Chapter 26
Mobile Technology in Higher Education:
Patterns of Replication and Transferability

Meghan Morris Deyoe
University at Albany (SUNY), USA

Dianna L. Newman
University at Albany (SUNY), USA

Jessica M. Lamendola
University at Albany (SUNY), USA

ABSTRACT

Innovative instructional strategies and approaches are in high demand in STEM higher education. Currently, interest lies in the integration of mobile technology within these settings to provide learning opportunities that are flexible and feasible enough to increase student understanding using critical inquiry. Although the positive impact of the use of mobile technology in many pilot settings is known, there are still numerous questions left unanswered in relation to the effectiveness of the use of mobile technology as it is replicated from developer across enthusiastic replicator use to required use. This chapter examines the replication and transferability patterns related to the use of a mobile technology device within and across multiple instructors, settings, context, and content areas. Key variables explored relate to student and instructor prior use and experience with the mobile technology, pedagogical goals, and similarly, content and context to original use.

INTRODUCTION

With the continuous development and expansion of mobile technologies comes the need for more planned integration into education. This is especially true in the areas of science, technology, engineering, and math (STEM), the domains which spawned much of technology's early development and use. This growth has left the field with a plethora of resources, tools, pilot curricula, and eager instructors, but very little confirmation of evidence-based use and outcomes.

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What we do know, however, is that in the STEM domain, incorporating technology into teaching and learning is fundamental if we are to represent and meet twenty-first century needs of students (DeHaan, 2005). Surprisingly, greater inclusion in higher education, the site of much of STEM's digital development, is especially needed. Inclusive, purposeful technology use within advanced and applied STEM settings is essential if today's students are to learn to navigate through complex problems that will prepare them for the future; today's students are tomorrow's professionals and they must have the ability to use flexible digital resources to solve problems efficiently and effectively if they are to move the society to new levels of economic greatness (Newman, Clure, Morris Deyoe, & Connor, 2013; Newman, Morris Deyoe, Lamendola, & Clure, 2014). To achieve the professions and society's goals, future workers need not only to be able to problem-solve and navigate through technology, they also must be able to combine their communication skills, their professional knowledge, and their work styles.

To meet these twenty-first century needs, both within the classroom and in future employment, more digitally supported devices, especially mobile devices, are being designed, developed, and piloted. The first generation impact of these tools is known; pilot studies show that mobile technology and its use enhances and promotes knowledge, both short-term and long-term, when coupled with active experimentation grounded in authentic settings (Hwang & Chang, 2011; National Council for Accreditation, 2008; Sultan, Woods, & Koo, 2011; Wong, Chin, Tan, & Liu, 2010). Most of the results of these studies, however, are limited in that they are based solely on use by developers or enthusiastic replicators. What we do not know is what happens to implementation, outcomes, and long-term adaptation of tools when the use of these devices becomes ubiquitous. Many questions still remain; for example: Are planned processes still used? What adaptations are crucial? How much prior user training is needed for the "typical" instructor? And, what developmental stages of instruction are supported?

A key area open for debate is the state of replicated use. Wiggins and McTighe's (2005) research on, and investigation of transferring new educational resources into practice suggests that to reap the benefits of using mobile technology as a means of enhancing learning, instructors must know not only how to use the new technology, but also how to integrate the tool into meaningful learning experiences. Research suggests, however, that in cases where technology and course materials are implemented solely on perception of content and industry needs, generally by the person who developed and designed the material, student learning outcomes and perceptions, are positive at first use, but tend to decline when materials are adopted by a non-developer instructor (Cordray, Harris, & Klein, 2009; Newman et al., 2013; Teclehaimanot, Mentzer, & Hickman, 2011). These studies suggest that something appears to be lost when technology, especially mobile technology, goes "ubiquitous." Very little research has tracked this "loss" and determined when, where, and how much of it occurs.

This chapter attempts to begin a discussion of that loss and how to counteract it when using mobile technology in authentic education approaches. The chapter documents the patterns of replicability and transferability of a multiyear project which focused on replication and transferability of authentic use of a mobile hand-held technology across multiple contexts, pedagogies and practicums, tracking changes as the device moved from development to mass integration in undergraduate STEM courses. The chapter attempts to develop a pattern of use and subsequent outcomes detailing:

1. Issues related to replicability across content, context, sites, and instructors, and
2. Unexpected transferability to external, unplanned use.