

QUESTIONS TO GUIDE THE READING OF EXPERIMENTAL AND QUASI-EXPERIMENTAL RESEARCH

THE RESEARCH PROBLEM

1. State the specific research problem (hypothesis or question) that this research will study (test or answer)? Does the author state the problem, or must you infer it? What assumptions does the researcher make in deriving this research question? State them.
2. State how the author deduces the research problem (hypothesis or questions): from theory, previous research, observation, or a combination of any of these three. In deducing the research problem, does the reviewer summarize and critique each of the various references and synthesize them in a cohesive and logical manner? Does the review include both old and current research? What does the author tell you (not tell you) to make you believe s/he has (has not) reviewed all relevant literature?
3. State the significance of the research problem (hypothesis or question). Is the research problem significant; i.e., is it important to answer the research problem? Why? (Will it contribute to (a) theory or knowledge base, (b) improvement of teaching and learning, or (c) improvement of methods of conducting research?) Is the significance stated or implied, or is it left to the reader to infer it?
4. Is there a need for this study? That is, is it necessary to conduct another study to answer the research problem? State how you know that there is a need for this study.

The Design and Methodology

A. THE INDEPENDENT VARIABLES

1. Exactly what are the independent variables of the study? That is, what is it that the researcher will be manipulating? State each of these independent variables.
2. What are the conditions or levels of each independent variable? How have the conditions or levels of the independent variables been specified, defined and operationalized? State these specifications.
3. Are these independent variables and their levels or conditions appropriate for the stated research problem? State how they are or are not appropriate.

B. THE DEPENDENT VARIABLES

1. What are the dependent variables? That is, what variables are the independent variables designed to affect? Name these dependent variables. Are these dependent variables valid? State their validity or lack of validity.
2. What are the measures of the dependent variables (i.e., how will variation or change in the dependent variable be measured)? What are the reliability and validity of these measures of the dependent variables? State their validity or lack of validity.
3. Are the measures of the dependent variables appropriate indices of the dependent variable? State this appropriateness.

C. THE SAMPLE

1. What is the sample(s) and how large is it?
2. What target population does the sample represent?
3. How was the sample selected from the population?
4. Is the sample an adequate representation of the population? State exactly how the sample is or is not an adequate representation of the population.
5. Are the population (from which the sample was selected) and the sample itself appropriate for the stated research problem?
6. How were members of the sample assigned to experimental conditions?
7. Do you think that the selection of the sample and the assignment of the sample to experimental conditions meet the standards of random selection and random assignment? State the basis of your answer.

D. THE PROCEDURES

1. What is the research design? State the design in (a) the nomenclature of research design (e.g., a 2-way ANOVA with repeated measures on the second factor), (b) ordinary words, and (c) visual or graphic form. If the design is an ANOVA, ANCOVA, MANOVA or MANCOVA, construct a skeletal source table that will allow you to make a record of the statistical results.
2. How are the conditions of the independent variables to be administered to the sample? Is the administration of the treatments appropriate for the research problem? That is, how strong is the internal validity of the design and procedures? State how this administration is or is not appropriate.
3. How are the measures of the dependent variables administered? Is the procedure for administering the measures of the dependent variables appropriate for the research problem? State how this administration is or is not appropriate.

THE DATA ANALYSES

1. What data from the measures of the dependent variables are to be analyzed? Are these the appropriate data to be analyzed in relation to the research problem? Would the use of alternative data or quantification procedures affect the results?
2. What statistical hypotheses are being tested? Are the statistical hypotheses directional—one-tailed tests? If they are, what theoretical or logical basis is proffered to support this directional test?
3. How are the data analyzed? Describe these analyses in words and in visual or graphic form. That is, be able to state or display what groups are being contrasted and what measures for these groups are being contrasted.
4. Are the measurement scales used to measure the dependent variable (i.e., nominal, ordinal, interval, ratio) appropriate for the statistic deployed?
5. Are all the appropriate data analyzed? Are all the appropriate contrasts between groups made?

THE FINDINGS

1. What are the findings reported? State the findings in both words and visual or graphic form.
2. Do the findings that are reported directly relate to the research problem for which the study was conducted?
3. Are the findings supported by the results of the data analyses?
4. Are the findings confounded with other important variables or traits?
5. Are all of the findings stated? If there are findings that should have been reported, but were not, what effect does this have on reported findings?
6. Are statistically significant findings educationally significant?

THE CONCLUSIONS

1. What are the stated conclusions?
2. Are the stated conclusions supported by the findings and logical deduction from the findings? Does the researcher have a "stake" in the findings, and if so, are the findings slanted toward his or her stake?
3. Are the stated conclusions related to the original research problem? How are the stated conclusions related to previous research?
4. Are all the pertinent conclusions stated?
5. Are alternative hypotheses or alternative explanations of the findings proffered? If so, are they discounted by logic or previous research or does the researcher offer these alternative explanations as significant future research problems?
6. Are the limitations or the qualifications of the findings and conclusions provided? State the specific qualifications that accompany the conclusions.

AN OUTLINE OF THE FACTORS THAT COULD JEOPARDIZE THE EXTERNAL AND INTERNAL VALIDITY OF EXPERIMENTS

I. Internal Validity

Internal validity refers to the quality and quantity of research controls in the experiment. Internal validity asks the question, "did in fact the experimental treatments make a difference in this specific experimental instance?" (Campbell & Stanley, 1966, p. 5). That is, is the statistically significant difference between the experimental treatment group and the other group(s) due to the experimental treatment, or are other factors confounded with or the cause of the experimental effects.

A. Effects that might have caused statistically significant experimental treatment effects OR have been confounded with treatments

1. History
2. Maturation
3. Pre-test effects
4. Instrumentation
5. Statistical regression
6. Selection bias (nonequivalence)
7. Attrition
8. Selection/maturation interaction

B. Effects that might have caused statistically non-significant experimental treatment effects

9. Sample size too small
10. Poor measure of the dependent variable
11. Weak treatment fidelity
12. Insufficient treatment length
13. John Henry effect
14. Treatment diffusion

II. External Validity

External validity refers to the generalizability of the experiment's findings. It is presumed that all experiments are conducted for the purpose of generalizing to another and larger group, called the target population. If an experimental effect is found, then "to what population, settings, treatment variables, and measurement variables can this effect be generalized?" (Campbell & Stanley, 1966, p.5).

A. Population Validity

1. Non-comparability of sample or accessible population to target population
2. Subject-trait / experimental treatment interaction

B. Ecological Validity

3. Non-comparability of research setting to natural setting
4. Hawthorne effect
5. Novelty / disruption effect
6. Multiple-treatment interference (repeated measures)

C. Validity of Operations

7. Definition of independent variable
8. Definition of dependent variable
9. Experimenter effects
10. Task effects
11. Placebo effect
12. Lawn mower effect