MEDRI Session 2: Methodologies for MedEd Research
To Learn More Resources

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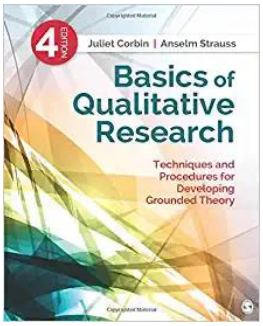
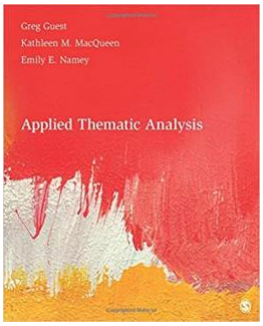
Writing review articles:
https://www.prisma-statement.org/
https://asmepublications.onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2923.2012.04328.x
https://journal.emwa.org/writing-for-lay-audiences/writing-narrative-style-literature-reviews/
https://onlinelibrary.wiley.com/doi/10.1111/eci.12931

A Guide to Basic Statistics for Educational Research:
https://www.mededportal.org/doi/10.15766/mep_2374-8265.11187

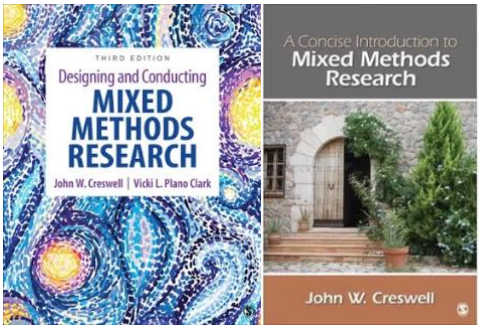
Effect size:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3444174/

Qualitative methods:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6301871/
https://www.researchtalk.com/fqsi





Mixed methods:
https://pubmed.ncbi.nlm.nih.gov/19573186/
https://www.mixedmethods.org/



AM Last Page: Common Evaluation Designs in Medical Education I

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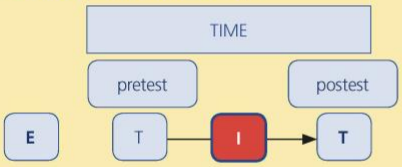
Evaluation design is important to establish that an instructional program produced the measured effects and learning outcomes. Evaluation design should help isolate extraneous factors so that differences or outcomes can be safely attributed to the instructional program. The goal of this Last Page is to describe three common program evaluation designs, along with benefits, drawbacks, and examples.

Internal validity of an evaluation measures the certainty with which educators can ascertain whether the program actually caused the effects they find. Educators should always consider threats to validity in designing program evaluation. Some of these internal validity threats (history, maturation, testing) are included in the description of some of the evaluation designs below.

Legend

E = Experimental group
C = Control group
I = Instructional program
T = Test, measurement, or observation
Rand = Randomization

One-Group Pre-Post Test Design



Example:

One group of students rotating through a medicine clerkship is given an 8-station objective structured clinical examination before and after the administration of a month-long, Web-based instructional program about the clinical presentation and diagnosis of ten common medical diseases

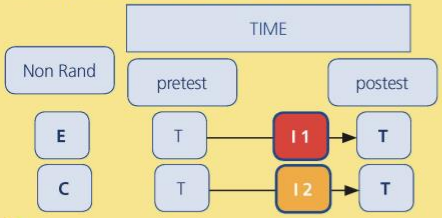
Pros:

- Easy to implement
- May be helpful for formative evaluation (e.g., to gather information that will guide program improvement), particularly if the interval of time is short

Cons:

- Internal validity threats, including both history (within the time that passes before and after the intervention, events may occur that influence the outcome) and maturation (learners may naturally grow during the time of the experiment), should be considered
- Absence of comparison group makes it difficult to assess whether extraneous variables affected the outcome

Non-Equivalent Control Group Pre-Post Test Design



Example:

Students from hospital X (group E) and students from hospital Y (group C) are selected (not randomly) and given a multiple-choice-question (MCQ) knowledge-based pretest on asthma and chronic obstructive lung disease (COPD). Group E experiences a self-directed reading program while Group C experiences a seminar-based program, involving discussion of asthma and COPD. Both groups are tested again one month later through a MCQ knowledge-based test that has the same content, but different questions, as the pretest.

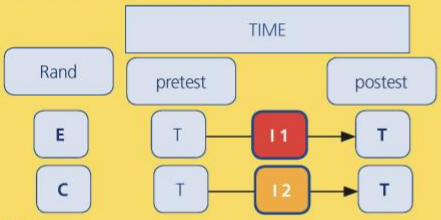
Pros:

- Feasible when randomization is not possible
- Allows for the comparison of two educational interventions
- The use of a pretest allows researchers to assess the comparability of the groups (e.g., are pretest scores the same or different between groups?) at the beginning of the program, since it is important to ensure that the 2 groups are similar at the beginning of the intervention

Cons:

- The use of a pretest can lead to testing effect; that is, students may identify certain content topics that will be on the posttest, based on test items in the pretest (e.g., the use of beta blockers in the treatment of congestive heart failure), regardless of question items being different between pre-and posttest
- Selection bias and dissimilar initial groups may be misleading and influence the outcome

True Control Pre-Post Test Design



Example:

A group of students are randomly assigned to either the E group or the C group at the beginning of the academic year (or at the beginning of a rotation). Group E experiences a small-group discussion instructional program and Group C experiences a video-based program with facilitators. Both groups learn about the diagnosis and treatment of osteoarthritis. Both groups are tested through a MCQ, knowledge-based test before and after administration of the programs.

Pros:

- Randomization assures group equivalence and eliminates selection bias
- Eliminates many of the internal threats to validity, thus yielding stronger conclusions about the outcome

Cons:

- Randomization may be challenging in medical education settings, particularly when classes and rotations are predetermined
- If the pretest is reactive (i.e., the content of the pretest may cause students to focus their study on specific program material), it may influence the outcome of the evaluation

References:
Cresswell JW. Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research. Upper Saddle River, N.J.: Pearson/Merrill Prentice Hall; 2008.
Fitz-Gibbons CT, Morris LL. How to Design a Program Evaluation. Newbury Park, CA: Sage; 1987.
Popham WJ. Educational Evaluation. 3rd ed. Boston: Allyn and Bacon; 1993.
Rossi PH, Freeman HE, Lipsey MW. Evaluation: A Systematic Approach. 6th ed. Thousand Oaks, CA: Sage; 1999.
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Common Evaluation Designs in Medical Education II

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The goal of this Last Page, a follow-up of a previous Last Page,[1] is to describe two additional evaluation designs, including their advantages and challenges, and to provide an example for each. We also mention any relevant internal threats to the validity of each design such as the effect of reactive testing.

True control posttest only

Example: A group of students are randomly assigned to either the E or C group at the beginning of a rotation. Group E is given a small-group discussion instructional program (I 1), and group C is given a video-based program with facilitators (I 2). Both groups are tested with an MCQ knowledge-based test after administration of the programs.

Pros:

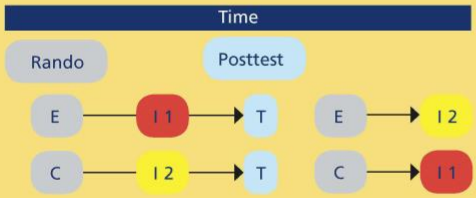
- Randomization can assure group equivalence and eliminates selection bias.
- Lack of pretest eliminates the threat of reactive testing (i.e., the content of the pretest may alert students to focus on specific topics).

Cons:

- Randomization may be challenging in medical education since denying a potentially effective educational program to some students may influence learning and final grading (However, the modified true control posttest-only design [see below] can address this issue).
- Without a pretest, researchers cannot be sure that the two groups have the same level of knowledge or skills at the beginning of the program (i.e., pretest scores may be different between groups).

Legend
E = experimental group; C = control group; I = instructional program; T = test, measurement, or observation; Rando = randomization

Modified true control posttest-only design



Example: A group of students is randomly assigned to either the E or C group at the beginning of a rotation. Group E is given a Web-based instructional program (I 1), and group B is given a lecture-based program (I 2). Both groups are tested with an MCQ knowledge-based test after 1 month. After the test, the group (E) that received the Web-based program is given the lecture-based program, and the other group (C) is given the Web-based program for 1 additional month.

The true control posttest-only design can be modified by creating a design wherein after the posttest, the instructional programs are switched between the two groups, so that each receives the program they had not previously received. This design ensures that no students are denied the opportunity to potentially learn from a different program.

Pros:

- All students, regardless of which group they are assigned to, receive the experimental program; thus, no student is denied the learning experience.

Con:

- The true control posttest-only design is more resource intensive and requires more time to complete.

Disclaimer:
The views in this Last Page are those of the authors alone and do not necessarily represent those of the US military, the Department of Defense, or the federal government of the United States.

Reference:
1. Torre DM, Daley BL. AM Last Page: Common evaluation designs in medical education. Acad Med. 2013;88:1784.

Additional resources:
- Fitz-Gibbon CT Morris LL. How to Design a Program Evaluation. 2nd ed. Newbury Park, CA: Sage; 1987.
- Popham WJ. Educational Evaluation. 3rd ed. Boston, MA: Allyn and Bacon; 1993.
- Cresswell JW. Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research. Upper Saddle River, NJ: Pearson/Merrill Practice Hall; 2008.
- Rossi PH, Freeman HE, Lipsey MW. Evaluation: A Systematic Approach. Thousand Oaks, CA: Sage; 1999.

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MCQ indicates multiple-choice question.