



Examining study attrition: Implications for experimental research on professional development[☆]

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ABSTRACT

As teacher professional development research includes more experimental designs, new challenges arise. We examine the threat of participant attrition as an example of the types of problems researchers face. Counter-intuitively, higher levels of recruitment effort were related to higher dropout rates among teachers. We also found that teachers left because of changes in teaching assignments, institutional challenges, and personal challenges. Finally, the majority of teachers in urban schools dropped out, while the majority of teachers in rural or suburban schools remained. We conclude with recommendations for future teacher learning experiments.

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1. Introduction

Professional development program offerings may vary greatly around the world (Cobb, Darling-Hammond, & Murangi, 1995; Schleicher, 2011), but there is widespread agreement that teacher professional development in its many forms is a key component for the success of substantive reform programs in education (Committee on Science and Mathematics Teacher Preparation, 2001; Guskey, 2002; Villegas-Reimers, 2003). The field's understanding of what makes professional development effective is constantly improving (see e.g., Garet, Porter, Birman, Desimone, & Yoon, 2001; Kudenko, Ratcliffe, Redmore, & Aldridge, 2011; Wayne, Yoon, Zhu, Cronen, & Garet, 2008; Wilson & Berne, 1999), and the methodologies employed to study professional development are rapidly evolving (Borko, 2004). As yet, however, there are relatively few studies of teacher learning from professional development that employ experimental designs with randomized

assignment, described as a "gold standard" for research by the 2002 U.S. National Research Council report entitled *Scientific Research in Education* (Shavelson & Towne, 2002). For instance, in a review of ten years of international research on professional development published in *Teaching and Teacher Education*, Avalos (2011) cites no studies conducted using randomized experimental designs. Hilda Borko (2004), in her American Educational Research Association Conference Presidential Address, pointed to experimental designs as critical for understanding the effects of any particular professional development approach as compared to others. It is important for research on teacher learning from professional development to employ a range of methodologies, from case-studies and close-up design-based work to larger-scale studies that can examine causal effects (Wayne et al., 2008). But with different methodologies come different methodological challenges. In this paper, we examine the challenge of *participant retention* as it relates to studies of professional development employing experimental designs.

The challenge of participant retention exists for research studies across the social sciences (Ahern & Le Brocque, 2005). In experimental designs, it is important to establish the number of participants required to achieve statistical power in order to be able to detect treatment effects (Cohen, 1988). Attrition becomes problematic in experiments when loss of participants compromises the chances of detecting the effects being studied. Attrition is particularly problematic, because it can result in biased estimation of

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treatment effects and potentially compromise the internal validity of study estimates (Barry, 2005; Shadish, Cook, & Campbell, 2002). Furthermore, depending on the nature of the attrition, the external validity of the study design can also be compromised. For instance, if the intent of the study is to understand how school socio-economic context is related to the effects of teacher professional development, attrition primarily among teachers from low socio-economic status schools may make it impossible to properly address the main question of the research.

We examine participant retention in the context of an experimental study of professional development supporting teachers learning to implement a new environmental science curriculum, with a focus on this issue from the perspective of *study attrition*, when teacher participants leave the study. A better understanding of issues related to attrition can help researchers make more informed decisions about how to recruit, and hopefully retain, participants in experimental research studies of professional development. If the field does not develop a more nuanced understanding of attrition in experimental studies, it will continue to be difficult to understand the causal effects of professional development programs, a necessary step in the continuing progress of the field to design, develop, and validate successful professional development approaches (Borko, 2004). In particular we investigate issues that have implications for internal and external validity raised by attrition in experimental studies, examining the following research questions: Why did teacher participants leave our study? What characteristics of participants are related to study attrition? What characteristics of participants' teaching contexts are related to study attrition?

2. Literature review

2.1. Why do we care about attrition?

Contemporary research on teacher professional development focuses on improving teacher learning and practice and, in turn, improving student achievement (Fishman, Marx, Best & Tal, 2003; Cobb, 2000; Desimone, 2009; Garet et al., 2001). Examining these links between professional development, teacher learning, teacher practice, and student learning in an effort to document impacts on achievement takes time – often in the form of study designs with extended durations or longitudinal study designs (Kubitskey & Fishman, 2007; Borko, 2004; Desimone, 2009; Wayne et al., 2008). However, any study that requires extended participation leads to challenges for retention, a phenomenon that has been observed in many different fields. For example, in medicine, Capaldi and Patterson (1987) found that the longer the study's duration, the more likely they were to lose participants. This is likely to be the case with teacher participants as well.

Set against this observation about a negative relationship between duration and retention is a persistent finding in the professional development literature that programs should provide teachers with sustained learning experiences (e.g., Kubitskey, 2006; Banilower, Heck, & Weiss, 2007; Supovitz & Turner, 2000). This is usually interpreted to mean both professional development that takes place over months or years, and also as professional development that requires a substantial time commitment on the part of teachers. Yet "onerous" time demands are also thought to affect study attrition (Navratil, Green, Loeber, & Lahey, 1994). Thus the field is faced with a dilemma, in that the professional development designs that are thought most likely to lead to successful outcomes are also those which will be hardest to study experimentally due to increased risk of participant attrition.

Attrition is a serious threat to research because it can impact the probability of detecting main effects of interventions and presents

a serious challenge to the validity of findings if there is differential attrition across research conditions that will likely bias the estimates (Ahern & Le Brocque, 2005; Barry, 2005; Konstantopoulos, 2011; Song & Herman, 2010). If teachers leaving one study condition have different characteristics than those leaving another condition, then attrition is differential, which may compromise random assignment, threatening internal validity. A similar argument holds for external validity in that if drop-outs have different characteristics than teachers who complete the study, generalizability of results to the original target population may be threatened since the final sample may represent a population that differs from that intended in the study design. For example, if the participants who leave a study share common characteristics that are central to the research, such as similarities in demographics or teaching contexts, this will compromise the validity of the estimates (Cordray & Polk, 1983). In large-scale or extended studies of teacher learning, the factors that influence study attrition fall both within and beyond the control of study investigators and include the nature of the research activities, such as long-term or time-intensive data gathering efforts with teacher participants, as well as institutional and organizational tensions, such as changes in teachers' work assignments or responsibilities.

2.2. How can we reduce attrition? Evidence from the literature

Approaches for mitigating study attrition have been addressed in literature across many fields: medicine/psychology (Bains, Pickett, & Hoey, 1998; Glasser, 2008; McFarlane, 2007; Ribisl et al., 1996), social science (Ahern & Le Brocque, 2005) and education (Valentine & McHugh, 2007). A number of suggestions related to retaining study participants have emerged. For instance, McFarlane (2007) and Ribisl et al. (1996) emphasize the importance of having comprehensive contact information for participants, so that there are multiple means of follow-up should the initial means of contact stop working for whatever reason. It is important to have both formal and informal relationships with public and private agencies (McFarlane, 2007), such as with administrators who may make decisions affecting teacher participants. Having a recognizable identity or "brand" for the research project can help in this regard (Ribisl et al., 1996), allowing participants to self-identify as members of a community. These points speak to the importance of developing relationships with participants that go beyond the formal "contract" of the research (e.g., Capaldi & Patterson, 1987; Navratil et al., 1994), to help develop trust and also a sense of shared responsibility. Finally, there has been much discussion about the trade-offs of monetary rewards (e.g., Bains et al., 1998; Glasser, 2008; McFarlane, 2007). Participation can often be its own reward (especially when participation means receiving professional development intended to help accomplish one's teaching goals), but providing cash incentives can encourage participants to complete data collection requirements.

There has been, however, little research that examines how to buffer against the influence of contextual factors (e.g., study demands and organizational tensions) on study attrition (Ribisl et al., 1996). As such, there remains a need to examine the causes of attrition and the characteristics of teacher participants who are likely to leave studies of professional development to help us be proactive in future experimental research designs on teacher learning. Most of the work cited above was conducted with participant populations outside of education. Do observations from those contexts also apply to teachers who, unlike participants in many health and social science studies, often participate in research in the context of their everyday work, and therefore have a professional stake in the research and how it is conducted?

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