!

- Returning to the MCQ that you created at the beginning of the workshop, how might you revise it to meet the guidelines we've discussed?



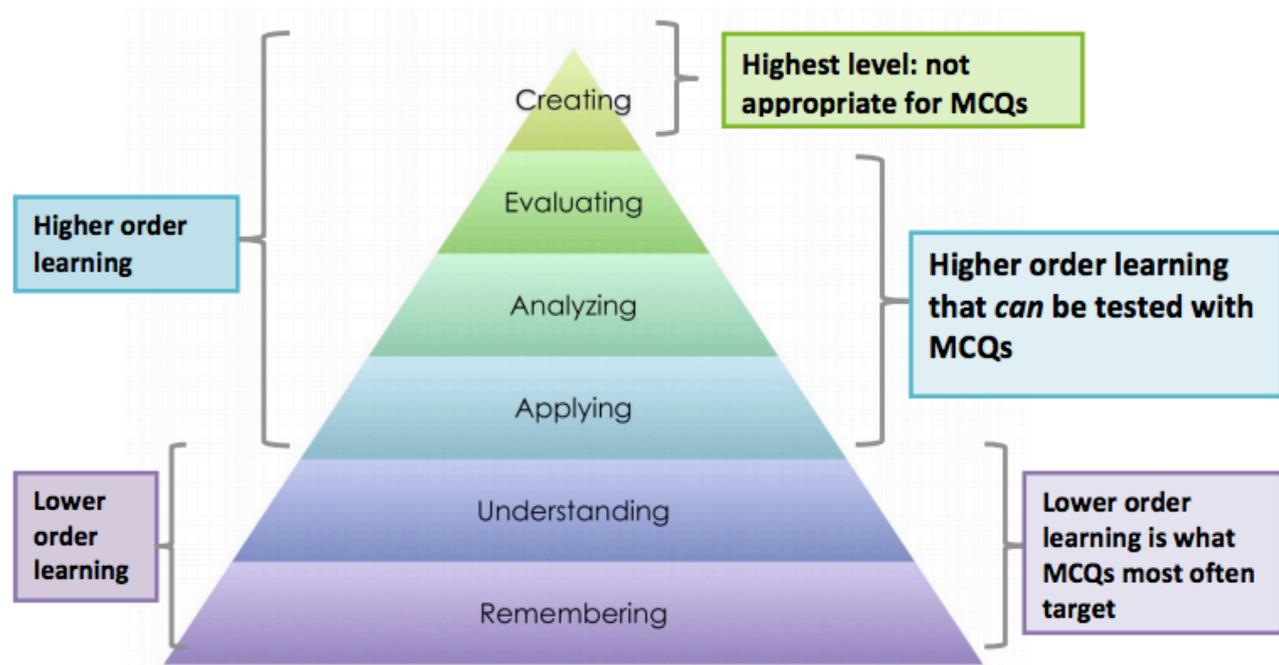
PIE BREAK!



CRITICAL THINKING

- Bloom's Taxonomy Explained

Handout: Levels of Learning & Bloom's Taxonomy¹



CLICKER QUESTION

1. Who is the author of "Das Kapital"?
 - A. Mannheim
 - B. Marx*
 - C. Weber
 - D. Engels
 - E. Michels

- Indicate which level of Bloom's this question tests:
 - A – Analyzing
 - B – Applying
 - C – Remembering
 - D – Understanding



MCQS FOR LOWER-ORDER THINKING

- Remembering – recalling information

Learning Outcome: to recall the author of a specific book.

1. Who is the author of "Das Kapital"?
 - A. Mannheim
 - B. Marx*
 - C. Weber
 - D. Engels
 - E. Michels

(Carneson, Delpierre, & Masters, 1996).



CLICKER QUESTION

2. Reliability is the same as:
- A. consistency.*
 - B. relevancy.
 - C. representativeness.
 - D. usefulness.

- Indicate which level of Bloom's this question tests:
 - A – Analyzing
 - B – Applying
 - C – Remembering
 - D – Understanding



MCQS FOR LOWER-ORDER THINKING

- Understanding – Identifying examples of a given term, concept, or principle.

Learning Outcome: to **identify** the meaning of a term.

2. Reliability is the same as:
 - A. consistency.*
 - B. relevancy.
 - C. representativeness.
 - D. usefulness.

(Gronlund, 1998).



MCQS FOR LOWER-ORDER THINKING

- Understanding – Interpreting the meaning of an idea, concept, or principle.

Learning Outcome: to **interpret** the meaning of an idea.

3. The statement that “test reliability is a necessary but not sufficient condition of test validity” means that:
 - A. a reliable test will have a certain degree of validity.
 - B. a valid test will have a certain degree of reliability.*
 - C. a reliable test may be completely invalid and a valid test completely unreliable.

(Gronlund, 1998).



MCQS FOR HIGHER-ORDER THINKING

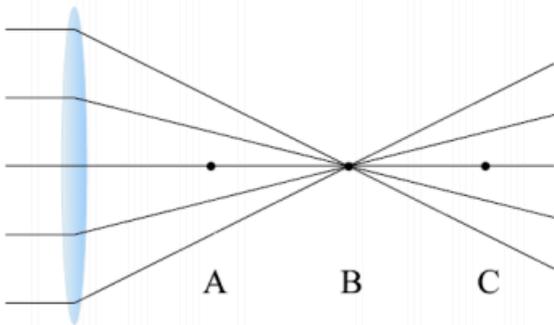
Three approaches:

1. Real-world scenarios
2. Analysis of visuals
3. The answer plus the reason why



CLICKER QUESTION

6. In the diagram below, parallel light rays pass through a convex lens and converge to a focus. They can be made parallel again by placing a:



- A. Concave lens at point B.
- B. Concave lens at point C.
- C. Second convex lens at point A.
- D. Second convex lens at point B.

- Indicate which level of Bloom's this question tests:
 - A – Creating
 - B – Evaluating
 - C – Analyzing
 - D – Applying

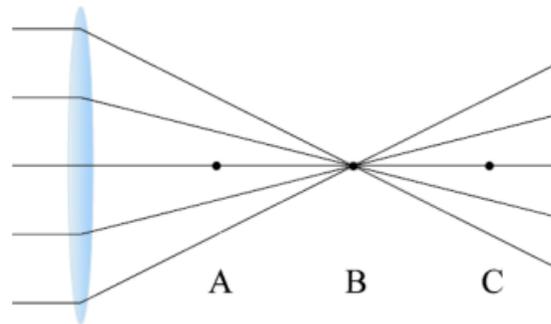


MCQS FOR HIGHER-ORDER THINKING

- Analyzing – Analyzing charts, data to support conclusions.

Learning Outcome: to **predict** effects of lenses on light trajectory.

6. In the diagram below, parallel light rays pass through a convex lens and converge to a focus. They can be made parallel again by placing a:



- A. Concave lens at point B.
- B. Concave lens at point C.
- C. Second convex lens at point A.
- D. Second convex lens at point B.



CLICKER QUESTION

1. Suppose you are given two clay balls of equal size and shape. The two clay balls also weigh the same. One ball is flattened into a pancake-shaped piece.

Which of these statements is correct?

- a. The pancake-shaped piece weighs more than the ball
- b. The two pieces still weigh the same
- c. The ball weighs more than the pancake-shaped piece

2. *because*

- a. the flattened piece covers a larger area.
- b. the ball pushes down more on one spot.
- c. when something is flattened it loses weight.
- d. clay has not been added or taken away.
- e. when something is flattened it gains weight.

- Indicate which level of Bloom's the **first part** of the question tests:
 - A – Creating
 - B – Evaluating
 - C – Analyzing
 - D – Applying



MCQS FOR HIGHER-ORDER THINKING

- Applying – Using information, rules, and procedures in concrete situations.

1. Suppose you are given two clay balls of equal size and shape. The two clay balls also weigh the same. One ball is flattened into a pancake-shaped piece.

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- Indicate which level of Bloom's the **second part** of the question tests:
 - A – Creating
 - B – Evaluating
 - C – Analyzing
 - D – Applying



MCQS FOR HIGHER-ORDER THINKING

- Evaluating – Justifying a decision or a course of action.

1. Suppose you are given two clay balls of equal size and shape. The two clay balls also weigh the same. One ball is flattened into a pancake-shaped piece.

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QUESTIONS?



WRAPPING UP

Thank you



RESOURCES

- Bothell, Timothy. Brigham Young University. 14 Rules for Writing Multiple Choice Questions <https://testing.byu.edu/handbooks/14%20Rules%20for%20Writing%20Multiple-Choice%20Questions.pdf>
- Brame, C., (2013) Writing good multiple choice test questions. <https://cft.vanderbilt.edu/guides-sub-pages/writing-good-multiple-choice-test-questions/>.
- Clark, Chris. Writing Multiple Choice Test Items. https://kaneb.nd.edu/assets/162168/mult_choice.pdf
- Teaching and Learning Services, McGill. Workshop: Designing Effective Multiple-Choice Questions. https://www.mcgill.ca/skillsets/files/skillsets/mcq_handout3.pdf
- University of Oregon Teaching and Learning Center. Writing Multiple Choice Questions that Demand Critical Thinking. https://kaneb.nd.edu/assets/261652/mc_critthink.pdf

