

Chapter 14

Making the Grade: Reporting Educational Technology and Teacher Knowledge Research

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ABSTRACT

This chapter examines issues surrounding the design of research in educational technology and teacher knowledge. The National Research Council proposed a set of principles for education research that has not been applied consistently to teacher knowledge and education technology research. Although some studies address reliability of measures, few adequately address validity or threats to validity or the trustworthiness of their designs or findings. Special attention is given to the need for explicit connections between the study purpose and guiding theoretical frameworks and previous research. This volume provides examples of studies addressed these design issues and includes a checklist of questions and additional resources to aid future researchers in developing rigorous, scientific research.

INTRODUCTION

This handbook shares a variety of educational technology research studies to demonstrate not only current trends in educational technology, but also current practices of educational research. Education research is a highly contested field

(Shavelson & Towne, 2002) and has been criticized for a lack of structure and rigor (Brickhouse, 2006; Levine, 2007; National Academy of Sciences – National Research Council [NAS-NRC], 1999): “In no other field are personal experience and ideology so frequently relied on to make policy choices, and in no other field is the research base so inadequate and little used” (NAS-NRC, 1999, p.1). This chapter examines evidence standards

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for reporting research and presents a checklist to help future researchers adhere to the National Research Council's six principles for conducting rigorous, scientific research.

Evidence Standards

Extensive efforts have been made to respond to the challenge laid out by NAS-NRC by improving the rigor of educational research, increasing the relevance of educational research for practitioners, and defining characteristics of high quality evidence. The No Child Left Behind Act (NCLB, 2001) defined scientifically-based research as requiring

the application of rigorous, systematic, and objective procedures to obtain reliable and valid knowledge relevant to education activities and programs; and includes research that (i) employs systematic, empirical methods that draw on observation or experiment; (ii) involves rigorous data analyses that are adequate to test the stated hypotheses and justify the general conclusions drawn; (iii) relies on measurements or observational methods that provide reliable and valid data across evaluators and observers, across multiple measurements and observations, and across studies by the same or different investigators; (iv) is evaluated using experimental or quasi-experimental designs in which individuals, entities, programs, or activities are assigned to different conditions and with appropriate controls to evaluate the effects of the condition of interest, with a preference for random-assignment experiments, or other designs to the extent that those designs contain within-condition or across-condition controls; (v) ensures that experimental studies are presented in sufficient detail and clarity to allow for replication or, at a minimum, offer the opportunity to build systematically on their findings; and (vi) has been accepted by a peer-reviewed journal or approved by a panel of inde-

pendent experts through a comparably rigorous, objective, and scientific review (p. 1964-1965).

Criteria iii and iv speak to the quality of evidence used to make inferences. The six Scientific Principles from the National Research Council (Shavelson and Towne, 2002) mirror the NCLB criteria and can serve well to guide researchers in their pursuit of educational research.

1. Pose Significant Questions That Can Be Investigated Empirically
2. Link Research to Relevant Theory
3. Use Methods That Permit Direct Investigation of the Question
4. Provide a Coherent and Explicit Chain of Reasoning
5. Replicate and Generalize Across Studies
6. Disclose Research to Encourage Professional Scrutiny and Critique

Whitehurst (2002) claimed that the wide array of evidence sources in research do not provide the same level of inferential validity. He laid out a hierarchy of six evidence levels from most valid for inference to least: "(1) randomized trial (true experiment), (2) comparison groups (quasi-experiment), (3) pre-post comparison, (4) correlational studies, (5) case studies, and (6) anecdotes" (p. 15). This hierarchy was not intended to narrow the scope of research as many have contended (e.g., Barone, T., 2007; Brickhouse, 2006; Donmoyer, R., & Galloway, F., 2010; Phillips, 2005; Schoenfeld, 2006; & Viadero, D., 2007), but to provide guidelines for evaluating evidence presented through research. Shavelson and Towne (2002) agreed with this principle: "What makes research scientific is not the motive for carrying it out, but the manner in which it is carried out" (p. 20). To that end, research supported through the Institute of Education Sciences includes five different goals, permitting a wide array of methodologies that have been determined to align with a particular type of evidence desired (IES, 2010). Only two

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