TRIZ: Maximizing Measurement Error

Prerequisite Knowledge	● Problems, objectives, hypotheses, and variables in studies ● Strengths and threats to validity in various study designs ● Study frameworks ● Introduction to measurement in research
Learner Setting	Classroom
Strategy Type	Small group
Time	Faculty prep: <5 minutes Delivery with students: 30 minutes Evaluation: 15 minutes
Learning Objectives	● Identify possible sources of measurement error in studies
Materials/ Resources	Markers and whiteboard
Strategy Overview	TRIZ is an acronym for a Russian inventive problem-solving strategy often used in engineering. A goal of TRIZ is to generate examples that maximize error in order to expose ways in which error may inadvertently be occurring and propose ways in which it can be corrected. In this activity, students borrow this method for nursing research. After a brief instructor-generated example of the TRIZ process, students brainstorm their own ideas related to research. They then share their ideas in small groups and generate further ideas. All examples are then written on the board and students discuss solutions.

Steps	1. Share example of applying TRIZ to a clinical problem: How do you make your patient fall?
	2. Encourage creative responses from class. Answers might include: trip him, tell her to always get up on her own, neglect hourly rounding duties.
	3. Explain how these examples may actually occur: Although I don't purposely trip my patient, what obstacles might I accidentally leave in his way? Although I don't tell my patient to always get up on her own, if I don't always tell her otherwise, this may still be the impression she gets.
	4. Introduce a research study/measurement topic to the class (i.e. a study about a community-based exercise program that is measuring blood pressure as an outcome)
	5. Have students take 2-3 minutes to individually write down as many ideas as they can about increasing measurement error in this proposed study
	6. In small groups, students take the next several minutes to share their ideas with each other and write down any more ideas that come to mind
	7. Group representatives write ideas on the whiteboard. The instructor may streamline/eliminate duplicate ideas.
	8. In their small groups, student discuss solutions for correcting the measurement error ideas displayed on the whiteboard.
	9. The instructor facilitates a class discussion of solutions.
	10. The instructor encourages students to use this critical mindset when analyzing measurement in studies, possibly tying this exercise to a research article recently discussed in class. What kinds of unseen measurement errors may have occurred?
Evaluation	Low stakes – Instructor feedback during class activity and/or credit for active participation

Crossword Puzzle Creation

Prerequisite Knowledge	● Critiquing quantitative and qualitative studies, ● Introducing meta-analysis and meta-synthesis studies
Learner Setting	Classroom or online
Strategy Type	Game
Time	Faculty Prep: 30-60 minutes Delivery with students: 2 -3 hours depending on how many sections of article critiqued Evaluation: 30 minutes
Learning Objectives	● Define and comprehend terms within research articles
Materials/ Resources	http://www.armoredpenguin.com/crossword/ Research articles of your choosing—see steps for suggestions
Strategy Overview	Each student creates a crossword puzzle using key terms they identify in a research article. The crossword puzzles they create may be used by other students in subsequent weeks. This assignment helps students comprehend various sections of a research article as they need to select keywords in each section.
Steps	1. Select and assign various nursing research articles (possibly one qualitative and one quantitative, or a meta analysis and meta synthesis) to each student 2. Assign students to various sections of each article (suggestion: background and methods, findings and discussion), or the entire article 3. Each student selects approximately 15 words and definitions based on the article, or found in other resources (statistical terms, etc.). Provide the students with the following information to set up the puzzle

4. Go to http://www.armoredpenguin.com/crossword/

5. In the title line, enter the first author of the study, and if only doing certain sections, the section used to create crossword puzzle (example: King, background and methods

6. Author's name is the name of the student creating the puzzle.

7. Description of puzzle can be name of course and course code, or name of assignment, etc. at the faculty's discretion

    For the following steps, refer to the notes on the webpage for more descriptions of options and see screen shots following instructions.

8. Set minimum number of groups to 2.

9. Start with 20 for size of square

10. Instruct students to select gray or black for preferred color. Note that if you will print these out for students to use, gray squares require less ink, black is more traditional

11. Let students know if you want all words in all capital letters, or leave as they are entered. Suggestion: leave words as entered, as spell check will notice errors more easily if you don't have words in all caps.

12. Instruct students regarding "omit words" (see cue) and determine how you want the puzzle to format (suggested to leave at "no")

13. Select "no" for free form and omit answer key

14. You have the option of using an uploaded file to create the puzzle, but students must follow formatting instructions. For the size of puzzle students create, entering the text is fine and not cumbersome.

15. Inform students of your preferred PDF font and page size

16. A 15 word puzzle can fit both cues and puzzle on one page. If you want students to create a larger puzzle, have cues and puzzle on 2 pages.

17. Instruct students on your preferences for information gap (used

	when working in pairs) and if you want a word bank created
	18. Start entering their words and cues
	19. Once all words and cues are entered, select "make puzzle" (this may take a few minutes)
	20. Once puzzle is created, students can preview, then select should select "answer key PDF", and then "printable PDF". Save both the answer key (suggest naming file "Last Name Author of Study Section Answer Key Student Surname" for ease in retrieving) and actual puzzle, and submit.
	21. One option for hybrid courses is to have students pair up and complete each other's puzzle, especially if they only did selected sections. For increased learning, students can complete puzzle on sections they did not use. NOTE that the PDF of the puzzle created is not fillable, just printable. Students could complete the printed puzzle, then scan and upload as an assignment, if they do not have problems scanning.
	22. For online courses, an additional learning option is for students to use a discussion forum after submitting their puzzle with their "takeaway" message from creating the puzzle, or any remaining questions they have about the article after creating the puzzle.
	23. For traditional (face to face) classes, students could project the puzzles they created and the class could solve the puzzles as a class, discussing the answers while solving the puzzle
	24. Note that students (and faculty) will have access to created puzzles on the Amored Penguin website for only 2 months, so saving the PDF is critical if you want to use the puzzle again, or if students want to have access to the puzzle after the 2 month time frame.
Evaluation	Low stakes, informal