Abstract

This document is designed to help education researchers plan similar research programs. Sections are organized by the chronology for developing a series of studies. First, we will discuss how exploratory research can suggest theories and causal models, but cannot test them. Second, we will describe testable research hypotheses and how to conduct adequately-powered, appropriately designed experiments. Third, we will discuss the treatment of data and how to choose the most appropriate statistical tests. Fourth, we will discuss how to interpret results and prepare them for publication.

There are few correct answers in research design and analysis: many methods can be used to address the same problem. Methodologists disagree, sometimes vehemently, about the appropriate use and interpretation of certain designs and statistics. The process of data analysis and the conventions for reporting results are constantly changing as scientists and editors adjust to new methodologies and fields of study. However, the basic premises of the scientific method are constant. Throughout the document, several of these points are highlighted as cardinal rules. The cardinal rules in this document describe widely-agreed upon truths of research, some of which are commonly misunderstood by novice researchers.

Our focus is on quantitative research design, so qualitative methods and analysis will not be described. Measurement, the art of translating real world concepts into observable quantities, is an enormous field, too complicated to be treated thoroughly in this document. We will address some aspects of measurement important to research design, but will leave much of the theory of measurement and operationalization to other authors.

This document is intended to be a guide to help a researcher plan, implement, and report empirical studies that are informative and useful to a broader scientific audience. We assume the reader has some familiarity with statistics and some experience using a statistical software package or two, but we use no math in our descriptions. A wide variety of complex and obscure methodological and statistical methods is available to researchers, but the concepts described in this document are common, widely accepted, and used consistently in the social science research literature.

Bio

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