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A FRAMEWORK FOR PROMOTING TEACHER SELF-EFFICACY WITH MOBILE REUSABLE LEARNING OBJECTS

BY

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Dedication

This dissertation is dedicated first and foremost to my family. My wife and children have supported me throughout my doctoral studies and research, and have given me the strength and the desire to be the best person, and the best teacher that I can possibly be. I also dedicate this dissertation to learners everywhere (including teachers). I can only hope that this dissertation contributes to making their learning experiences more relevant, effective, and enjoyable.

Acknowledgements

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Collaborative Situated Active Mobile (CSAM) learning design framework was worth pursuing as the topic of this dissertation research study. Drs Cristol and Gimbert were instrumental in developing the concept for the CSAM professional development course, and in my partnership with Ohio State University for this study. Dr. Cristol, along with Dr. Marguerite Koole, have also provided me with tremendous support and advice throughout the process of planning and conducting my dissertation research, and preparing this dissertation document.

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Finally, I would like to acknowledge my family for supporting me throughout my doctoral studies, and for putting up with the many hours I have dedicated to the completion of this dissertation.

Abstract

Recent calls have been made to shift the focus of mobile learning discussions from technical implementation to pedagogical strategies. However, a lack of a sense of self-efficacy amongst educators has been identified as a barrier to the successful integration of mobile learning resources into teaching practice (Ally, Farias, Gitsaki, Jones, MacLeod, Power & Stein, 2013). This research study outlines the distillation of the Collaborative Situated Active Mobile (CSAM) learning design framework, which represents the key pedagogical components of collaborative mobile reusable learning objects (RLOs). This study examined increases in teachers' perceptions of self-efficacy with mobile learning after participating in an online professional development course focused on using CSAM to guide the design and development of mobile RLOs. A mixed-methodologies approach was used to measure changes in perceptions of self-efficacy, and to contextualize participants' perceptions of the influence of the CSAM framework. After completing the professional development course, participants were motivated to integrate mobile RLOs into their teaching practice. Participants also felt more confident with using mobile RLOs, and they perceived the CSAM framework to be a useful tool for providing guidance for instructional design and reflective practice. The findings from this study are consistent with the rationale behind recent professional development policy recommendations (DeMonte, 2013; Koehler & Mishra, 2008; mdk12.org, 2014; National College for School Leadership, 2003), and add further support to calls to contextualize educational technology training in the context of supporting pedagogical decision-making. Findings from this study have resulted in recommendations for improvements for future iterations of the CSAM professional development course, as well as recommendations for future research into the use of pedagogical frameworks to help teachers increase their perceptions of self-efficacy with mobile learning.

Preface

The Collaborative Situated Active Mobile (CSAM) learning design framework has evolved from efforts to emulate examples of facilitating collaborative learner interactions using mobile reusable learning objects (RLOs). It began as a mental conceptualization of the central pedagogical design of mobile RLOs constructed for a research project at College of the North Atlantic-Qatar (Power, 2012b, 2013c). That conceptualization allowed the instructional design process to focus on teaching and learning practices during the development of set of mobile RLOs using free, online web-authoring and social networking tools. Following that project, the CSAM framework emerged as a distillation of the key pedagogical elements represented in recent case studies of the use of mobile RLOs to facilitate collaborative learner interactions. Those case studies are presented in Chapter II, along with the theoretical underpinnings of CSAM.

The guiding question behind this research was whether the CSAM framework, in combination with the removal of the cognitive load associated with mastering web and multimedia authoring tools, could help teachers to increase their interest in, and sense of self-efficacy with the integration of mobile RLOs for collaborative learning in teaching and learning practice. This research study used a mixed-methodologies approach to triangulate changes in perceptions of self-efficacy amongst participants in an online course focused on using the CSAM framework to guide the development of mobile RLOs. This study represents the first phases of ongoing design-based research (DBR). Future DBR phases stemming from this research study will focus on iterative improvements to the design and content of the online professional development course.

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List of Nomenclature and Acronyms

Alpha Testing – Initial testing of a learning resource, assessment, or data collection instrument conducted by soliciting feedback from expert peers.

Android™ – An open source mobile device operating system developed by the Google™ corporation.

App – Originally abbreviated from the term application, meaning a computer software program. An app is an application designed to perform a smaller range of tasks than a full-scale computer program, and is usually designed to be installed and run on a mobile device (Bogost, 2011).

AR – Augmented Reality.

Artifacts – information, physical or virtual objects, or new skill sets resulting from engagement in learning.

Autonomous – To engage in activities independently.

Beta Testing – See Pilot Testing.

Canvas™ – An open online learning management system platform managed by Instructure.

Cognitive Load – The amount of information that a learner must process at a given point in time.

Cognitive Overload – A potential problem that may arise when the amount of information that a learner must process at a given point in time exceeds mental capacities.

Collaborative Learning – Any activities in which participants are mutually engaged towards the achievement of a shared goal.

Conceptual Framework – A chart, diagram, or graphic, illustrating the interplay of influencing factors and emerging problems, issues, or questions, on research purpose, questions, and design.

Cooperative Learning – Any activity in which participants may be mutually engaged, but with the aim of accomplishing differing objectives.

CSAM – Collaborative Situated Active Mobile learning design framework.

DBR – Design-Based Research.

Epistemology – a view of the actual nature of knowledge and “how it can be acquired, and how communicated to other human beings” (Cohen, Manion & Morrison, 2011, p. 6).

FRAME – Framework for the Rational Evaluation of Mobile Education (Koole, 2009).

Framework – a breaking down of key variables to provide a guide as to how to proceed or to structure a task (Oxford University Press, 2013; Sherif, n.d.; University of Southern California, n.d.).

Google Earth™ – An online mapping service synchronized with GPS data provided by the Google™ Corporation (Science Education Resource Center, 2013)

GPS – Global Positioning System.

iOS™ – A mobile device operating system developed by the Apple™ corporation.

iPad™ – A mobile tablet computer produced by the Apple™ corporation.

Learning -- For purposes of this research study, learning will be defined as collaborative interaction mediated through mobile reusable learning objects, to create new artifacts (information, physical or virtual objects, or skill sets).

LimeSurvey – An online tool for creating and administering digital surveys and questionnaires (LimeSurvey.org, 2014).

LMS – Learning Management System.

mLearning – See mobile learning.

Mobile Device – A digital communications and computation device that is portable, and can be accessed rapidly.

Mobile Learning – "any activity that allows individuals to be more productive when consuming, interacting with or creating information mediated through a compact portable digital device that the individual carries on a regular basis, has reliable connectivity and fits in a pocket or purse" (Wexler, Brown, Metcalf, Rogers & Wagner, 2009, p. 7).

Model – "simplified description… of a system or process, to assist calculations and predictions" (Oxford University Press, 2013)

Micro-MOOC – A Massive Open Online Course (see MOOC) designed to be conducted over a limited timeframe and with a fixed or limited number of participants (Coulter, 2014; Klassen, 2014).

MOOC – Massive Open Online Course. A MOOC is "a model for delivering learning content online to any person who wants to take a course" (Educause, 2014)

Moodle – An open-source, free learning management system (LMS) and Virtual Learning Environment (VLE) platform.

mTSES – A version of TSES adapted for this research to survey teachers' perceptions of their own ability to complete tasks related to teaching using mobile learning strategies.

Online – Available for access via the Internet or a smaller computer network.

Ontology – Basic assumptions about “the very nature or essence of the social phenomena being investigated” (Cohen et al., 2011, p. 5)

Pilot Testing – Conducting a pre-trial of a learning resource, assessment, or data collection instrument. Typically includes use of the items by representative samples of the intended target audience.

Quick Response Code – (QR Code) A specialized graphic consisting of a square comprised of smaller squares, which contains computer-readable information or instructions.

Self-Efficacy – A measure of the belief in one’s own ability to complete tasks.

Reusable Learning Object – “Any digital object that can be reused to facilitate and support learning activities” (Polsani, 2003; University of Wolverhampton, n.d.).

RLO – Reusable Learning Object

TPS2 – *Second Edition Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* (Government of Canada, 2011).

TSES – Teacher’s Sense of Efficacy Scale (or the Ohio State Teacher’s Sense of Efficacy Scale). A survey developed by researchers at Ohio State University to test teacher’s perceptions of their own ability to complete tasks related to teaching (Tschannen-Moran, & Woolfolk Hoy, 2001b)

VLE – Virtual Learning Environment.

YouTube™ – An online resource for uploading, sharing, and viewing digital video files.

WiFi – Wireless Fidelity connectivity. A form of Wireless Local Area Network connectivity used by mobile computing devices that complies with IEEE 802.11 standards (Varma, 2012)

Winksite™ – A free web-based mobile website development and hosting platform (Wireless Inc., 2014).

Chapter I: INTRODUCTION

The central question behind this research study is: *Can a framework of key pedagogical considerations increase teachers' sense of self-efficacy with the integration of mobile learning strategies into teaching practice?* Participants in this research study completed a short online professional development course that focused on the use of an instructional design framework to guide the development of mobile reusable learning objects using free, online tools. This research study measured teachers' perceptions of self-efficacy with the use mobile learning strategies before and after participation in the online course. A design-based research (DBR) approach was used for this research study, with the aim of making recommendations for improvements for future iterations of the professional development course.

This chapter begins by presenting an overview of the key concepts and the learning design framework that were used for the professional development course in this research study. That framework is called the Collaborative Situated Active Mobile (CSAM) learning design framework. This chapter then presents the conceptual framework, problem statement, and specific research questions that were investigated in this research study. The ontological and epistemological positionings are described, along with the significance of this research study. Key assumptions and delimitations for this research study are outlined. This chapter concludes with an overview of the dissertation project, including the structure of this dissertation document.

Key Concepts

In order to contextualize the needs and problems addressed by this research, it is necessary to clarify how specific terminology is used.

Cognitive load.

Cognitive load is a term used by educational psychologists to refer to the amount of information that a learner must process at a given time. Mayer and Moreno (2003) described the problem of being confronted with too much information to process as cognitive overload. For teachers who are learning how to integrate new resources or strategies into classroom practice, cognitive load includes learning pedagogical approaches as well as mastery of technological tools. For the purposes of this research study, the focus is on the effects of a framework for guiding instructional design decision-making. The mastery of multimedia and web authoring tools represents extraneous cognitive load. Therefore, participants in the online professional development course as part of this research study used free, online tools for the development of mobile RLOs that are designed to minimize the need to develop new technical skill sets.

Collaborative learning.

For this research study, the terms collaboration, collaborative learning, and collaborative learner interaction are used to refer to any activities in which participants are mutually engaged towards the achievement of a shared goal (Boyinbode, 2013, p. xi). This differs from cooperative learning, in which participants may be mutually engaged in a learning activity, but with the aim of accomplishing differing objectives (Boyinbode, 2013, p. xi).

Learning.

Definitions of learning vary depending upon the context in which they are being examined and discussed (Department of Education and Training, State of Victoria, 2005; Wikipedia, 2014). For instance, adherents of behaviourist learning theory would describe learning as a behavioral change induced by repetitive exposure to a stimulus (Davey, 2011; Wikipedia, 2014). Cognitive learning theorists describe learning as the use of sequential supports, called scaffolding, to facilitate the development of new knowledge and meaning (Bruner, 1964). Mayer and Moreno (2003) expanded upon cognitive learning theory by describing the use of multiple channels to receive information, thereby increasing the amount of new information that a learner could simultaneously encode and make sense out of, and deepening understanding. Constructivist learning theorists would describe learning as being contingent upon what a learner already knows and is capable of doing, and how the learner incorporates new knowledge and skill sets to construct new meaning (Culetta, 2013).

Chapter II describes how the CSAM learning design framework draws upon activity theory. Activity theory describes learning as the interaction between subjects (learners) and objects (information, physical objects, a situated environment, etc.) to produce artifacts (new information, new skills, new expertise, or new physical or virtual objects) (Impedovo, 2011; Sharples, Taylor & Vavoula, 2005). Sharples et al. (2005) describe active learning in a mobile learning context as social interaction, mediated through technological tools, to develop new knowledge and skills, and to make sense out of the learner's environment and context. This view of learning is consistent with the nominalist ontological approach for this research study as described in this chapter.

For purposes of this research study, learning will be defined as collaborative interaction – either between learners and their peers, learners and their instructor, learners and objects, or learners and their environment and context – mediated through objects (in this case mobile reusable learning objects), to create new artifacts (information, physical or virtual objects, or skill sets). The creation of the artifacts is an active process resulting in learning. The artifacts of this learning process represent the understanding of the learner's environment or context that has been generated, and the increased ability of the learner to interact with their environment or context.

Mobile device.

Soloway and Norris (2013) proposed a simple test of what constitutes a mobile device for educational purposes. They argued that in order to be truly mobile, a learner must be able to pull the device out of a pocket at a moment's notice, use it to capture or transmit relevant data or artifacts, and put the device away again with minimal effort.

Mobile learning (mLearning).

There are a number of definitions of mobile learning (mLearning). Wexler et al. (2008) provided one of the most concise definitions of mLearning as:

> any activity that allows individuals to be more productive when consuming, interacting with or creating information mediated through a compact portable digital device that the individual carries on a regular basis, has reliable connectivity and fits in a pocket or purse (p. 7).

Mobile reusable learning objects (RLOs).

The University of Wolverhampton (n.d.) cited Polsani (2003) in its concise definition of a reusable learning object (RLO) as any "digital object that can be reused to facilitate and support learning activities." Access to RLOs is typically free. The reusable nature of RLOs enables them to reduce the effort required to deliver content and instruction. The digital nature of RLOs enables them to be embedded into learning activities and virtual learning environments, such as learning management systems. In the case of mobile RLOs, the digital objects are designed to be accessed and used via a mobile device.

Model versus framework.

The terms model and framework refer to related concepts in academic publications. However, it is necessary to make a distinction between a model and a framework in order to accurately represent what this research study investigates. The *Oxford English Dictionary* defined a model at “a simplified description… of a system or process, to assist calculations and predictions” (Oxford University Press, 2013). Sherif (n.d.) described models as having the ability to make predictions, and as therefore allowing “analysts to test specific parts of theories.” The University of Southern California (n.d.) described a framework as a “structure and support that may be used as both the launching point and the on-going guidelines” for a research investigation or task. Sherif (n.d.) distinguished a framework from a model on the basis that a framework does not provide predictive abilities. For this research study, the term framework is used to describe the Collaborative Situated Active Mobile (CSAM) learning design. The term model is not used because the CSAM framework does not provide predictive abilities with respect to instructional design or learning outcomes. The CSAM framework is a tool that breaks down the key or instructional design elements of mobile RLOs used to facilitate collaborative learning. Therefore, the purpose of the CSAM learning design framework is to provide a guide for structuring the pedagogical elements of instructional design when using mobile RLOs to facilitate collaborative learner interactions.

Self-efficacy.

Self-efficacy is a belief in one's own ability to complete tasks. Tschannen-Moran and Woolfolk Hoy (2001) defined a teacher's self-efficacy as "a judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated" (p. 783). Teacher self-efficacy is important because it influences "levels of planning and organization," and "willingness to experiment with new methods to meet the needs of their students" (p. 783). This research study investigated the impact of the CSAM learning design framework on teachers' self-efficacy with respect to the integration of mobile RLOs into teaching and learning practice.

The CSAM Learning Design Framework

The Collaborative Situated Active Mobile (CSAM) learning design framework has emerged from a qualitative analysis of case studies of mobile learning involving collaborative pedagogical approaches that have been facilitated by mobile reusable learning objects (Power, 2013a, 2013b). The framework reflects the essential pedagogical elements that have been shared, to varying degrees, in the instructional designs of the collaborative mobile learning scenarios described in recent literature (Ally, 2009; Ally & Tsinakos, 2014; Beijing Normal University, 2011; Berge & Muilenburge, 2013; IJMBL, 2014; McContha, Penny, Schugar & Bolton, 2014; Palfreyman, 2013a; Power, 2013e; Specht, Sharples & Multisilta, 2012). The CSAM framework aims to help practicing teachers increase self-efficacy with using mobile reusable learning objects to facilitate collaborative learner interactions. To achieve this, CSAM provides a picture of the key domains that should be taken into consideration in the instructional design of collaborative mobile RLOs. These domains include collaborative interaction, situation of learning activities in a realistic context, active engagement with content, and the affordance of learner mobility. The key elements of the CSAM learning design framework are depicted in Figure 1.

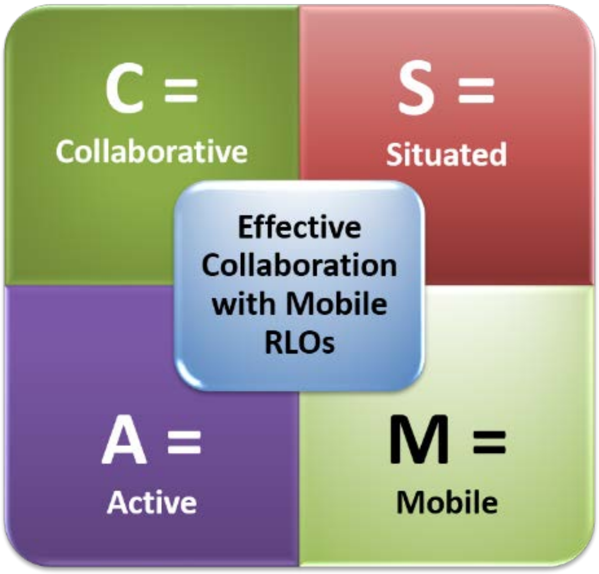


Figure 1: The Collaborative Situated Active Mobile (CSAM) learning design framework

Contextualizing Needs and Problems

CSAM began with the determination of the instructional design requirements for the *QR Cache* research project at a technical college in Doha, Qatar (Power, 2012b, 2012c). It evolved from a qualitative analysis of case studies of practice into a framework for guiding mobile learning (mLearning) instructional design decisions and reflective practice.

The CSAM learning design framework formed the foundation for a series of professional development workshops on creating mobile RLOs using free, online resources. Participant responses to the initial workshop offered at the *Technology in Higher Education 2013* conference in Doha, Qatar (Power, 2013c), and an accompanying mobile RLO (http://winksite.mobi/robpower/mrlos), led to requests to facilitate similar workshops in Qatar, Canada, and the United States of America (USA). The perceived utility of the CSAM framework, workshop and RLO were encapsulated in the initial response of a faculty member from a large Midwestern USA university, who stated "we've been looking for something like this for years" (Dean Cristol, personal communication, October 21, 2013). A request from faculty members at that university to collaborate on professional development for faculty and pre-service teachers led to the development of an expanded online course. That online course formed the foundation of the data collection for this study.

The foundations of CSAM were presented as a poster at the *Mobile Learning: Gulf Perspectives* symposium in Abu Dhabi, United Arab Emirates, in April 2013 (Power, 2013b). This was followed by the publication of an extended paper in *Learning and Teaching: Gulf Perspectives* (Power, 2013a), using the CSAM framework to reflect upon the instructional design elements of recent mobile learning projects in the Gulf Cooperative Council (GCC) region. One anonymous peer-reviewer described CSAM as having the potential to make a "significant contribution to the existing literature of mobile learning." Another anonymous peer-reviewer remarked that "the writer describes in detail how effective mLearning can be enhanced with appropriately designed activities." Following the publication of that paper, the CSAM learning design framework was identified by researchers with the Advanced Distributed Learning Initiative's (2013) *Mobile Training Implementation Framework* (MoTIF) project as noteworthy and worthy of further exploration (Marcus Birtwhistle, personal communication, September 2013).

Responses to CSAM have indicated an interest in the learning design framework and related training on using the framework to guide instructional design decisions and reflective practice. This interest coincides with recent calls to shift mobile learning research and dialogue from issues of technical implementation to those of pedagogical grounding and practice. Such calls were reflected by panel members at the *12th World Conference on Mobile and Contextual Learning* (mLearn 2013) in Doha, Qatar (Ally, et al., 2013). In response to a question on the greatest barriers to successful implementation of mobile learning initiatives at educational institutions, Athabasca University mLearning researcher Mohamed Ally discussed the impact of human factors. Those human factors include perceptions of the pedagogical efficacy of mLearning strategies, and teachers' self-efficacy with integrating mLearning resources into their own practice. It is that sense of self-efficacy that the CSAM framework aims to strengthen. This study explored the impact on teacher self-efficacy of using CSAM to guide instructional design and reflective practice. Participants in this study focused on pedagogical decision-making by drawing upon free online resources to address technical implementation issues.

Conceptual Framework

The previous sections established the purpose of the CSAM learning design framework and the problem to be investigated in this research study. A conceptual framework can be used to depict a vision of the purpose of this research study, and how the essential elements relate to each other (Cohen, Manion & Morrison, 2011, p. 117). Developing a conceptual framework helps to ensure that the conduct and reporting of the research efforts are thoroughly conceived, have strong grounding, and are able to meet established objectives (Koro-Ljungberg, Yendol-Hoppey, Smith & Haynes, 2009, p. 687;

MacDonald, Stodel, Muirhead & Thompson, n.d.). The conceptual framework for this research study is presented in Figure 2.

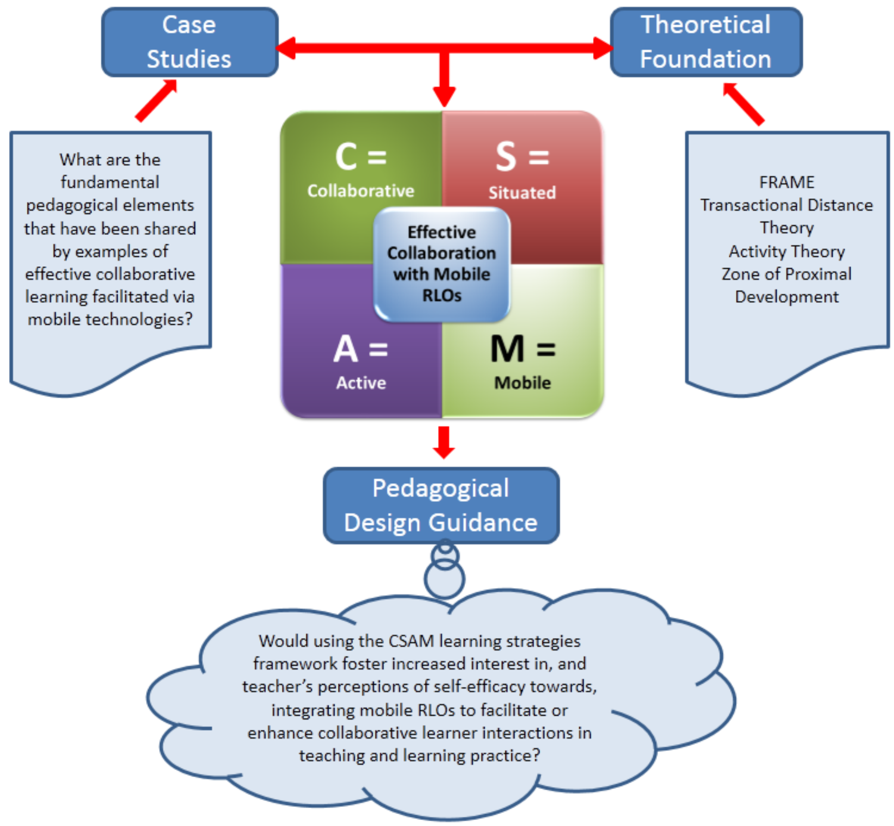


Figure 2: Conceptual framework for evaluating the CSAM learning design framework

The conceptual framework illustrates how case studies of practice, coupled with the theoretical underpinnings of key models of mobile learning research and practice, such as the framework for the rational analysis of mobile education (FRAME) (Koole, 2009), have influenced the Collaborative Situated Active Mobile learning design framework. This has resulted in a framework for pedagogical design guidance and reflective practice for integrating mobile RLOs to facilitate collaborative learner interactions. Stemming from this process is the central problem, or question, explored by this study – whether the use of the CSAM framework has a positive effect on teachers' interest and perceptions of self-efficacy surrounding the use of mLearning RLOs.

Statement of the Problem

Mobile technologies will become increasingly critical resources in the design and delivery of education at all levels over the next few years (Ally, 2014). However, the adoption of mobile learning strategies by teachers has been hindered by a lack of perceptions of self-efficacy (Ally et al., 2013; Kenny, Van Neste-Kenny, Burton & Park, 2010). Ally (2014) noted that teacher training continues to be based on an outdated education system model that does not adequately prepare teachers to integrate mobile technologies into teaching practice. Lack of training in the pedagogical considerations for the integration of a specific type of technology can have a negative impact upon teachers' perceptions of self-efficacy (Kenny et al, 2010). However, Kenny et al. (2010) noted that:

> While a significant body of research exists on learners' feelings of self-efficacy concerning computer technology, online learning, and even podcasting (e.g., Compeau & Higgins, 1995; Hodges, Stackpole-Hodges, & Cox, 2008; Johnson, 2005; Kao & Tsai, 2009; Koh & Frick, 2009; Liang and Wu, 2010; Loftus, 2009), this concept does not yet appear to have been examined in any detail in a mobile learning context (p. 2).

The purpose of this research study was to determine if the Collaborative Situated Active Mobile learning design framework, derived from key pedagogical elements of mobile collaborative learning case studies, could help individual educators overcome barriers of perception, become more interested in integrating mobile learning teaching strategies into practice, and increase their sense of self-efficacy in using mobile learning pedagogical strategies to facilitate or enhance collaborative learner interactions.

Research Questions

The creation of the conceptual framework and statement of a discrete problem to explore led to the formulation of the primary questions that formed the basis of research study.

1. Does the Collaborative Situated Active Mobile (CSAM) learning design framework provide teachers with an increased sense of self-efficacy in the use of mobile reusable learning objects (RLOs) to facilitate or enhance collaborative learner interactions?
    a. Do teachers perceive greater self-efficacy when using the CSAM framework?
    b. Do teachers perceive their use of mobile RLOs to be more effective when using the CSAM framework?

An overview of the epistemological and ontological positioning of this study is provided below. This is followed by an overview of the research design. Specific details of the research design and methodology are discussed in Chapter III.

Ontological and Epistemological Positioning and Research Paradigm

The determination of research questions, overall research design, and methodologies flows from specific ontological and epistemological positioning. Those positionings must align with the nature of the problem to be investigated. Cohen et al. described ontology as referring to basic assumptions about “the very nature or essence of the social phenomena being investigated” (2011, p. 5). The problem investigated by this research study relates to the phenomenon of self-efficacy as it manifests for each participant. Self-efficacy is a matter of perception of ability, which in turn affects perceptions of confidence and willingness to undertake an endeavor (Tschannen-Moran & Woolfolk Hoy, 2001). Since perceptions are different for each individual participant, and can be affected by interaction with varying social contexts, it cannot be said that there is a universal entity that is self-efficacy. Rather, self-efficacy is an individual perception of reality. Moreover, individual perceptions of self-efficacy within a distinct group, such as a university faculty or a school department, can contribute to collective perceptions of reality about that group’s ability with respect to a given task or skill set (Tschannen-Moran & Woolfolk Hoy, 2001). A nominalist ontological perspective has the best fit for this research study because nominalist ontology focuses on individual and group perceptions and constructions of reality. This research study has been approached from the nominalist assumption that an abstract concept can exist, such as the concept of self-efficacy, but that there is no universal entities that is self-efficacy.

Nominalist ontology fits with the research study aim of examining the extent to which the use of the CSAM learning design framework affects teachers’ perceptions of self-efficacy with mobile learning strategies. Methods for this research study must be compatible with this nominalist ontology. Decisions about research design, including data collection and analysis procedures, stem from epistemological positioning. Cohen et al. described epistemology as the nature of knowledge and “how it can be acquired, and how communicated to other human beings” (2011. p. 6). Subscribing to nominalist ontology warrants the integration of a combination of qualitative and quantitative methods in order to triangulate findings and provide a contextualized understanding of their significance for research and practice. Quantitative methods were used in this research study to determine the extent to which participants' perceptions of self-efficacy changed. However, nominalist ontology necessitates that qualitative methods also be used to verify changes in participants' perceptions, and to understand the nature of those changes within participants' individual contexts.

Significance of the Study

This research study is significant because it explored the potential for the use of a pedagogical framework to generate interest in the use of mobile reusable learning objects to facilitate collaborative learner interactions. It also explored the potential of the CSAM framework to help teachers overcome the cognitive load associated with issues of technical development in order to gain the self-efficacy to begin integrating mLearning strategies into their practice. The results of this study point to areas for future research into preparing teachers to integrate mobile learning strategies into teaching and learning practice. This study also contributes to the changes called for in mobile learning discourse, by placing a direct emphasis on pedagogical strategies as opposed to issues of technical development and deployment.

This study is also significant from the perspective of distance education research and practice. As technologies available for the mediation of teaching and learning evolve, the distinctions between traditional face-to-face education, distance education, and mobile learning are beginning to disappear. This trend is described as ubiquitous learning, where learning "anywhere, anytime" is supported through advances in one-to-one computing technologies, including mobile devices (Education-2025, 2013). Wheeler (2014) advised that if educational institutions such as universities are to continue to meet the needs of changing learner demographics, they should place more emphasis on the use of technology to facilitate blended and distributed approaches to teaching and learning. As noted earlier in this chapter, Ally (2014) indicated that mobile technologies will play an increasingly significant role in the design and delivery of education at all levels. Ally (2014) also noted that teachers need to be better prepared to integrate new technologies into teaching and learning practices. This study investigated the use of the CSAM learning design framework to better prepare teachers to leverage mobile technologies to promote a more ubiquitous model of teaching and learning.

Assumptions

This research study was conducted with the following assumptions:

- Participants in the online course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies* enrolled voluntarily.
- Participants in the online course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies* were advised before enrolling that the course would be part of a research study.
- Participants in the online course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies* would come from a diverse range of institutional and regional backgrounds.
- Participants in the online course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies* would have a diverse range of experiences in the teaching profession, and would come from differing levels of the education sector.

- Participants in the online course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies* would have a diverse range of levels of experience with the use of educational technologies, including the use of mobile devices and mobile learning resources.
- Participants in the online course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies* would have access to a computer or a mobile device with an Internet connection, and the ability to access the online course learning management system site.
- The *Canvas*™ open online Learning Management System host site would be available and accessible for the duration of this research study.
- A minimum of thirty participants, across multiple offerings of the online course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies,* would consent to, and provide feedback using the online data collection survey instruments.
- Iterative improvements would be made to the online course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies* between the beta-testing (pilot) and live course (data collection phase of this research study) offerings, and for purposes of future use of the online course for teacher professional development.

Delimitations

This research study included participants who voluntarily enrolled in the CSAM online professional development course. The voluntary nature of enrollment means that the range of participants may be limited to individuals who already displayed an interest in the use of educational technology resources such as mobile RLOs. In addition, while participants for this research study were solicited from a range of professional, institutional, and regional backgrounds, the CSAM professional development course was only offered in English. Therefore, it may not be possible to generalize the findings of this research study across a wider population of teachers.

Overview of the Dissertation Project

This research study followed four primary stages, as outlined in Table 1.

Table 1

Dissertation research study stages

Stage	Description
1	Development of intervention (CSAM professional development course development and pilot testing)
2	Online professional development course and data collection.
3	Follow-up interviews.
4	Data analysis.

In the first stage, the intervention for this research study was developed. This stage included the development of an online professional development course about creating mobile reusable learning objects for collaborative learning. The first stage also included quality assurance testing of the course site and materials, and pilot-testing of the course. In the second stage, professional development training was provided to teachers and graduate-level education students through the online course. The collection of primary research data was included within the second stage of this study. Data collection instruments were embedded as learning activities within the online professional development course. These instruments included surveys of teacher perceptions of self-efficacy and the usefulness of the CSAM framework. Participants' own survey responses were provided to them for the purpose of facilitating reflective practice during the course. Participants were informed about the use of the survey data for this study, and were provided with an opportunity to provide or decline informed consent. Participants who did not consent to be included in the survey data collection were provided with downloadable copies of the survey instruments so that they could continue to participate in the online course learning activities.

The third stage of the research study involved conducting follow-up interviews and surveys with selected course participants. Follow-up interviews were conducted shortly after the completion of the course. The purpose of the follow-up interviews was to collect qualitative feedback about participants' perceptions of self-efficacy and the personal usefulness of the CSAM framework. Follow-up surveys were scheduled after the completion of the course in order to determine changes in perceptions of self-efficacy and interest in the use of mLearning strategies, and whether initial interest generated during the course translated into changes in teaching and learning practice.

The fourth stage of this research study involved the analysis of the collected data. Quantitative approaches were used for the analysis of fixed-response survey questions. Qualitative methods were used for the analysis of open-response questions and follow-up interview transcripts in order to provide a contextualized picture of teacher perceptions and the overall utility to practicing teachers of the CSAM learning design framework. A complete description of the research design and methodology, including the development of the survey instruments and interview scripts, as well as the data analysis procedures, is covered in Chapter III.

Structure of the Dissertation

This dissertation document includes eight chapters. Chapter I has provided an introduction to the dissertation. It has included a brief overview of the emergence of the CSAM learning design framework, contextualization of the needs and problems addressed, a conceptual framework and formal statement of the research problem, and specific research questions. It has also included statements of and rationale for the study's nominalist ontological perspective, and its pragmatic epistemology focusing on a mixed-methodological approach to gaining a qualitative picture of teachers' perceptions of self-efficacy and interest in using mobile RLOs. An overview of the stages of the research study has also been included, along with a statement of the significance of the study and a description of the structure of the dissertation.

Chapter II describes the development of the CSAM learning design framework through a review of the stages of its evolution from a mental conceptualization into a framework. The chapter includes a review of the key texts and case studies from the literature, examined qualitatively to demonstrate the conceptualization of the primacy of the constituent components of the CSAM framework in examples of the use of mobile RLOs to facilitate or enhance collaborative learner interactions. This is followed by an analysis of the prevalence of CSAM in the instructional designs of examples of mobile RLOs in recent mobile learning publications. An overview of the theoretical underpinnings of the CSAM framework is also included, drawn from Koole's (2009) work with the FRAME model, which provided the initial inspiration for the conceptualization of CSAM. Chapter II concludes with a description of the relationship of the CSAM framework to other prominent models and frameworks of instructional design and educational technology integration.

Chapter III details the research design and methodology of this study. The research problem and questions are restated in order to frame the description of the participant selection process, and the modes and tools for data collection. The specific data collection instruments are described, followed by a description of the data analysis methods. The chapter concludes with a discussion of practical and ethical considerations for the research study.

Chapter IV of this dissertation provides a detailed description of the first phase of this design-based research study. This chapter focuses on the development and implementation of the intervention for this research study. The instructional design and development is detailed for the CSAM online professional development course. A detailed description is provided of the quality assurance standards and tools used to minimize the potential that instructional and technical design flaws for the course would adversely affect data collection for the research study. The alpha and pilot-testing procedures for the professional development course are described. Chapter IV also provides a breakdown of the professional development course and research study participant demographics, response rates for the research study survey instruments, and general feedback about the course from the End of Course Feedback survey. Chapter IV concludes with a brief list of recommendations for improvements for future iterations of the CSAM professional development course.

Chapters V-VII represent the second phase of this design-based research study. Chapter V includes research results and findings from the quantitative data collection instruments. Data from the repeated administrations of the teacher self-efficacy surveys are presented. Qualitative analyses of the open-response survey questions and follow-up interviews are presented in Chapter VI. Chapter VII provides a discussion of the quantitative and qualitative data analyses, in the context of the original research questions.

Chapter VIII represents the conclusion of the second phase of this design-based research study, and outlines possible directions for future research study phases. Chapter VIII presents conclusions from the research findings, as well as the limitations of the research and recommendations for further research and practice.

Summary

This chapter has provided a contextualization for this research study. The emergence of the Collaborative Situated Active Mobile learning design framework has been briefly discussed, along with an overview of expressed interest in the potential applications of the framework. This interest in CSAM, along with related professional development in the area of pedagogical design for the creation and integration of mobile reusable learning objects, has been contextualized against the backdrop of emerging calls to shift discussions of mLearning research and practice away from technology and towards issues of pedagogy. A statement of problem, a conceptual framework, and the specific questions have been delineated for the study. The significance of this research study has been discussed, and overviews have been provided of the research design and methodology, the dissertation project, and this dissertation document. The next chapter provides a detailed review of the development of the CSAM learning design framework from the literature, including key mobile learning texts, case studies of research and practice, and the theoretical underpinnings of CSAM.

Chapter II: DISTILLATION OF THE CSAM FRAMEWORK

This chapter establishes the learning design framework that was used as the focus of the intervention that was implemented in this research study. This chapter presents a qualitative analysis, in chronological order, of a sampling of the texts and case studies that have influenced the CSAM learning design framework. The sections that follow summarize the distillation of the key pedagogical elements described in those texts and case studies, followed by an analysis of the prevalence of CSAM compliant mobile RLOs in recent mobile learning publications. The analysis of recent literature is followed by a discussion of the theoretical underpinnings of the pedagogical designs emerging from the case studies of mobile collaborative learning. The chapter concludes with a summary of influences on the CSAM framework, and an overview of questions about its utility to practicing teachers that will be investigated in this study.

Initial Conceptualization of Key Pedagogical Elements of CSAM

Ally (2009) and Traxler and Wishart (2011) presented background information and case studies that influenced the initial conceptualization of the CSAM learning design framework. Ally provided general introductions to the affordances mobile technologies provide to learners, including a chapter on the framework for the rational analysis of mobile education (FRAME) (Koole, 2009). Koole encouraged readers to use the FRAME model to guide their analysis of the mobile learning examples presented throughout the text. The model provided common grounding to the wide diversity of learning objectives, pedagogical approaches, and technical solutions described in the case studies. However, that grounding of diversity highlights the limitations of FRAME in providing focused advice for specific types of learning objectives and activities, such as the facilitation of collaborative learner interaction.

While the FRAME model does not provide specific pedagogical guidance, it does present a holistic picture of the domains to be considered when designing or reflecting upon mobile learning initiatives. Those domains are the learner aspect, the social aspect, and the device aspect, all of which coexist within an information context. The interlocking domains of the FRAME model are depicted in Figure 3.

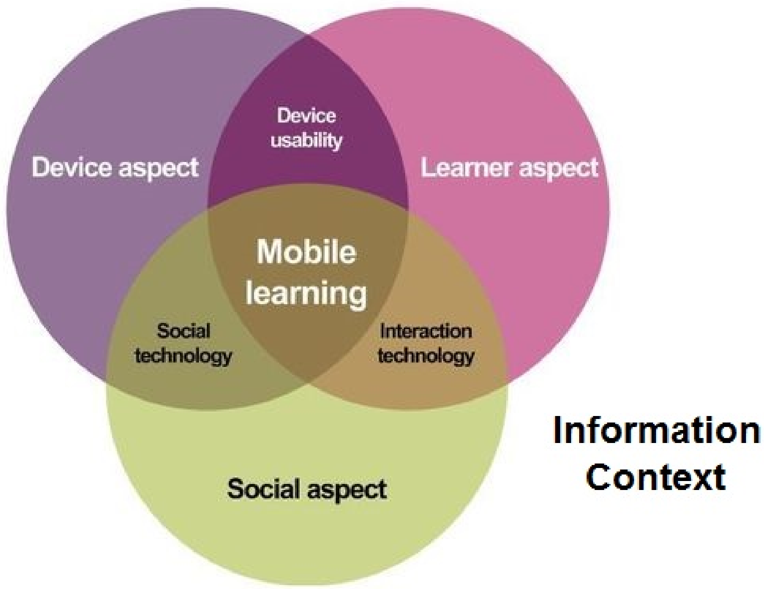


Figure 3: The FRAME model (Koole, 2009, reproduced with permission)

According to the FRAME model, effective mobile learning initiatives need to focus on the intersection of individual learner needs and capabilities, social interaction, and overall device usability. The FRAME model encompasses the central elements of mobile learning design. However, it does not provide guidance on the pedagogical elements needed to utilize mobile technologies to facilitate specific types of learning objectives or activities. What FRAME does point to, in terms of advice for facilitating collaborative learner interactions, is the primacy of leveraging the affordances of mobile technologies to enable such collaborative interactions. In her description of the theoretical underpinnings of FRAME, Koole (2009) noted that “interaction with other people provides a potentially more powerful form of learning” (p. 37) because it bridges what Vygotsky described as the “gap between what a learner is currently able to do and what she could potentially do with assistance from more advanced peers” (p. 37).

The device usability aspect of the FRAME model is an important issue. However, device usability is becoming less significant from the perspective of instructional design. During a panel discussion at the *12th World Conference on Mobile and Contextual Learning*, Ally noted that mobile technologies have become ubiquitous to the point where the greatest remaining barriers to the adoption of mobile learning strategies are now the human elements (Ally et al., 2013). Woods and Scanlon (2012) also described how the increasing ubiquity of mobile technologies provides supportive tools for educational purposes:

> Advances in technology make the current generation of mobile devices more educationally-appropriate through improvements in aggregation and use of services coupled with increasing multimedia capabilities; for example, the powerful combination of picture capture, geo-location and ‘network awareness’ makes the current generation of smart phone technologies potentially beneficial for rich exploratory and discovery application (p. 25).

Naismith and Smith’s (2009) case study of the development of a set of mobile reusable learning objects for guided museum tours provided a detailed description of the technical issues that were encountered. That description is vital to analyzing the case study holistically using the FRAME model. However, since the specific technical solutions discussed are now embedded in virtually all commercially available mobile devices, it is possible to shift focus to analyze the pedagogical aspects of the case study. What the RLOs achieved was to enable school-aged learners to explore the University of Birmingham's Lapworth Museum of Geology artifacts independent of staff or teacher guidance. Near-field sensors triggered the launch of relevant content, enabling students to explore the museum in small peer groups. Because the content could be tailored to the ages and needs of museum visitors, the RLOs enabled active engagement with artifacts based upon the personal interests of the learners. The pedagogical elements of Naismith and Smith's case study can be summarized as collaborative student interactions, situated in a realistic context (exploring artifacts of interest outside of a classroom), active engagement with content of interest, and the mobility to explore and learn independent of strict teacher guidance.

Traxler and Wishart (2011) featured a case study of collaborative learning by Woodgate, Fraser and Martin (2011). The case study included a description of the customized mobile tools provided to secondary school students, including personal digital assistants (PDAs), specialized sensing and data logging equipment, and Global Positioning System (GPS) devices. With commercially available smartphone and mobile tablet technologies becoming increasingly sophisticated, the functions of the specialized equipment can now be emulated without significant infrastructure investment. The primary objectives of the project described by Woodgate et al. were to make secondary science instruction more interesting, relevant, and active. Students worked in small groups and used the equipment to explore natural environments in their local communities and record relevant scientific data for a topic of interest. They then downloaded the data and plotted it onto online maps using *Google Earth*™. This enabled the students to act like real scientists and to produce reports or projects that were of practical use in their own contexts. Students reported that they were better able to contextualize what had previously been abstract concepts, and that they enjoyed the activities more so than typical laboratory experiments. In the case study, the primary pedagogical elements were collaborative exploration and production, situation of learning in a realistic and relevant context, active engagement with and production of new content, and the mobility to engage in effective, self-directed learning outside of traditional science classroom and laboratory confines.

Initial Application of Pedagogical Lessons Learned

Lessons learned from the case studies by Naismith and Smith (2009) and Woodgate et al. (2011) were instrumental to the instructional design of the reusable learning object based activities developed for a research project in May and June 2012 at technical college in Doha, Qatar (Power, 2012b, 2012c). In that project, RLOs were used to help teach technical terminology and device functions to English Foreign Language learners who were preparing to work as technicians at Qatari oil and natural gas production facilities. The English names and functional descriptions of basic computer hardware components had previously been delivered using a printed workbook. In the *QR Cache* project, that content was delivered by RLOs triggered by scanning quick response (QR) codes mounted on working computer equipment. Students used their own devices to explore the equipment either independently or in small groups. Each RLO took approximately five minutes to complete, and included a “Test Your Knowledge” self-assessment exercise. The results of the self-assessments were easily displayed on a large screen as pie charts, prompting whole group discussions about the concepts encountered. Participating students reported enjoying the opportunity to break away from traditional classroom routines and to use their own devices for learning, and that they were more easily able to conceptualize the overall integration of the computer components they explored (Power, 2012b).

The technical aspects of developing the *QR Cache* RLOs were straightforward, as the resources were constructed using free online web hosting services and QR code generators. This allowed the design process to focus on the relevant pedagogical components of the RLOs, which were the facilitation of collaborative exploration and discussion, situation in the realistic context of hands-on exploration of functioning computer equipment, active engagement with the content, and the mobility to explore real equipment instead of a non-interactive workbook. At the time of the *QR Cache* research project, the CSAM framework had not yet been developed. However, the key elements of collaboration, situation in a realistic context, active learning, and learner mobility clearly played central roles in the instructional design of the mobile RLOs. The ability to focus on these pedagogical elements, without the cognitive load associated with technical development and functional testing, significantly contributed to the implementation of the *QR Cache* project. One of the primary questions outlined in Chapter III is whether the pedagogical framework that has emerged from these lessons learned can help practicing teachers to increase their sense of self-efficacy with integrating mobile RLOs for collaborative learning activities.

Case Studies from mLearn 2012

Woods and Scanlon (2012) began their discussion of the *iSpot* Natural History project by placing an emphasis on the pedagogical affordances of mobile technologies with respect to collaborative inquiry in the sciences. They described *iSpot* as a project that relies on user-generated content through activities that "encourage a transition from consumption of academic content to greater learner collaboration, which are increasingly mobile" (p. 25). The authors delineated three elements of mobile learning which heavily influenced the pedagogical design of *iSpot*:

> First, that learners are on the move, moving around physically but in other ways too, for example between devices and over time. Secondly, a vast amount of learning takes place outside formal learning situations and thirdly the ubiquitous nature of learning (Scanlon et al., 2005, in Woods & Scanlon, 2012, p. 25).

iSpot was a mobile-accessible reusable learning object that facilitated collaborative activity in informal learning contexts. The resource allowed participants to use their own mobile devices to collect and submit observations about animal and plant life, in their natural environments, to a central database. By doing this, participants learned how to become natural history scientists and were able to contribute new content to a growing body of knowledge. After new observations were submitted, other members of the participant community, including a panel of experts, collaborated to correctly identify the species observed. Woods and Scanlon noted that the informal learning project has enabled the identification and geo-location tagging of several species that were not previously known to have been present in the United Kingdom.

Woods and Scanlon outlined several pedagogical benefits of the design of the *iSpot* project. The reusable learning objects allowed participants to voluntarily collaborate in efforts that helped them to develop lifelong learning skills, and raised awareness about biodiversity issues and the sciences in general. The project promoted motivation to participate in informal and collaborative learner interactions, and the development of soft skills related to the use of mobile technologies for learning. While not stated in the context of the CSAM framework, Woods and Scanlon explicitly described a pedagogical approach that involved collaborative learning, was situated in a real (as opposed to simply realistic) context, involved active interaction with and production of new content, and mobilized learners to learn more effectively and in contexts that would not be possible without both the technological tools and pedagogical design.

Collaborative learner interactions were also facilitated through mobile reusable learning objects in a research project presented by Ahmed and Parsons (2012). The *ThinknLearn* project involved the use of mobile RLOs to develop secondary school students' abductive reasoning skills. Participating students collaborated in classroom and laboratory sub-groups to complete experiments involving taking temperature measurements of boiling water in different colored metallic cans. The groups took repeated measurements over time to determine which cans of water cooled most rapidly. The *ThinknLearn* mobile RLO then guided students through the process of questioning their findings, and trying to determine the scientific reasons why particularly colored cans of water cooled more quickly or slowly than others. When compared to the results of the same laboratory experiments for whole class control groups, students who were guided in their inquiry by the *ThinknLearn* RLO showed higher levels of enthusiasm towards the topic and activities. The experimental group students also showed higher rates of reaching the correct scientific conclusions and more rapid mastery of abductive reasoning skills.

Ahmed and Parsons (2012) placed the emphasis in their paper on the pedagogical design of the *ThinknLearn* project, and the results of the experimental stage of the project. The explicitly stated pedagogical framework for *ThinknLearn* focused on collaboration to complete laboratory experiments and exercise abductive reasoning, situation of the learning activities in the context of behaving like real scientists, active interaction with the objects and data under study and the generation of new scientific explanations, and the mobility to conduct the experiments as peer groups, without being tethered to either complex experimental apparatus or desktop computer terminals.

While not specifically a presentation of a case study of practice, Schmitz, Specht and Klemke's (2012) presentation at *mLearn 2012* did discuss how a specific type of mobile application, or RLO, supports collaborative learner interactions. Schmitz et al. discussed the pedagogical benefits of augmented reality (AR) games. Discussing the affective learning outcomes of AR games, Schmitz et al. noted that such games frequently include collaborative aspects in which players must work together to reach a shared objective. This collaboration and social interaction increases student motivation and engagement in the learning activity. AR games also situate learning in a realistic context by immersing participants in the learning environment, which the authors argued further increases motivation and retention. Active engagement with learning content is supported through interaction to manipulate the state of the AR environment to fulfill specific objectives.

Schmitz et al.'s description of how the use of AR games with collaborative aspects increases motivation and overall learning is congruent with the premise of *flow theory*. In his presentation at mLearn 2012, Järvilehto (2012) outlined the application of flow theory to mLearning pedagogy. Flow theory (Csikszentmihalyi, 1997) focuses on what people can achieve when they reach an ideal state of concentration and enjoyment. AR games, in particular, can bring participants into what is described as a *flow zone* where they become completely immersed in the task at hand. This optimal level of engagement draws upon participants' skills to overcome "a challenge that is just about manageable" (p. 2), creating an environment supportive of new skill development and learning. Too little challenge or stimulation causes participants to lose interest, while too much challenge causes them to abandon a task out of frustration. Järvilehto (2012) argued that collaborative games bring learners into a flow zone. As Csikszentmihalyi (1997) noted, social interaction has its own unique challenges and rewards that demand the attention of the learner.

> A successful interaction involves finding some compatibility between our goals and those of the other person or persons, and becoming willing to invest attention in the other person's goals. When these conditions are met, it is possible to experience the flow that comes from optimal interaction. (p. 5)

Schmitz et al. described how collaborative AR games can reduce individual boredom. Additionally, peer group support through combined knowledge and skills mediates the potential for anxiety when faced with complex learning tasks. Thus, when collaborating on a learning task the individual is more likely to get into *a* flow zone and thereby succeed in meeting the learning objective. The concept of the flow zone is illustrated in Figure 4.

Figure 4: The flow zone in Flow theory (Chen, 2006)

In their conference presentation, Schmitz et al. (2012) described the example of an AR game from a pilot project with secondary school students in Chicago, IL. The purpose of the game was for students to learn about environmental impacts on local waterways. Students used an AR application installed on their own devices to explore contextualized information when looking at local waterways. The app presented students with an overlay showing what a particular waterway looked like one century earlier. Groups of students interacted in the game to make decisions about environmental protection policy, and the app then displayed a projection of what the waterway would look like one century into the future. The objective of the game was to compete against other groups of students to develop the most effective local environmental protection policy. The scenario described by Schmitz et al. highlighted the affective outcomes of using AR games. It also highlighted the primacy of the CSAM pedagogical elements when using mobile RLOs to facilitate collaborative learner interactions. In the waterways game, groups of students collaborated towards a shared objective. The learning was situated in a real and meaningful context within their own local environment. Students were actively engaged with content, and were required to produce new artifacts in the form of environmental policies and their resultant effects upon the simulated environment. Mobility was enhanced through the use of the RLO, as students were free to explore their environment rather than studying abstract concepts in a classroom. The use of the mobile RLO also facilitated communication and collaboration, regardless of the physical proximity of students to their peers or teacher.

Examining Recent Case Studies Using the CSAM Framework

After distilling the central pedagogical elements from case studies of using mobile RLOs to facilitate collaborative learner interactions into the CSAM learning design framework, that framework was used as the foundation for a series of professional development workshops on creating mobile RLOs using free online resources beginning in the April of 2013. Attention also turned to examining additional case studies of practice specifically using the CSAM framework.

Mobile Learning: Gulf Perspectives.

The *Mobile Learning: Gulf Perspectives* (*mLearn Gulf*) symposium in Abu Dhabi, United Arab Emirates, was the first dedicated regional mobile learning symposium hosted by Zayed University. Many of the presentations at the symposium focused on the ongoing iPad™ tablet deployment initiative at Emirati higher education institutions, sponsored by the UAE government. However, two case studies were presented that looked at the use of mobile learning to facilitate collaborative learner interactions (McCoy, 2013; Nicoll & Hopkins, 2013). As with the examples from Ally (2009), Traxler and Wishart (2011), and *mLearn 2012* (Ahmed & Parsons, 2012; Schmitz et al., 2012; Woods & Scanlon, 2012), these case studies also displayed the core pedagogical elements encapsulated in the CSAM framework.

Nicoll and Hopkyns (2013) presented a poster describing the use of a mobile RLO to develop English language conversational skills. Within the RLO, students manipulated cartoon puppets (or avatars) to facilitate language learning. With guidance from instructors, students collaborated to manipulate what their avatars were doing and what their virtual puppets were saying. In that example, the learning was situated in a realistic context through immersion into realistic English conversation scenarios. Learners also actively engaged with content by manipulating spoken language to produce meaningful conversations. The mobility aspect of CSAM was represented through the use of mobile devices to facilitate the collaborative interaction, and to free learners from interaction in less authentic textbook learning or role playing scenarios.

Mobile learning strategies were also drawn upon for an initiative described in a poster presentation at *mLearn Gulf* by McCoy (2013). In that example, students in Zayed University's Academic Bridge program produced the actual mobile RLOs. McCoy outlined how learners used iPads™ to research and gather resources related to a specific English language grammar topic. Those students then used their devices to record and edit short video lessons about their topic. By uploading their finished videos to YouTube™, the students created RLOs that could then be disseminated to their classmates and future cohorts. It was not specified by McCoy whether learners collaborated to produce the video lessons, however, there is obvious potential to do so.

The collaborative aspect of CSAM was directly represented in this case study through the sharing of student generated RLOs for peer teaching. Student production of RLOs also represented the inclusion of the active learning element of CSAM. In this example, the learning was situated in a realistic context by virtue of the fact that students were engaging with the grammar content for an authentic purpose—to teach it to their peers. The mobile aspect was represented through the use of iPad™ tablets to complete every stage of the learning activity. Uploading the finished videos to YouTube™ also mobilized learning for students' eventual peer audience, as the resources could then be accessed at any time via a mobile device.

mLearn 2013.

Clarke (2013) described an Australian pilot project that brought together a suite of mobile applications to create an augmented reality (AR) collaborative learning application. The purpose of the pilot project was to demonstrate the pedagogical benefits of integrating such collaborative mobile RLOs into cross-curricular teaching and learning practice. Clarke described a sample application developed for field trips along the Swan River in Perth, Australia. A range of cross-curricular content was developed, along with a list of suggested learning activities. Participating teachers could pre-select which activities and content their students would explore based upon their specific curricular needs. This case study explicitly focused on collaborative learner interactions. The field trip activities were all designed to be undertaken in small student groups, with each group member sharing specific responsibilities required to complete the exercises. The situated aspect of CSAM was represented by the contextualizing of learning in an authentic setting in a park along the Swan River. Students also actively engaged with content that was triggered by either scanning a quick response (QR) code, a customized graphic, or proximity to a target object (determined by a mobile device's built in Global Positioning System (GPS) functionality), and they completed learning tasks by using the content they uncovered.

Giemza and Hoppe's (2013) presentation at *mLearn 2013* described the *Mobilogue* (MOBile Location GUidancE) tool. *Mobilogue* was designed to provide guidance, as well as an authoring tool, for the development of mobile applications to support informal learning activities such as field trips or museum visits. While no specific examples were provided of the use of *Mobilogue* for direct collaboration between learners, the types of informal learning activities targeted by the tool were similar to those outlined by Naismith and Smith (2009), in which students used mobile devices to access contextualized content as they explored a museum in small groups. With *Mobilogue*, customized content was tied to physical spaces through the use of QR codes. In addition to audience specific content, the tool allowed for the integration of multimedia files and location maps tied to a mobile device's GPS capabilities. The *Mobilogue* authoring package included the ability to embed interactive quizzes, enabling end-users to gain formative or summative feedback about their learning while still immersed in the learning environment. In *Mobilogue*, collaboration could be viewed as interaction between groups exploring a particular physical space. It could also be viewed as the interaction between content authors and consumers, especially if students themselves were to use the authoring tools to produce content for their peers or future users. Learning using *Mobilogue* was designed to be situated in the realistic contexts of field trip locations or museums. The embedding of interactive elements such as quizzes enabled active engagement with content. Active engagement could be further enhanced through student production of new location specific content for future users. The mobile aspect of CSAM was integrated through the use of mobile devices to access the informal learning content, as well as through the facilitation of learning independent of a fixed classroom location.

Sugair, Hopkins, Fitzgerald and Brailsford (2013) described the *AnswerPro* application at mLearn 2013. *AnswerPro* was a mobile peer-support application that was pilot tested with Key Stage 3 and 4 students in the United Kingdom (UK). The authors described the design requirements for the application, the findings of the research study, and recommendations for improvements for future iterations of the tool. The aim of *AnswerPro* was to provide learning support by facilitating collaboration with more knowledgeable peers to help answer questions or solve problems. Sugair et al. described a learning resource that provided a common platform for learning interaction that is distinct from students' typical social uses of mobile devices. Students could view profile information about their peers, and could direct questions or select provided answers based upon profile details. They noted that this type of collaborative peer support is beneficial because it can increase student motivation and can lead to the "adoption of problem solving strategies from their peers (p. 1)." This collaborative support was situated for learners, because the students can pose questions and access answers while immersed in the actual learning activity for which they are seeking assistance. *AnswerPro* represented the Active element of CSAM by enabling students to engage with learning content either by posing specific questions, generating content through the provision of answers, or making decisions about the selection of appropriate responses for their specific learning context.

Meta-Analysis of Mobile RLO Examples

The previous sections of this chapter presented qualitative analyses of selected case studies that demonstrated the integration of the key elements of the CSAM learning design framework in the instructional design of collaborative mobile learning tools. The case studies provided examples of how collaborative, situated, active and mobile learning factors are being considered in mLearning instructional design for collaborative learner interactions. The CSAM learning design framework is an attempt to represent those pedagogical considerations to provide guidance to instructional designers when planning for the use of mobile reusable learning objects to support collaborative learning. This section provides further evidence of the prevalence of the CSAM learning design elements by reporting the results of a qualitative meta-analysis of recent mLearning literature.

A qualitative meta-analysis is a systematic review that synthesizes the results or reports of a large body of research literature for the purposes of analyzing large-scale trends (Au, 2007, Cohen et al, 2011). A qualitative meta-analysis differs from quantitative meta-analysis techniques, which Bernard, Abrami, Lou, Borokhovski, Wade, Wazni, Wallet, Fiset and Huang (2004, p. 384) describe as “an approach to estimating how much one treatment differs from another, over a large set of similar studies, along with the associated variability.” The purpose of this literature review was to demonstrate trends in the descriptions of pedagogical strategies, as opposed to the meta-analysis of quantitative effect sizes. For the purposes of this literature review, a qualitative meta-analysis procedure similar to that used by Au (2007) was deemed to be the most appropriate approach. Au used a form of thematic meta-analysis described as a template analysis, where “textual data are coded using a template of codes designed by the researcher” (2007, p. 259).

For this meta-analysis, a sample of 403 articles and chapters from mobile learning literature sources over a five year period were examined. The samples were from textbooks and conference proceedings publications between the years 2009 and 2014 (Ally, 2009; Ally & Tsinakos, 2014; Beijing Normal University, 2011; Berge & Muilenburge, 2013; McContha, Penny, Schugar & Bolton, 2014; Palfreyman, 2013a; Power, 2013e; Specht et al., 2012), as well as all five volumes of the *International Journal of Mobile and Blended Learning* (IJMBL, 2014) published during the same period. The first level of coding was the identification of the articles or chapters as examples of RLO case studies. Chapters or articles that self-identified as case studies of mobile RLOs were automatically coded as RLO case studies. Chapters or articles were also coded as RLO case studies if they presented supporting examples that included either a customized mobile RLO, or the use of a combination of existing mobile applications to support instructional design.

After completing the first level of coding for the meta-analysis, the samples identified as RLO case studies were further coded to indicate whether they displayed either the Collaborative, Situated, Active, or Mobile pedagogical elements represented by the CSAM framework. This coding process involved determining whether the descriptions of the case studies explicitly described instructional design for the CSAM elements, or if those pedagogical considerations were implied in the descriptions. The results of the meta-analysis of mobile RLO examples are summarized in Table 2. Detailed results of the meta-analysis are provided in APPENDIX O.

Table 2

Summary of the meta-analysis of mobile RLO examples

Year	Articles/ Chapters	# of RLO Case Studies	Case Ratio	# Collab	Collab Ratio	# CSAM	100% CSAM Ratio
2009	32	10	.31	9	.90	6	.67
2010	17	7	.41	7	1.00	7	1.00
2011	109	30	.28	24	.80	24	1.00
2012	80	18	.23	13	.72	13	1.00
2013	134	35	.26	32	.91	31	.97
2014	31	7	.23	7	1.00	7	1.00
Totals	403	107	.27	92	.86	88	.96

Just over one quarter (27%) of the articles and chapters analyzed (*n* = 107) were coded as RLO examples. The remaining articles and chapters covered such topics as theoretical perspectives on mobile learning design, technical specifications for the design and implementation of mobile learning tools, bureaucratic and administrative policy for mobile learning adoption, and mobile learning tools and strategies intended for individualized learning purposes.

Of the chapters or articles coded as RLO examples, 86% (*n* = 92) were identified as examples explicitly intended for the facilitation of collaborative learning. Eighty-two percent of the RLO examples either explicitly or implicitly described the inclusion of all four CSAM learning design framework pedagogical elements in their instructional design. Ninety-six percent of the RLO examples represented three of the four CSAM elements. All of the RLO examples represented at least two of the four CSAM elements.

The most frequently missing pedagogical element was design for collaborative learning. The second most common pedagogical element not referenced in the RLO examples was the Situated element. Eighty-eight percent of the RLO examples (*n* = 95) integrated situated learning strategies. However, only two of the RLO examples that were also coded as being Collaborative were not cross-coded as Situated. Ninety-six percent of the case studies coded as Collaborative were also coded as Situated, and all of the RLO examples coded as Collaborative included the Active and Mobile pedagogical elements.

Although the RLO case studies identified in the meta-analysis did not explicitly draw upon the CSAM learning design framework to guide instructional design decision-making, the majority of the RLO examples (86%) were designed to support collaborative learning. Of the RLO case studies identified as collaborative learning examples, 96% integrated all four of the CSAM learning design framework pedagogical elements. The meta-analysis results do not reveal the entire scope of pedagogical factors that influenced instructional design decision-making processes for the examples identified as RLO case studies. However, the results of the meta-analysis do confirm that the four CSAM constituent elements are central to the instructional design of mobile RLOs targeted to support collaborative learning interactions. CSAM compliant mobile RLOs also figure prominently in recent mobile learning literature, and are presented as either the central focus or as supporting examples in nearly one-fifth (18%) of the chapters or articles examined. The following section will examine the theoretical foundations for the use of the CSAM learning design framework.

Theoretical Underpinnings Emerging From the Case Studies

The qualitative analyses of case studies of research and practice outlined in this chapter have been foundational to the conceptualization of the CSAM learning design framework. That process has revealed the central pedagogical elements in the use of mobile reusable learning objects to facilitate collaborative learner interactions. Attention now turns to the theoretical underpinnings of those pedagogical elements.

The FRAME model (Koole, 2009) described earlier in this chapter was central to the initial conceptualization of the CSAM learning design framework. The intersections of the learner, social and device aspects of FRAME indicate the importance of drawing upon mobile technologies to facilitate collaborative interaction. Collaboration is so fundamental to mobile learning instructional design that it is reflected in the four Cs of mLearning described by Quinn (2011) and Soloway and Norris (2013), which are content, computation, capture (of data and artifacts), and communication (with collaborating learners and other sources of learning assistance). The theoretical underpinnings of FRAME were also central to the conceptualization of CSAM. These include such prominent theories as *transactional distance theory* (Moore, 1989, 1991), *activity theory* (Chaiklin, 2003; Kaptelinin & Nardi, 2006), and the *zone of proximal development* (Chaiklin, 2003; Kaptelinin & Nardi, 2006).

Transactional distance theory.

CSAM design aims to reduce the distance between learners, their collaborators, and what they are learning, through collaborative interaction mediated by mobile technologies. Moore’s (1989, 1991) transactional distance theory identified these gaps, and postulated that they can be managed by controlling the structure of learning activities, interactivity between learners and with content, and learner autonomy.

The case studies outlined in this chapter frequently involved the facilitation of activities that had the potential to be highly unstructured. This raises the danger of increasing the degree of transactional distance (Park, 2011). However, the introduction of mobile RLOs and CSAM design mitigates this possibility by focusing attention on appropriate artifacts, and providing cues as to desired activities and data collection and generation. The capacity of CSAM RLOs to increase focus has the added benefit of reducing the extraneous cognitive load associated with such organizational tasks. Using CSAM RLOs enables learners to focus on the learning tasks because the RLOs provide structure to the learning activities and the tools necessary to facilitate collaborative communication and information exchange. The RLOs also provide the tools necessary to capture or produce learning artifacts. By using CSAM RLOs, learners are not required to identify and master the use of appropriate tools.

CSAM designs also place an emphasis on the interactions between learners, and with their teachers. Receiving static content through digital media has been criticized for increasing transactional distance (Park, 2011). However, physical proximity in a traditional classroom does not necessarily result in adequate interaction to reduce transactional distance. CSAM designs aim to reduce transactional distance by capitalizing on emerging technologies to allow for increased collaboration even when physical distances are increased. Mobile RLOs allow learners to access supporting content regardless of their location, and provide multiple channels for participant interaction. Even in cases where physical distance has been increased, the frequency and quality of interactions made possible by mobile RLOs fosters a net decrease in transactional distance (Koole, 2009). By using RLOs to situate collaborative learning in authentic contexts, CSAM learning designs also have the potential to reduce the transactional distance experienced by learners when studying abstract concepts.

With respect to learner autonomy, CSAM designs aim to reduce transactional distance by drawing individual learners into collaborative efforts. Moore (1989, 1991) noted that transactional distance increases with some types of learner autonomy, so CSAM designs try to capitalize on collective skills sets and motivational influences. As discussed in the next section on activity theory and the zone of proximal development, collaborative learning activities ultimately lead to increased ability to learn effectively in future autonomous scenarios. CSAM designs also increase another form of learner autonomy by freeing learners from traditional classroom settings, and offering choices with respect to learning environments, artifacts to explore, and ranges of tools from which to select.

Activity theory and the zone of proximal development.

The conceptualization of the CSAM learning design framework is consistent with the emphasis of the FRAME model on the intersections of the learner, social and device aspects to facilitate collaborative learning interactions. The benefits stemming from the optimal intersections of these aspects in FRAME are grounded in Vygotsky and Engström’s work in the field of activity theory and the zone of proximal development (Koole, 2009).

One common summarization of the zone of proximal development is that it describes gaps in the different levels of thinking, activity and learning that individuals are capable of achieving (Chaiklin, 2003; Kaptelinin & Nardi, 2006). Vygotsky's definition of the zone of proximal development states that:

> It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers (Vygotsky, 1978, in Engström, 1987).

Advanced tasks and skills that a learner could "potentially do with assistance" (Koole, 2009, p. 37) are represented in Figure 5 by the middle region, which surrounds the inner circle representing what a learner is currently capable of achieving autonomously. The dark outer circle represents what a learner either cannot or will not do.

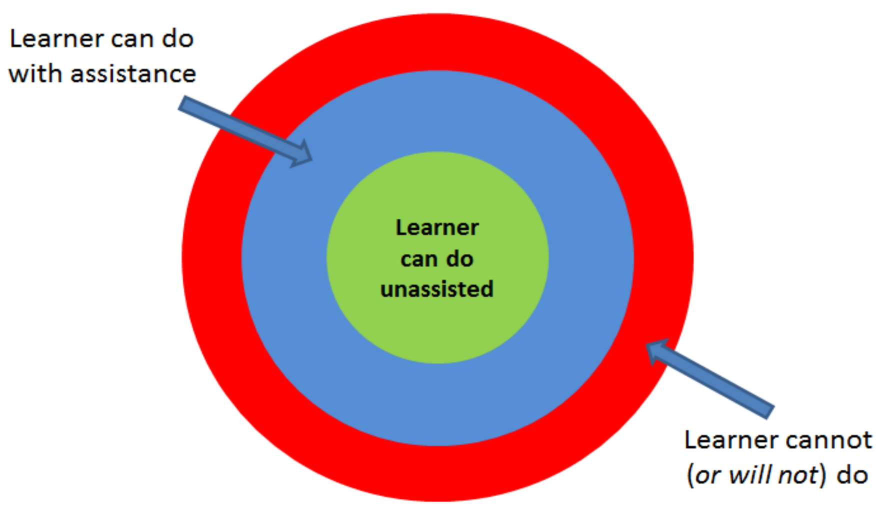


Figure 5: Vygotsky's zone of proximal development

Engström (1987) noted that the concept of the zone of proximal development has been used to support instructional design that aims to "create social situations or environments where instructional support is given to children, thus enabling children to acquire new skills in a new way, through joint problem solving and interaction." However, Engström cautioned against using the zone of proximal development as a justification solely for providing scaffolding to learners. Engström (1987) warned that simply providing scaffolding may rely too heavily on transmitting the current wisdom of the teacher without allowing the creativity of the learner to flourish.

The zone of proximal development is closely related to activity theory, and drawing upon both concepts has the potential to result in more effective instructional design for collaborative learning. The descriptions of activity theory by Kaptelinin and Nardi (2007) and the linking of activity theory and mobile learning by Koole (2009), Sharples et al. (2005) and Impedovo (2011), have been central to the conceptualization of the CSAM learning design framework.

Kaptelinin and Nardi (2007) described activity theory as a theory of learning that places emphasis on the activities in which learners engage, the objects with which they interact, and the products of those interactions. This description of activity theory stems from the Engström's work with cultural-historical activity theory. Engström (2004) described a human activity system in which leaners engage in activities because they desire to reach a goal. The activities are focused upon an object, such as a physical or virtual object, a piece of information, or the learners' surrounding environment. Impedovo (2011) described how interactions between learners, each other, and the objects of their focus is "always mediated" in some form as learners try to make sense out of their environments (p. 105). Engström (1987) emphasized that activity "must be analyzed as a culturally mediated phenomenon." Kaptelinin and Nardi (2007) described mediation as interactions occurring through the use of tools. Tools can range from spoken and written language, to physical tool such as pens, pencils, or hammers, to more sophisticated tools such as mobile devices and virtual learning environments. The selection of specific tools can simultaneously expand and constrain the range of interactions that could possible occur. Through the mediated interactions with objects, learners generate new artifacts. Those artifacts could be new physical or virtual objects, new knowledge, new skill sets, or even changes in attitudes and perceptions.

The aim of CSAM learning design is consistent with both the zone of proximal development and the interactions between learners, objects, mediating tools, and the generation of artifacts. CSAM learning design draws upon mobile RLOs to go beyond merely scaffolding a learning experience through the provision of an instructor's wisdom. Rather, CSAM learning design aims to use mobile RLOs to provide the appropriate tools to mediate collaborative learner interaction, and to enable the creation of new types of artifacts of learning. The potential for mobile RLOs and CSAM learning design to promote greater collective and individual learning was emphasized by the efforts of Sharples, Taylor and Vavoula (2005) to describe a theory of mobile learning stemming from activity theory. Sharples et al. drew upon activity theory to explore mobile learning, such as the use of CSAM design, as a "cultural-historic activity system mediated by tools that both constrain and support [learners] in their goals of transforming knowledge and skills" (2006, p. 6).

By combining the areas of what can already be accomplished individually and what can be achieved through collaborative efforts, the CSAM framework aims to use mobile technologies to increase overall collective and individual learning potential, and reduce the outer range of previously unattainable objectives described by the zone of proximal development (Figure 6). A recent meta-analysis (van Shaik & Burkart, 2011) of research into the learning potential of social animals, including humans, provided evidence of the capacity to increase both collective and individual learning potential through social collaboration.

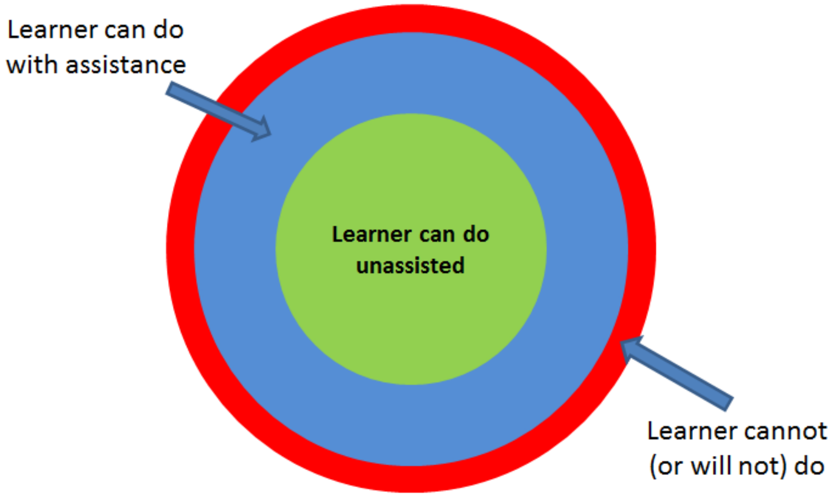


Figure 6: Increasing learning potential in the zone of proximal development

Supporting Models and Frameworks

The influence on the CSAM learning design framework of Koole's (2009) FRAME model was described earlier in this chapter in the section on the Initial Conceptualization of the Key Pedagogical Elements of CSAM. The FRAME model is important because it provides a holistic picture of the interplay between the mobile device, the learner, and social interaction. However, the limitations of the FRAME model from an instructional design perspective were also discussed earlier in this chapter. Specifically, the FRAME model does not provide guidance on the pedagogical design considerations necessary to create an effective collaborative learning experience for the learner. The CSAM framework supports the FRAME model by providing pedagogical guidance for one possible type of mobile learning implementation—the use of mobile reusable learning objects to support collaborative learner interactions. This section now examines two additional models and frameworks that have been prominent in recent literature on instructional design and the integration of educational technologies. Keller's (1987, 2013) ARCS model and Koehler and Mishra's (2008) technical pedagogical and content knowledge (TPACK) framework both highlight important instructional design considerations for the use of mobile RLOs. The CSAM learning design framework is consistent with the considerations espoused by both the ARCS model and the TPACK framework. However, as with its relationship to the FRAME model, CSAM aims to provide more targeted guidance than either ARCS or TPACK on a narrower range of considerations specific to pedagogical decision making.

ARCS model.

ARCS (Keller, 1987, 2013) stands for attention, relevance, confidence and satisfaction. ARCS is an instructional design model that "was developed to find more effective ways of understanding the major influences on the motivation to learn, and for systematic ways of identifying and solving problems with learning motivation" (Keller, 1987, p. 2). Keller (1987) described the ARCS model as a "method for improving the motivational appeal of instructional materials" (p. 2). Table 3 outlines three major instructional design considerations for each of the four categories of the ARCS model.

Table 3

ARCS categories and instructional design considerations (Keller, 2013)

Category	Considerations
Attention	Perceptual arousal Inquiry arousal Variability
Relevance	Goal orientation Motive matching Familiarity
Confidence	Learning requirements Success opportunities Personal control
Satisfaction	Intrinsic reinforcement Extrinsic rewards Equity

Bae, Lim and Lee (2005) and Moura and Carvalho (2013) describe the use of the ARCS model to guide instructional design for mobile learning. Bae et al. (2005) drew upon the ARCS model to guide the interface design, resources, and interactive aspects of an application to support a reading program for elementary school students. They delineated examples of how each of the ARCS category considerations were addressed in the design of their application. Moura and Carvalho (2013) took a more theoretical approach to describing how the ARCS model can be used for mobile learning. They described the Shih model, which was developed by Shih and Mills (2007) specifically to provide “an innovation in instructional design that guides the use of enhancements for effective teaching and learning in today’s virtual m-learning environments” (p. 60). Moura and Carvalho (2013) demonstrated how mobile technologies combined with appropriate instructional design are ideal for addressing all four ARCS model categories to increase learner motivation and enrich the learning experience. The CSAM learning design framework aligns with all four categories of the ARCS model in the context of instructional design for the use of mobile RLOs for collaborative learning. Support for this alignment can be seen in the parallels between the instructional design considerations described by Bae et al. (2005), Moura and Carvalho (2013), and those of the CSAM learning design framework.

CSAM targets the attention category (Keller, 1987, 2013) of ARCS by using mobile RLOs as a focal point to arouse both perception and inquiry amongst learners. Bae et al. (2005) described their use of images, question and answer boards, and appearances (images) of characters to elicit attention amongst learners. Moura and Carvalho (2013) indicated that the Shih model also draws upon multimedia elements to support learner attention. CSAM RLOs also draw upon multimedia, and the mobile interface itself, to increase learner attention. CSAM RLOs can be used to attune learners' perceptions to the specific information or objects to be investigated in the environments and contexts in which the learning scenarios are situated. The RLOs can also provide cues as to problems to be investigated, skills to be developed, or learning artifacts to be generated, thereby supporting the inquiry arousal espoused by ARCS. The introduction of mobile RLOs into learning design also has the potential to generate variability in the learning experience. This can occur simply through the novel interjection of mobile RLOs into a broader range of learning tools, and also through the variability possible in the designs of the RLOs themselves.

The Situated and Active elements of the CSAM framework support the relevance category of the ARCS model (Keller, 1987, 2013). Situation of learning means to place the learning experience into a realistic and relevant context for the learner (Farmer &

Hughes, 2005). This makes the learning more authentic, and more easily transferrable to other contexts. Farmer and Hughes highlighted the importance of the situating of RLOs to their relevance to learners:

> We must first recognize that knowledge and learning are embedded within sociocultural frames of reference. Failure to include context in design and evaluation processes effectively ignores the issues and associated benefits of learner autonomy, as well as the embeddedness of collaborative activity within culturally-historic communities of practice. Rather than removing context from LO design… we embrace it, approaching LO description and evaluation from a learner-centred and situated perspective (2005, p. 72).

Situation of learning also increases learners' level of familiarity with the learning environment and expectations. Moura and Carvalho (2013) noted that the Shih model lists the web searching capabilities of mobile technologies as supportive of the Relevance category of the ARCS model. Similarly, CSAM learning design strategies can leverage web connectivity to provide learners with guided access to relevant, up-to-date tools and resources. The significance of active learning was described earlier in this chapter in the section about activity theory (Chaiklin, 2003; Engström, 1987; Impedovo, 2011; Kaptelinin & Nardi, 2006, 2007; Sharples et al., 2005). By engaging learners in active learning, CSAM RLOs by their nature have a goal orientation. Collaborating learners are given a goal, or motive, for interacting with objects to produce artifacts such as new knowledge, skills, or physical or virtual objects.

The CSAM learning design framework aims to foster increased confidence amongst learners. In keeping with the considerations for the confidence category of the

ARCS model (Keller, 1987, 2013), CSAM RLOs provide learners with a focused and explicit set of learning objectives. The collaborative and active nature of CSAM learning design provides both personal control and opportunities for success to learners. Bae et al. (2005) provided specific examples of this type of support for learner confidence. Their mobile reading program support application allowed learners personal control through the provision of optional starting points. Their application also allowed learners to demonstrate success by posting statistics on the number of books that they had read. With CSAM, the mobile RLOs provide cues and learning support tools, as well as opportunities for learners to demonstrate their success through the production of either tangible or virtual artifacts. The active production of learning artifacts to support learner confidence is supported by the Shih model, which lists digital story-telling as its active stage in the ARCS-grounded mobile learning instructional design cycle (Moura & Carvalho, 2013).

The satisfaction category of the ARCS model (Keller, 1987, 2013) is supported in multiple ways by the CSAM learning design framework. First, the element of situating learning in a relevant context for learners aims to increase learner satisfaction by making the learning experience more personally meaningful. This provides intrinsic reinforcement, as learners can see a personal relevance to the learning activities. As discussed earlier in this chapter, CSAM also draws upon the zone of proximal development to increase the range of what learners can possibly achieve through the pooling of collaborative skills sets, knowledge, and the motivational power of the group. Moura and Carvalho (2013) noted that the Shih model lists simulated gaming in mobile learning as supportive of the learner satisfaction. The use of augmented reality games and applications in CSAM learning design, and their impact upon learner engagement, was discussed earlier in this chapter (Schmitz et al, 2012). The ARCS consideration of extrinsic rewards is supported by CSAM through the ability of students to achieve mandated learning objectives, thereby experiencing formal success. Equity is supported in CSAM through the provision of a range of supporting tools that can be utilized, as needed, by individual learners, and through the ability of learners to exercise control over the production of personally relevant learning artifacts.

Unlike Bae et al. (2005), or the Shih model discussed by Moura and Carvalho (2013), the CSAM learning design framework does not stipulate that instructional designers must explicitly follow the ARCS model, or address its instructional design considerations. Rather, the CSAM framework focuses on a set of key pedagogical considerations that are congruent with a range of learning theories and instructional design models, including ARCS. The congruence of CSAM with the ARCS model means that design of CSAM RLOs is supported by a well-established model for promoting learner motivation.

The TPACK Framework.

The technological pedagogical and content knowledge (TPACK) framework was developed by Koehler and Mishra (2006, 2008) as a “conceptual framework for educational technology [that]… attempts to capture some of the essential qualities of teacher knowledge required for technology integration in teaching” (2006, p. 1017). TPACK (originally TPCK) posits that in order to effectively integrate technology into teaching practice, teachers must have adequate knowledge levels in each of the areas of technology, pedagogy, and content. Figure 7 illustrates the interplay between the technology, pedagogy and content domains, and the complexity of those relationships that teachers must be knowledgeable in.

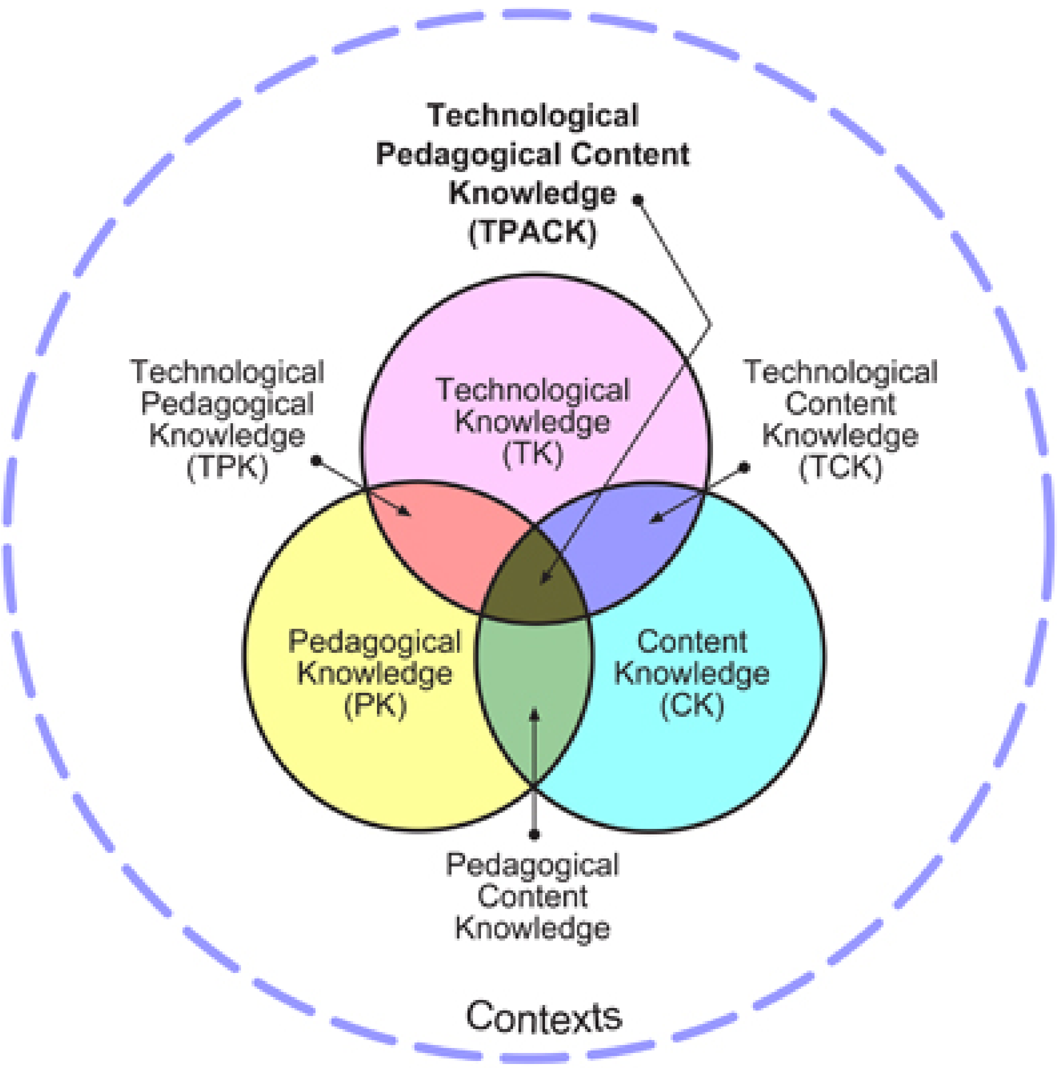


Figure 7: Components of the TPACK framework. Reproduced with permission (tpack.org, 2012)

Figure 7 includes seven specific knowledge bases, which are delineated by the intersections of the primary domain circles. The first six of these knowledge bases are content knowledge (CK), pedagogical knowledge (PK), technology knowledge (TK), pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical knowledge (TPK). The seventh, central, knowledge base, represented by the intersections of all three primary domains, is technological pedagogical content knowledge (TPACK).

TPACK has been widely adopted as a framework for providing teacher professional development with educational technology use (Voogt, Fisser, Pareja, Tondeur, & van Braak, 2012). As part of a large-scale mobile learning research and deployment initiative in the United Arab Emirates, Cavanaugh, Hargis, Munns and Kamali (2013) found that “TPCK was considered to be foundational to effective teaching in a mobile learning environment” (Kennedy, 2013). However, TPACK has been criticized as a focus for teacher professional development (Perk, 2009; Unwin, 2007; Voogt et al. 2012). Perk (2009) asked “where are the students in this framework?” He criticized TPACK as being overly teacher-centric, and failing to consider the role that learners play in determining pedagogical decisions and the appropriateness of technology selection in instructional design. Unwin (2007) also suggested that TPACK fails to place emphasis on the role of the learner in the process of pedagogic design. Perk (2009), Unwin (2007) and Voogt et al. (2012) also criticized the notion posited by TPACK that technology has become so intertwined with modern life that it is in danger of becoming invisible in pedagogical decision-making. Unwin stressed that the pedagogic design process always “requires collaborative communities of practice that include ICT ‘enthusiasts’ within any course team” (2007, p. 231, emphasis is original). Unwin’s suggestion is that not all teachers will have high levels of technological knowledge, and that educational technology enthusiasts will continue to play a significant role in helping their peers to make decisions about how to integrate technology into their teaching practice.

Like the FRAME model, the TPACK framework provides a holistic picture of instructional design that integrates technology with teachers' knowledge of content and pedagogy. However, the criticisms of TPACK suggest shortcomings in the provision of guidance on how to achieve this integration (Perk, 2009; Unwin, 2007; Voogt et al. 2012). The CSAM learning design framework can be used to compliment the strengths of TPACK, as well as to resolve some of the criticisms of the framework. As indicated in the Statement of the Problem section in Chapter I, CSAM presumes that teaching professionals already possess both content and pedagogy knowledge. The problem that CSAM attempts to address is the lack of a sense of self-efficacy amongst teachers in how to integrate mobile reusable learning objects into their teaching practice. CSAM draws upon teachers' existing pedagogical and content expertise, and provides a framework for deciding how to deploy mobile RLOs to create a collaborative learning environment for students. The characteristics and needs of learners are therefore included in the instructional design process. The CSAM learning design framework could be used as tool to incorporate mobile technologies (specifically, mobile RLOs) with teachers' existing pedagogical and content knowledge for the purpose of moving the holistic picture of instructional design into the central, TPACK region of the TPACK framework. This research study specifically examined the use of the CSAM framework to increase teachers' sense of self-efficacy in a context where they do not need to worry about extensive development of new technological skill sets. The use of the CSAM framework could help teachers to increase their TPACK competency levels, while still allowing room for them to collaborate with more technologically knowledgeable peers to progressively expand the range and complexity of the types of technologies they integrate into their teaching practice.

Framework-Scaffolded Professional Development and Teacher Self-Efficacy

Both the ARCS model and the TPACK framework have been widely adopted as frameworks for guiding teacher professional development, particularly in the United States. The use of ARCS and TPACK to guide professional development is beneficial because it takes the emphasis off of generic technology competencies, and places it on how to apply technologies in educational contexts. The CSAM framework and the professional development course developed for this research study have similar aims. Koehler and Mishra (2008) noted that technology-centric professional development initiatives are likely to be unsuccessful because they do not take into account the contexts in which teachers must apply the technologies, thus “traditional methods of technology training… are ill suited to produce the ‘deep understanding’ that can assist teachers in becoming intelligent users of technology for pedagogy” (pp. 1031-1032). In contrast, an emphasis in professional development on clearly-defined competencies such as pedagogical decision-making can help teachers to feel more confident with the use of new technologies (mdk12.org, 2014).

Confidence in one’s ability to integrate new technologies into instructional design is one form of teacher self-efficacy. Self-efficacy is important to address through professional development initiatives because it is a significant predictor of a teacher’s likelihood to pursue, and succeed, with a teaching strategy (such as the integration of mobile RLOs). Bandura (1997) (as cited in Tschannen-Moran & Woolfolk Hoy, 2001, p. 787) defined perceived self-efficacy as ‘‘beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments.'' Teachers' beliefs about their capabilities are important in a technology integration context because they are "far more influential than knowledge in determining how individuals organize and define tasks and problems and are stronger predictors of behavior" (Pajares, 1992, as cited in Benton-Borghi, 2006, p. 54). Tschannen-Moran and Woolfolk Hoy also noted that teachers "are more open to new ideas and are more willing to experiment with new methods to better meet the needs of their students" if they have a strong sense of self-efficacy (2001, p. 783). In contrast, Bandura (1997, 2001) (as cited in Benton-Borghi, 2006, p. 55) cautioned that "unless teachers believe that they can produce desired outcomes [such as integrating mobile RLOs]… they will have little incentive to try." The CSAM framework was developed to provide scaffolding for instructional design decision-making for the use of mobile RLOs.

Chapter IV outlines the development of a professional development course focused on the CSAM framework with the aim of increasing teachers' perceptions of self-efficacy and, thus, their incentive to more widely adopt mobile learning strategies. The course's focus on using the CSAM framework within participants' own classroom and content area contexts builds upon the strategy of using frameworks and models such as ARCS and TPACK to ground professional development initiatives. This emphasis on contextualized grounding with a pedagogical framework aligns with recent trends in teacher professional development policy, such as those outlined by DeMonte (2013), mdk12.org (2014), and the National College for School Leadership (2003). DeMonte (2013) linked professional development policy recommendations to evidence of efficacy from a meta-analyses of 1300 research studies conducted by Yoon, Duncan, Lee, Scarloss and Shapley (2007). DeMonte also described two longitudinal studies which found that the use of specific instructional design frameworks for professional development resulted in changes to teacher practices which, in turn, had positive effects upon student learning.

Summary

The evolution of the Collaborative Situated Active Mobile learning design framework began with a need to design effective reusable learning objects for the *QR Cache* research project. The actual RLOs for *QR Cache* utilized free online mobile web hosting services and quick response code generators, placing the emphasis in the instructional design phase on content development and pedagogical design. That pedagogical design was influenced by examples of collaborative learner interactions facilitated using mobile RLOs. A qualitative examination of the literature has revealed the four key pedagogical elements that have been central to the instructional design of effective mobile collaborative learning, which are summarized in Table 4.

Table 4

Elements of CSAM design (from Power, 2013a)

C	Collaborative	Whatever apps or applications are used, the learning activity should involve collaboration of some sort between learning peers, and with their instructors.
S	Situated	Learning should be situated in a realistic context. This will increase motivation and learner excitement, and will make the activity more personally relevant to the learner.
A	Active	Learners should actually do something with the content they encounter, not just act as passive recipients.
M	Mobile	The learning should take advantage of the affordance of mobile technologies. More importantly, it should free learners from the tether of traditional classroom routines.

The theoretical underpinnings of the CSAM framework draw upon those of the FRAME model (Koole, 2009), transactional distance theory, activity theory, and the zone of proximal development. The CSAM framework is also congruent with, and complimentary to such prominent instructional design frameworks as the ARCS model (Keller, 1987, 2013) and TPACKS (Koehler & Mishra, 2006, 2008).

The conceptualization of the CSAM framework, when coupled with the affordances of mobile technologies, was crucial to the implementation of the *QR Cache* project. It has also led to the development of a series of professional development resources and workshops aimed at encouraging educators to start using reusable learning objects to facilitate or enhance collaborative learner interactions (Power, 2013c). Like the development of the *QR Cache* RLOs, those workshops have utilized free online resources to reduce the cognitive burden associated with the technical aspects of RLO development. This placed the emphasis on the pedagogical decision-making process, echoing the calls of the keynote presenters (Soloway & Norris, 2013) and panel discussion members at the *12th World Conference on Mobile and Contextual Learning*.

Calls for a shift of focus to pedagogical decision-making in mobile learning research and practice, combined with feedback from workshop participants and teacher training specialists, support the need for research to verify the utility of the CSAM framework. Chapter III outlines the mixed-methodological approach used in this research study to investigate the extent to which the CSAM pedagogical framework facilitates increased interest, and teacher self-efficacy, in using mobile RLOs to facilitate or enhance collaborative learner interactions.

Chapter III: RESEARCH DESIGN AND METHODOLOGY

This chapter is divided into four major segments. The first segment restates the research study problem and questions that were outlined in Chapter I. The second segment outlines the research design for this study, which follows a design-based research (DBR) approach. The third segment provides specific details of the research methodologies used for this study. An introduction is provided to the development of the online professional development course called *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies*. Details are provided on the methodologies used for participant recruitment, data collection, and data analysis. The fourth segment of this chapter outlines specific practical and ethical considerations for this research study.

This research study used a pragmatic, mixed-methodological, design-based research approach in an effort to address practical questions and provide results that will be of benefit to learners and teaching practitioners (Anderson & Shattuck, 2012; Cohen et al., 2011; Design-Based Research Collective [DBRC], 2003), including the identification of refinements for future offerings of CSAM online professional development course. This study was approached from a nominalist ontological perspective. The study was conducted in an online class environment with in-service and pre-service teachers from primary, elementary, secondary, and post-secondary training backgrounds.

Statement of the Problem

As outlined in Chapter I, the integration of mobile technologies and mobile learning strategies into teaching practice is hindered by teachers' low perceptions of self-efficacy with mobile learning (Ally et al., 2013; Kenny et al, 2010). Low perceptions of self-efficacy stem, in part, from a lack of preparation on pedagogical approaches to mobile learning instructional design (Ally, 2014; Kenny et al, 2010). While research has been done into teachers' perceptions of self-efficacy with the use of various educational technologies, there is a lack of research into perceptions of self-efficacy with instructional design for mobile learning.

This research study aimed to determine to what extent the Collaborative Situated Active Mobile learning design framework could help individual educators to overcome barriers of perception when integrating mobile RLOs into instructional design. It also aimed to determine whether the CSAM framework could help teachers to become more interested in integrating mobile learning design into their practice, and to develop a stronger sense of self-efficacy with respect to using mobile learning strategies to facilitate or enhance collaborative learner interactions.

Research Questions

As outlined in Chapter I, the research questions for this study were:

1. Does the Collaborative Situated Active Mobile (CSAM) learning design framework provide teachers with an increased sense of self-efficacy in the use of mobile reusable learning objects (RLOs) to facilitate or enhance collaborative learner interactions?
    a. Do teachers perceive greater self-efficacy when using the CSAM framework?
    b. Do teachers perceive their use of mobile RLOs to be more effective when using the CSAM framework?

Research Design

To address the research questions, as well as to accommodate the aims of suggesting areas for further research and the continued offering of iteratively improved versions of the CSAM professional development course, a design-based research (DBR) approach was used. DBR is an appropriate methodological approach because of its pragmatic focus on integrating educational solutions across multiple iterations, and its focus on understanding and expanding theoretical foundations (Anderson & Shattuck, 2012; DBRC, 2003). According to the DBRC (2003), DBR must focus on “designing learning environments and developing theories” (p. 5). DBR must also focus on application in real settings and “lead to sharable theories that help communicate relevant implications” to other stakeholders (p. 5). The aims of DBR fit with this research study’s objective of evaluating the utility of CSAM and refining the framework. The aims of DBR also fit with the intention to refine the CSAM professional development course for future professional development offerings, with the overall aim of enabling more teachers to integrate mobile learning strategies into teaching and learning practice. DBR also allows for the integration of a variety of methodological tools, as appropriate for answering specific research questions (Anderson & Shattuck, 2012). From a practical perspective, this study could be regarded as the first phases of DBR, in which the intervention (the CSAM framework and related professional development course) were pilot tested. Future iterations could “evolve through… the testing of prototypes, iterative refinement, and continuous evolution of the design” (p. 17) based upon the outcomes of this study, and the definition of problems or questions for further investigation. This research study represented the first two phases of ongoing design-based research. The first phase included the development and pilot testing of the intervention. The second phase included the implementation of the intervention. The second phase also included the collection and analysis of data related to participants' perceptions of self-efficacy with using mobile reusable learning objects, and the effectiveness of the intervention. The third and subsequent DBR phases would include the investigation of additional research questions, and future refinements and implementations of the online professional development course. Table 5 delineates the DBR phases of this research study along with their corresponding chapters in this dissertation.

Table 5

Design-based research study phases

Stage	Tasks	Chapter
1	Development of the intervention:	
	CSAM online professional development course development	IV
	Online course quality assurance testing	IV
	Alpha and beta (pilot) testing of the online course	IV
	Participant recruitment	IV
2	Implementation, data collection and analysis	
	Course participation and data collection:	
	Data collection using the first mTSES and second mTSES surveys	IV
	Data collection using the end-of-course feedback survey	IV
	Data collection using follow-up interviews	IV
	Data collection using the third mTSES survey	IV
	Data analysis:	
	Quantitative analysis of end-of-course feedback survey	V
	Quantitative analysis of the first, second, and third mTSES surveys	V
	Qualitative analysis of the second mTSES and end-of-course feedback survey open-response questions	VI
	Qualitative analysis of the follow-up interview transcripts	VI
3	Recommendations, future research, and future course offerings	VIII

Figure 8 illustrates the flow of the course development and refinement, data collection, and data analysis processes for this research study.

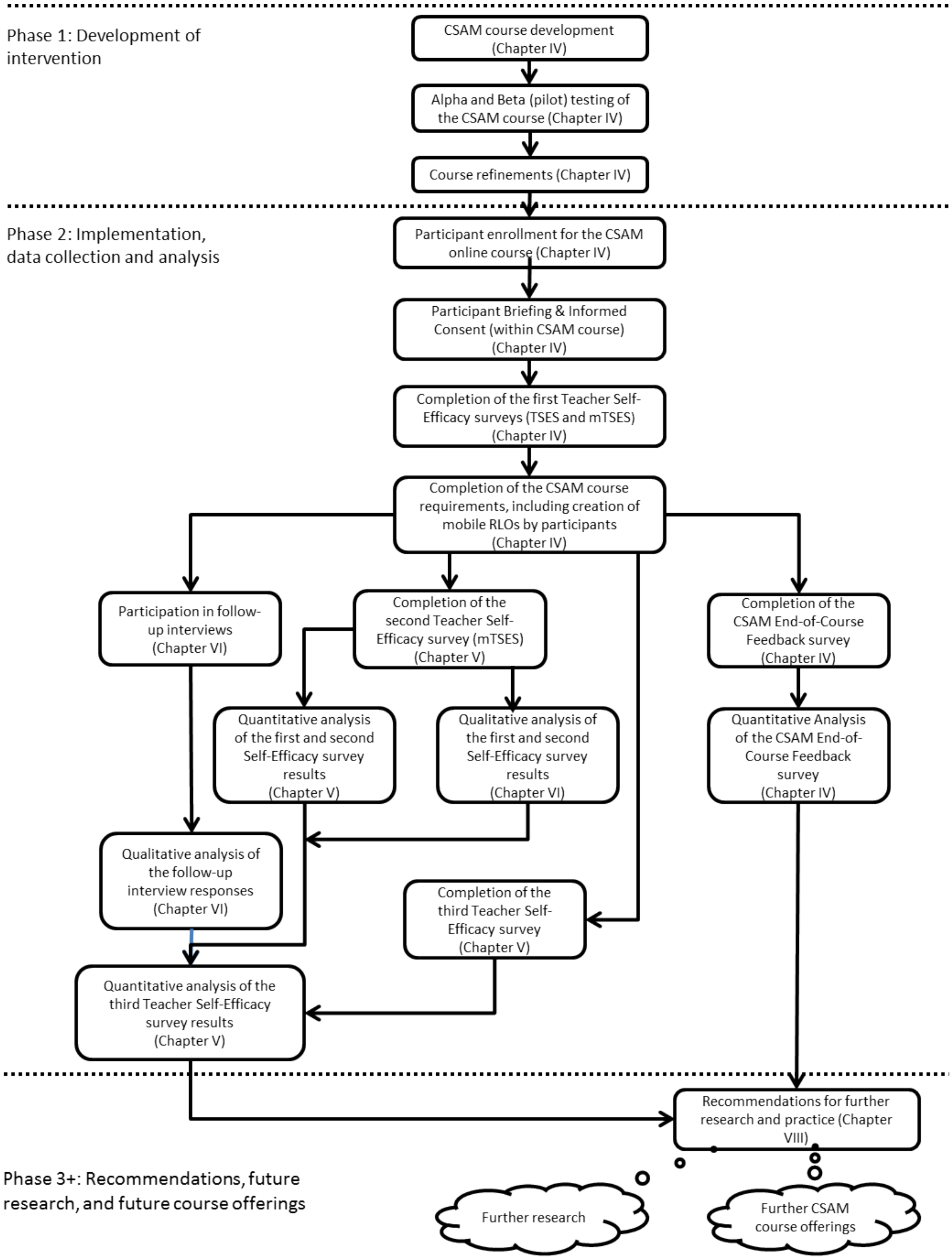


Figure 8: Research data collection and analysis design

Research Method

This research study involved providing a professional development training opportunity to participants, and gathering and analyzing data on participants' perceptions of self-efficacy and the utility of the CSAM learning design framework. Data collection methods for study included online surveys and interviews. A mixed-methodologies approach was employed for data analysis.

Target Audience and Participant Sample

The target audience for the CSAM learning design framework, and the online course on developing mobile reusable learning objects, was practicing teachers and graduate-level education students. To that end, participant selection for this study targeted an open mix of practicing teachers and graduate-level education students. An open-mix of participants was targeted in order to increase the generalizability of the research study findings across the widest possible range of teacher demographics. Research participants included participants enrolled in the CSAM online professional development course. Course participants were affiliated with four higher education institutions. Instructional staff were invited to participate in the course and the research study from two technical and vocational training institutions in Canada and Qatar. Graduate education students were invited to participate from a Masters in Distance Education program at a university in Western Canada. Teachers were also invited to participate in the course and research study from K-12 schools affiliated through educational technology research partnerships with a large university in the Mid-Western United States.

Participation in the online course was voluntary. Open invitations to participate in the course, and the research study, were forwarded to faculty at a technical college in Doha, Qatar, via that institution's Teaching and Learning Center. Open invitations to participate were forwarded by email by collaborating partners at a large university in a Midwestern USA state, to interested teaching faculty, as well as graduate-level education students. Open invitations were also forwarded by email to interested graduate-level education students at a western Canadian university, and to a subset of teaching faculty with the Business Administration program at technical and vocational education college in Newfoundland, Canada. No limit was set on the number of enrollments.

The open invitation provided information about the course objectives and structure. Background information about the research study was also provided. Interested participants were able to self-enroll in the course by using a provided Internet hyperlink. The online course enrollment procedure involved following a provided hyperlink, inputting the participant's email address, and creating a new password for the course website. Participants who had existing accounts with the *Canvas*™ Learning Management System (LMS) were able to use their existing username and password.

The course used a micro-Massive Open Online Course (MOOC) format. The micro-MOOC format meant that high enrollment numbers would not place extra burden upon the course facilitator. The specific instructional design called for learning through peer-interaction and collaboration, as opposed to direct guidance and formative or summative feedback from the facilitator. Cohen et al. (2011) specify a minimum sample size of 30 participants in order to conduct reliable and valid statistical analysis when using quantitative instruments such as Likert-scale surveys. A total of 72 people self-enrolled to participate in the online professional development course, which was conducted in May 2014. Fifty-seven percent (*n* = 41) of the course participants completed an online Informed Consent form, and volunteered to participate in this research study. A more detailed breakdown of the course and research study participation demographics is presented in Chapter IV.

Course Development and Pilot Testing

The CSAM online professional development course was developed based on the content of the original *Create Your Own Mobile RLOs* workshop series and accompanying mobile RLO. The online course was hosted on the *Canvas*™ open Learning Management System (LMS). Alpha testing of the online course was conducted by sharing access to the course site to colleagues, including instructional designers and developers, from a technical and vocational training college in Doha, Qatar, and a large Midwestern USA university. The purpose of the Alpha testing was to solicit feedback on the look and feel of the course, overall technical functionality, instructional design, and potential issues with content (Cohen et al., 2011). Access to the data collection instruments was omitted from the Alpha testing stage. Peer-feedback from the Alpha-testing stage was considered in consult with partnering faculty from a Midwestern USA university to determine if changes to the course design were required. Beta, or pilot-testing was conducted in partnership with faculty from a large Midwestern USA university. The purpose of the pilot-testing was to conduct a trial run of the full course, including the use of copies of the data collection instruments, in order to solicit further feedback on elements of look and feel, overall technical functionality, instructional design, and content (Cohen et al., 2011). No analysis was conducted on data collected during the pilot-testing phase. A detailed account of the course development process, including the Alpha and pilot-testing procedures and results, is provided in Chapter IV.

Data Collection

This section outlines the specific instruments and methods that were used during the data collection phase of this research study. The survey instruments section describes the selection of the *Teacher's Sense of Self-Efficacy Scale* (TSES) (Tschannen-Moran, & Woolfolk Hoy, 2001b), the modification of the TSES to create the *Mobile Teacher's Sense of Self-Efficacy Scale* (mTSES) instrument, and the procedures that were used to verify the reliability and validity of the updated survey instrument. A description is also provided regarding the use of follow-up interviews with volunteer participants from the CSAM professional development course.

The quantitative survey instruments and qualitative interview transcript analyses described in the following sections were integrated in the mixed-methodological approach of this research study. Figure 9 illustrates the combination of the quantitative and qualitative data sets to triangulate findings in the research design.

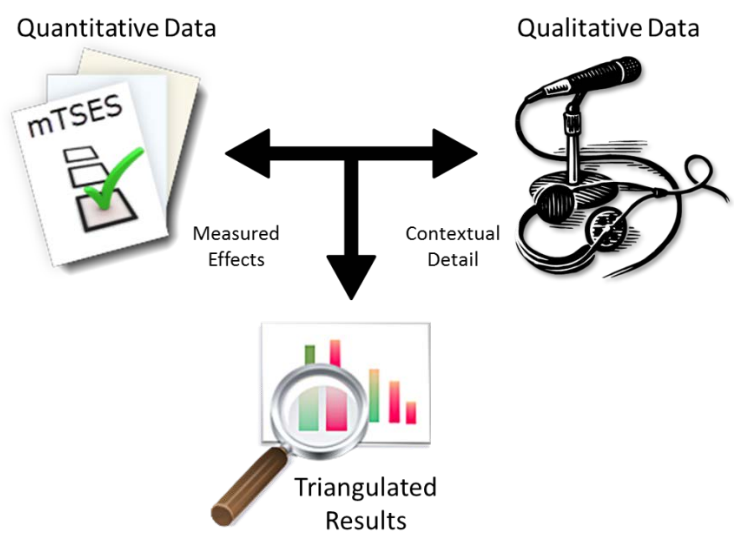


Figure 9: Triangulation of research findings

The quantitative data collected using the survey instruments described in this chapter are used in this research study to demonstrate measurable changes in participants' perceptions of self-efficacy with mobile learning strategies. The qualitative data are used to triangulate the quantitative data results, and to enhance understanding of the changes that were measured through the integration of contextual information (Cohen, et al., 2011).

Survey instruments.

Four separate surveys were used for the data collection phase. Participants' sense of self-efficacy with respect to the integration of mobile learning strategies to facilitate collaborative learner interactions was evaluated at three stages, including the beginning of the online course, the completion of the training, and at an interval of four months after completion of the course. This data was collected using the *Teacher's Sense of Self-Efficacy Scale* (TSES) (Tschannen-Moran, & Woolfolk Hoy, 2001b), and a modified version of the TSES called the *Mobile Teacher's Sense of Self-Efficacy Scale* (mTSES). The original survey was developed by researchers at Ohio State University to gauge teachers' perceptions of their own ability to complete teaching related tasks. The combined TSES and mTSES survey is provided in APPENDIX C.

The TSES survey was selected for this study because its reliability and validity have been previously established (Tschannen-Moran & Woolfolk Hoy, 2001a). The original TSES contains 24 questions. A nine-point Likert-scale is used to rate perceptions of self-efficacy with respect to student engagement, instructional strategies, and class management skills. The reliabilities for the overall TSES instrument, as well as the sub-categories, are provided in Table 6.

Table 6

Reliabilities for the TSES instrument (Tschannen-Moran & Woolfolk Hoy, 2001a)

	Mean	SD	alpha
TSES	7.1	.94	.94
Engagement	7.3	1.1	.87
Instruction	7.3	1.1	.91
Management	6.7	1.1	.90

Construct validity for the original TSES was established by assessing results of its administration against those of other established measures of self-efficacy (Tschannen-Moran, & Woolfolk Hoy, 2001a). Tschannen-Moran and Woolfolk Hoy found a positive correlation (r = .18 and .53, p < .01) to the Rand scale, as well as to the personal teaching efficacy (r = .64, p < .01) and the general teacher efficacy (r = .16, p < .01) factors of the Gibson and Dembo measure (2001a, p. 801).

The widespread use of TSES at the Midwestern USA university and at other institutions throughout the USA also facilitates potential future comparison and contextualization of the study results to those of other research endeavors. Slight modifications were made to the wording of some of the TSES survey items for contextualization of the survey to mobile learning strategies. The phrase “how much can you do to…” from the original TSES has been changed to “how much can you use alternative (technology-based) resources to…” for the mTSES. Both the original TSES and the mTSES survey questions were combined into a single survey for the purposes of this research study. The questions from both survey instruments were used to facilitate cross-comparison of participants’ sense of self-efficacy with respect to teaching skills in general, and with respect to the use of mobile RLOs. Additional questions related to participants' perceptions of the utility of the CSAM framework to their own practice were included for the second (end-of-course) administration of the survey. Additional questions related to impressions of the CSAM learning design framework, included for the second and third administrations of the mTSES, are outlined in APPENDIX E. In order to solicit more candid survey responses, and to reduce the impact on participants' time-on-task during the online course, the survey instruments were embedded in the course design as learning activities. Copies of participants' own survey responses were provided to them for the purpose of completing self-reflective exercises in the course discussion forums. The actual surveys were administered using Athabasca University's *LimeSurvey* tool. All survey data collected was stored using a secured Athabasca University *LimeSurvey* account. Copies of the raw survey data were downloaded by the researcher to a password-protected external hard disk. Only the principal researcher and an independently contracted research assistant had access to the survey data stored on the external hard disk. Links were also provided in the course LMS to downloadable copies of the survey instruments that could be used to complete course learning activities by course participants who decided not to provide informed consent to participate in the data collection for this study.

Benton-Borghi (2006) used a similar strategy as in this research study to determine teachers' perceptions of self-efficacy with respect to the use of technology to facilitate the inclusion of students with disabilities. Benton-Borghi (2006) developed a modified version of the TSES called the Teacher's Sense of Inclusion Efficacy Scale (I-TSES). The I-TSES made minor changes to the wording of questions from the short-form (12 question) version of the TSES. For the I-TSES, the words "student(s)" were changed to “student(s) with disabilities” (Benton-Borghi, 2006, pp. 115-116). An additional seven questions related to technology were also included in the I-TSES. Changes to wording between the 12 common questions from the TSES and I-TSES were made in order to contextualize the questions with respect to the inclusion of students with disabilities. Benton-Borghi (2006) used a combined questionnaire called the Teacher Beliefs Inventory. For that study, the combined sets of questions were administered to measure differences in participants’ sense of efficacy with respect to general teaching tasks versus the inclusion of students with disabilities. Statistical analysis was conducted to determine the validity of the I-TSES by comparing the 12 common questions “to determine whether the TSES and the I-TSES were measuring the same sense of efficacy” (p. 116). Reliabilities of the questions on the TSES and I-TSES were compared by calculating *Cronbach’s* alpha scores. Benton-Borghi found an overall reliability of .932 for the I-TSES, compared to .925 for the original TSES. The reliability scores for the overall TSES, I-TSES (without the additional technology-specific questions) and the complete I-TSES (with the additional technology-specific questions), as well as those for the subsets of questions related to Student Engagement, Instructional Strategies, and Class Management, are presented in Table 7.

Table 7

TSES and I-TSES reliabilities Cronbach's alpha Teachers' Sense of Efficacy (Tschannen-Moran and Woolfolk Hoy, 2001) and the Teachers' Sense of Inclusion Efficacy (Benton-Borghi, 2006, p. 118).

SCALES	Cronbach's Alpha	Mean	SD	No. Items
Teachers' Sense of Efficacy Scale (TSES)				
Efficacy for Student Engagement	.85	27.39	5.06	4
Efficacy for Instructional Strategies	.89	30.00	4.76	4
Efficacy for Classroom Management	.91	29.54	5.01	4
Total TSES Efficacy	.93	87.00	12.69	12
Teachers Sense of Inclusion Efficacy Scale (I-TSES)				
Without Technology Items				
Efficacy for Student Engagement	.86	25.79	5.61	4
Efficacy for Instructional Strategies	.89	27.38	5.70	4
Efficacy for Classroom Management	.88	26.93	5.16	4
Total I-TSES	.93	80.17	14.49	12
Teachers Sense of Inclusion Efficacy Scale (I-TSES) With Technology Items				
Efficacy for Student Engagement	.86	25.79	5.61	4
Efficacy for Instructional Strategies	.89	27.38	5.70	4
Efficacy for Classroom Management	.88	26.93	5.16	4
Efficacy for Technology	.94	23.37	10.18	5
Total I-TSES	.94	103.55	21.72	17

Changes to the wording of questions between the TSES and the mTSES are of a similar nature and extent to those between the TSES and the I-TSES. This research study followed the procedures established by Benton-Borghi (2006) to conduct statistical analyses to compare the impact of the mTSES wording changes on the actual construct validity and reliability for the new instrument. The results of the analyses to determine construct validity and reliability for the mTSES are presented in Chapter V.

A fourth survey was included at the end of the professional development course to solicit feedback specific to the training itself. Results of that survey are presented in Chapter IV, in the context of providing the basis for suggestions for iterative improvements to the online course content and instructional design. The end-of-course feedback survey was also administered via a hyperlink to Athabasca University's *LimeSurvey* tool. A copy of the end-of-course feedback survey script is provided in APPENDIX F.

Interviews.

Interviews were conducted with volunteer participants from the CSAM online professional development course. A survey instrument within the online course was used to solicit potential follow-up interview participants. A total of five interview sessions were conducted by the researcher. Four interview sessions were conducted in person with participants at College of the North Atlantic-Qatar. A fifth interview session was conducted using the *Skype*™ Voice over Internet Protocol (VoIP) software package to initiate a *Skype*™-to-telephone call, based upon the preferences specified by the specific participant in the Consent to be Contacted for a Follow-up Interview survey. Interview sessions were recorded using the *Audacity*™ audio recording software package. The interview recordings were transcribed by a research assistant, and copies were forwarded to the participants for verification of the accuracy of the transcriptions. The potential for researcher bias in the interview process was addressed through the recording of the interview sessions, the use of a research assistant in the transcription process, and the verification of transcript accuracy by the interview participants. The mitigation of potential researcher bias through the calculation of inter-rater reliability for the qualitative coding of interview transcripts is described later in this chapter.

The purpose of the interview sessions was to gain qualitative feedback as to the utility of the CSAM framework, and changes in participants' perceptions of self-efficacy and interest in integrating mobile learning strategies into teaching and learning practice. Interviews were conducted approximately two weeks after the completion of the online course. Four questions were delineated for the follow-up interviews. However, the actual interviews used an open-ended, free-response approach. Additional probing questions were asked in follow-up to participants' responses. Interviews were scheduled for one-hour sessions, but allowances were made for longer durations depending upon participants' responses. The follow-up interview script is provided in APPENDIX G.

Consideration was given to the possible analysis of online course transcripts, including discussion forum postings and participant products such as mobile RLOs. However, because the LMS used to host the online course is externally administered, and is an open online system, the decision was made to omit the course transcripts from the data collection and analysis procedures.

Data Analysis

This section provides a description of the data analysis methods used for this research study. This includes an overview of the methods used for evaluating the construct validity for the mTSES survey instrument, and the statistical comparisons of the results of the pre and post administrations of the TSES and mTSES surveys. This section concludes with an overview of the qualitative analysis procedures used for the analysis of the follow-up survey data.

Survey instruments.

Construct validity for the mTSES was evaluated using similar procedures to those employed by Benton-Borghi (2006) to determine the construct validity of the I-TSES compared to the original TSES. *Microsoft*™ *Excel*™ was used to calculate *Cronbach's* *alpha* scores for the overall TSES and mTSES instruments, as well as for the subscales of Student Engagement, Instructional Methods, and Class Management. Reliabilities for the TSES and mTSES were compared using the procedures established by Benton-Borghi (2006) for the evaluation of the I-TSES.

For this research study, the procedures outline by Tschannen-Moran and Woolfolk Hoy (2001a, 2001b) were used to determine teachers' overall perceptions of self-efficacy. Raw survey response data for each survey instrument was exported from *LimeSurvey* into a *Microsoft*™ *Excel*™ spreadsheet data format. For the pre-test administration of the combined TSES and mTSES survey instrument questions, the procedures outlined by Tschannen-Moran and Woolfolk Hoy were used to conduct factor analyses to determine overall sense of efficacy for both the TSES and mTSES, and to compare the means and standard deviations of respondents' scores for both instruments. The results were used to demonstrate differences in respondents' initial perceptions of overall self-efficacy and self-efficacy with the use of mobile RLOs. Unweighted means were also computed according to the procedures outlined by Tschannen-Moran and Woolfolk Hoy (2001a, 2001b) to facilitate comparison of the results for scores on the *Efficacy in Student Engagement*, *Efficacy in Instructional Practices*, and *Efficacy in Classroom Management* subscales. The same procedures were used to determine respondents' sense of self-efficacy with the use of mobile RLOs upon completion of the online course, and at an interval of four months after the completion of the course. The results of the post-course and follow-up survey analyses were compared to those from the initial survey administration. The results from the post-course and follow-up surveys were used to determine if respondents demonstrated any changes in sense of self-efficacy with the use of mobile RLOs, and if those changes were sustained beyond the initial period following the completion of the course.

Additional open-response questions included for the second administration of the mTSES were used to collect feedback related to participants' perceptions of the usefulness of the CSAM learning design framework. Responses to the open-ended questions were entered into *Microsoft*™ *Excel*™. The responses to the open-ended questions were coded and analyzed for themes indicated general perceptions of the usefulness of the CSAM learning design framework.

The results of the quantitative analyses of the survey data are presented in Chapter V. Qualitative analyses of the open-response survey questions are presented in Chapter VI.

Accounting for effects on changes measured with the survey instruments.

The research design for this study does not include a control group. The impact of maturation (Kirk, 2004) on changes measured with the data collection instruments was isolated through two methods.

First, the impact of maturation was determined by comparison of changes to the mean scores for each of the sub-categories between the original TSES questions and those from the mTSES. It was assumed that maturation would have a similar effect upon both the TSES scores (teachers' perceptions of self-efficacy with teaching tasks in general) and the mTSES scores (teachers' perceptions of self-efficacy with using mobile learning strategies). This assumption was based upon Benton-Borghi's (2006) findings that her modified I-TSES was measuring the same self-efficacy constructs as the original TSES instrument. The modified mTSES instrument was developed and tested using procedures similar to those outline by Benton-Borghi (2006). Therefore, the net difference in the changes in the repeated measures of the TSES and mTSES scores can be assumed to be attributable to the effects of the intervention in this research study, as follows:

$$(\text{mTSES}_2 - \text{mTSES}_1) - (\text{TSES}_2 - \text{TSES}_1) = \text{Net Change}_{(\text{Intervention Effect})}$$

It is possible that the impact of maturation differed between the TSES and mTSES instruments. However, this possibility was mitigated by the actual timespan of this research study. The first combined TSES and mTSES survey instrument was administered at the beginning of the professional development course. The second combined survey administration occurred at the end of the course, which had a two-week duration. As noted by Crawford (1997), “experiments requiring the cooperation of respondents… are most likely to suffer from maturation effects” when they are conducted over a “substantial period of time.” Kirk (2004) and Ohlund and Yu (n.d.) also note that the effects of maturation upon experimental design are more pronounced over long-duration experiments.

Second, follow-up interview responses were used to triangulate the extent to which teachers, themselves, perceive the training and the CSAM framework has influenced their perceptions of self-efficacy with the use of mobile learning strategies and mobile RLOs.

Interviews.

A qualitative approach was used for the analysis of the interview data. Interview responses were transcribed, and *Microsoft*™ *Excel*™ was used to code to the responses to indicate perceptions of the strengths and weakness of the CSAM framework, the strengths and weaknesses of the CSAM professional development course, self-efficacy and interest in integrating mobile learning strategies, and barriers and supports to the integration of mobile RLOs into teaching practice. Further coding levels were used to differentiate specific topics discussed within each of the primary topics. A research assistant was hired to assist with the interview transcription and to determine inter-rater reliability of the coding. Interview transcripts were returned to the individual participants for member verification (Cohen et al., 2011) prior to qualitative coding and analysis.

Development of the qualitative coding system.

A set of codes was developed for the qualitative analyses of the open-response question items on the CSAM feedback survey and the follow-up interview transcripts. The initial set of codes were derived from a preliminary analysis of participants' responses to the open-response CSAM feedback survey question items, which were included in the post-course administration of the Mobile Teacher's Sense of Efficacy Scale (Second mTSES) survey. A list of key words and phrases was collated from the survey responses. These key words and phrases were then arranged according to themes. Titles were assigned to each thematic grouping. The thematic groupings were designated as the primary coding level for the qualitative analysis process. Each thematic grouping was assigned a numeric code for statistical analysis purposes. The key words and phrases assigned to each thematic grouping constituted the simultaneous coding level for the qualitative analysis process. The coding process for both the survey responses and the interview transcripts involved the assigning of a both a primary code and a simultaneous code to each unit of analysis. The eight primary codes used for the qualitative analyses are listed in Table 8.

Table 8:

Primary codes used for the qualitative survey and interview transcript analyses

Code	Description
100	FRAMEWORK STRENGTHS
200	FRAMEWORK WEAKNESSES
300	COURSE STRENGTHS
400	COURSE WEAKNESSES
500	SELF-EFFICACY
600	INTEREST
700	OTHER BARRIERS
800	OTHER SUPPORTS

The initial set of eight primary codes and 37 simultaneous codes were used by the researcher and a research assistant to test-code a sample follow-up interview transcript, following which process three new simultaneous codes were added to the final set. The complete list of primary and simultaneous codes used for the qualitative analyses is provided in APPENDIX P. Figure 10 shows a screenshot of an excerpt from a sample interview transcript, which has been divided into thematic units and coded using *MicroSoft*™ *Excel*™ software.

D	E	F	G	H	I
Datum Unit	**Response**		**Primary Code #**		**Simulataneous Code**
1	Nope. Ready to go.		0		
2	I'm always trying to be alert and aware of what's around with current technologies that could enhance my own tasks and jobs.		600		603
3	I'm no longer, in my present position, a classroom teacher, but I look for ways that would augment what I do within the context of the Writing Centre, specifically.		600		603
4	I'm not, completely, averse to using them. I look for them and ways that they might be useful and,		600		603
5	when this opportunity came up, I saw it as an opportunity to get a little more insight of working with the RLOs,		600		
6	getting a sense of the pragmatics of creating a RLO and making practical use of it, hoping that that experience would give me a little better insight, a little more reliable insight, into very particular application in a concrete circumstance,		600		
7	which I don't have a lot of opportunity for. So it's mostly my scanning of reading, what literature, popular magazine articles, what professional literature I have exposure to and stuff, and the various discussions and debates, announcements, and so on, much of which has, in my readings, put me on guard every bit as much, if not more so, as being intrigued about the use of technology.		700		706
8	So this was a really interesting exercise for me and it was for largely that reason, getting those insights, that I took it.		600		
9	And since doing it, I think I have . . . In real terms . . . I've probably just decided that I can look even more closely.		600		603
10	I can take a more active approach at looking closely at some of these technologies and how we can integrate them.		600		603
11	I don't see it as specifically a trigger for me to make use of RLOs in my present context right now.		600		604
12	But they interested me.		600		
13	That whole process that you led us through with that exploration stuff interested me and so I think I'm a bit more open to it		300		304

Figure 10: Interview transcript excerpt demonstrating thematic units and coding

Inter-rater reliability for the interview transcript coding.

Inter-rater reliability is a measure of the consistency with which different raters select the same descriptive code when analyzing transcripts such as those from follow-up interviews (Cohen, et al., 2011; Stemler, 2013). A high degree of inter-rater reliability indicates the level of confidence that can be placed in the classification and qualitative interpretation of a participant's comments. A total of five researcher-led follow-up interviews were conducted with participants from the CSAM professional development course. Two of the interview transcripts were randomly selected to be used for the establishment of inter-rater reliability for the qualitative analysis component of this research study.

Follow-up interview transcripts were entered into *Microsoft*™ *Excel*™ spreadsheet files. The transcripts were divided into separate units of analysis on each row of the spreadsheet. The units of analysis ranged in size from a single clause within a sentence, up to several sentences comprising a single topical theme. Drop-down menus were created in the adjacent columns to allow raters to select from the predetermined sets of primary and simultaneous codes. Only one primary code and one simultaneous code were assigned to a single unit of analysis by each rater. The principal researcher and a research assistant each independently coded copies of the same two sample interview transcripts. The numerical codes for each sample transcript were collated into a separate *Microsoft*™ *Excel*™ spreadsheet file, and exported to a comma-delimited (.csv) file format. The raw numerical code files were imported into a web-based tool to calculate four measures of inter-rater reliability (Freelon, 2011). The results of the calculations of inter-rater reliability for the two sample interview transcripts are presented in Table 9.

Table 9*:*

Inter-rater reliabilities for the interview transcript coding

	Percent Agreement	Scott's Pi	Cohen's Kappa	Krippendorff's Alpha	# Agree	# Disagree
Primary Coding						
Sample 1	96.72	.96	.96	.96	59.00	2.00
Sample 2	96.00	.95	.95	.95	24.00	1.00
Simultaneous Coding						
Sample 1	91.80	.90	.90	.90	56.00	5.00
Sample 2	84.00	.81	.81	.81	21.00	4.00

Notes: n_{Sample1} = 61 units of analysis; n_{Sample2} = 25 units of analysis

Percent agreement is a simple statistical calculation of the percentage of coding decisions that were the same between the two raters. The percent agreement for the primary coding level was calculated at 96.72 for the first sample transcript, and 96.00 for the second sample transcript. The percent agreement for the simultaneous coding level was calculated at 91.80 for the first sample transcript, and 84.00 for the second sample transcript.

Scott’s Pi and Cohen’s Kappa are coefficients calculated to determine the level of agreement between two raters when comparing nominal data scales (Lombard, Snyder-Duch & Campanella Bracken, 2004). Both measures attempt to account for the probability of random chance in the selection of identical codes, as opposed to coding decisions derived from similar rater logic or mental mindset. Krippendorff’s Alpha is a coefficient used to determine the level of agreement between multiple raters for either nominal, ordered, or ranking scales (Lombard, Snyder-Duch & Campanella Bracken, 2004). Krippendorff’s Alpha also accounts for the probability of random chance in the selection of identical codes by multiple raters. Scott’s Pi, Cohen’s Kappa, and Krippendorff’s Alpha were all calculated at .96 for the primary coding of the first sample transcript, and .95 for the primary coding of the second sample transcript. The three coefficients were all calculated at .90 for the simultaneous coding level for the first sample transcript, and .81 for the simultaneous coding level for the second sample transcript. A coefficient level of 1.0 for either Scott's Pi, Cohen's Kappa, or Krippendorff's Alpha would signify complete agreement between raters (Lombard, Snyder-Duch & Campanella Bracken, 2004). A coefficient level of 0.0 would signify complete disagreement between raters (Lombard, Snyder-Duch & Campanella Bracken, 2004). The calculated coefficients ranging from .81 to .96 indicate a high level of inter-rater reliability for the qualitative analyses of the follow-up interview transcripts in this research study.

Practical and Ethical Considerations

This section includes an overview of key practical and ethical considerations for the implementation of the research study. A description is provided regarding considerations for obtaining informed consent from research study participants. Details are provided regarding the collection and storage of research study data, which followed guidelines established by the *Tri-Council Policy Statement on Research Involving Humans* (TPS2) (Government of Canada Panel on Research Ethics, 2011). This section concludes with an overview of practical and ethical considerations regarding the selection of the specific course learning management system (LMS) platform used for the CSAM online professional development course.

Informed consent.

This research study involved minimal risk. Enrollment in the CSAM professional development course was voluntary, and by open invitation. Registered participants were orally informed of the purpose of the research study, the specific data collection instruments, and the intended use of the data (via an audio recording embedded in the online course site) and in written form (via an information letter included with the original email invitation package, a dedicated page in the online course site, and a downloadable, printable information letter). Expectations of participants were explained. Participants were informed that participation was voluntary, that there would be no negative consequences for withdrawing from the study, and that no explanation was required when deciding to withdraw. Participants who withdrew from this study were able to continue with their participation in the online course. All research study participants completed an electronic Consent Form (see APPENDIX A for the Consent Form script), and were sent a confirmation email upon completion of the Consent Form.

Data collection and storage.

Data collection via electronic survey instruments was conducted in compliance with the Second Edition of the Government of Canada *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* (TPS2) (Government of Canada Panel on Research Ethics, 2011) and Athabasca University research ethics guidelines and procedures. The Research Ethics Boards (REB) or Institutional Research Boards (IRB) of other participating institutions were also consulted to determine if separate Ethics Approval applications were required. Survey instruments were housed on, and stored collected data on secured servers administered by Athabasca University. Participant interviews were conducted in person or via recorded VoIP-to-telephone calls. Interview recordings and subsequent transcripts were stored and secured offline by the researcher. The presentation of data in this dissertation and any research conclusions do not contain any names or personal information. All research information was secured and protected.

Course LMS.

The CSAM online professional development course was hosted on the *Canvas*™ Learning Management System (LMS) (https://canvas.instructure.com). *Canvas*™ is an open LMS, and is free for use to create and host courses by individual teachers. The *Canvas*™ platform was selected because it is a free, open, online resource. The open nature of the LMS reflects the premise of using free, online resources for the creation of mobile RLOs. Use of the Canvas LMS platform was also critical to the participant sampling for this research study. The platform enabled potential participants to easily create their own user accounts, and to self-enroll in the course by using a provided Internet hyperlink, entering their email address, and creating a new password. The ability to self-enroll was vital for this research study because participants came from multiple institutions. These diverse institutional affiliations had the potential to create an administrative barrier if a closed LMS (such as Athabasca University's *Moodle*™ LMS) were to have been used, which would have then required local enrollment of all study participants. In addition to logistical requirements, the *Canvas*™ platform was optimized for both personal computer and mobile device access. A mobile app was available for the Android™ and iOS™ operating systems. Users of other mobile operating systems could access a virtually identical interface via a mobile web browser.

Summary

A pragmatic, mixed-methods approach was used for this research study. Data on participants' perceptions of self-efficacy and the utility of the CSAM framework was collected using a combination of survey instruments and interviews. Data analyses used a combination of quantitative and qualitative methods in order to triangulate survey results with contextualized data from open-response survey and interview questions. The overall research design could be described as the first and second phases of design-based research, involving the development, pilot testing, and implementation of both the CSAM framework and the online course. This study provides recommendations for further research and practice, including refinements for future offerings of the online professional development course. Future research stemming from this study may include collaboration with researchers to investigate the potential for continued use of the CSAM professional development course. That collaboration would entail continued provision of professional development training opportunities to faculty, pre-service and practicing teachers, as well as the identification of problems and questions for continued research. Specific recommendations for refinements to the professional development course, stemming from the feedback from participants in this research study, are presented in Chapter IV. Additional recommendations for further research and practice are outlined in Chapter VIII. The following chapter (Chapter IV) describes the first phase of this DBR study. Chapter IV presents a detailed description of the online course development and implementation process (including pilot-testing procedures and course and research study participant figures).

Chapter IV: THE CSAM ONLINE PROFESSIONAL DEVELOPMENT COURSE

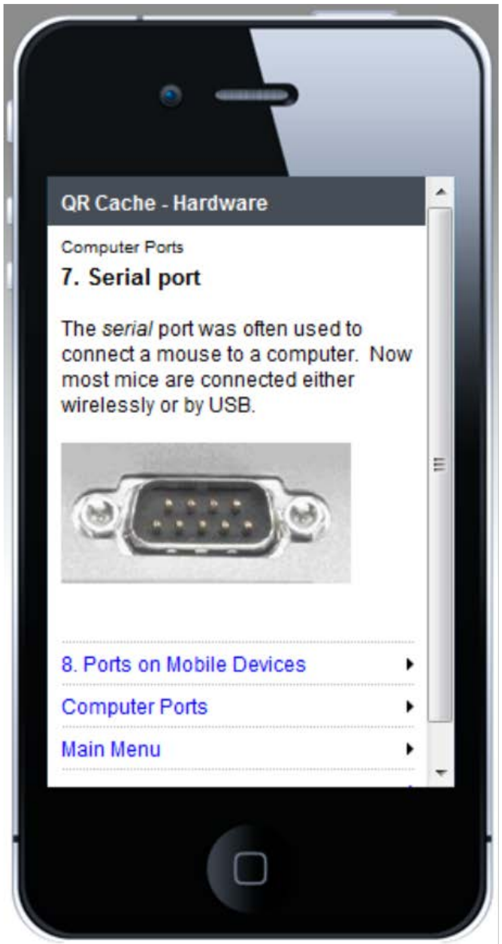
The detailed research design and methodology for this study were presented in Chapter III. This chapter describes the first phase of this design-based research study by providing an overview of the development and implementation of the research study intervention. Participants were recruited to complete an online professional development course called *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies*. This chapter is divided into five sections. The first section of this chapter describes the origins of the professional development course, as well as the specifics of the course modules, learning activities and resources, and the integration of the research data collection instruments into the online course. The second section of this chapter provides a description of the method used to ensure that the development of the professional development course adhered to recognized quality assurance standards. The third section of this chapter outlines the recruitment and enrollment of participants in the online professional development course and the research study. This section also describes demographic information related to participants and participating institutions. The fourth section of this chapter examines general feedback about the professional development course obtained through the end-of-course feedback survey. The fifth section of this chapter provides recommendations for iterative improvements to the overall design and implementation for future offerings of the online professional development course.

Origins of the PD Course

The CSAM online professional development course was developed based upon the content from a training workshop originally delivered at the *Technology in Higher*

Education (THE2013) Conference in Doha, Qatar (Power, 2013c). That workshop was delivered following a request from the conference organizers to demonstrate how to build the types of mobile reusable learning objects developed for the *QR Cache* research project (Power, 2012b, 2012c).

The *QR Cache* mobile RLOs were designed using the key pedagogical elements of CSAM. Those RLOs were developed using such free online resources as *Winksite*™ (Wireless Inc., 2014), to host the HTML-based RLOs, royalty-free and Creative Commons attributed online graphics, and free quick response (QR) code generator applications. For the *QR Cache* project, QR codes were printed on stickers and mounted on parts inside of computer chassis. Students accessed the RLOs by scanning the QR codes with their own mobile devices. The RLOs presented them with content related to the names and functions of the computer components upon which the QR codes had been mounted. Figure 11 shows two screenshots of the *QR Cache* RLOs that were developed entirely with free, online resources.



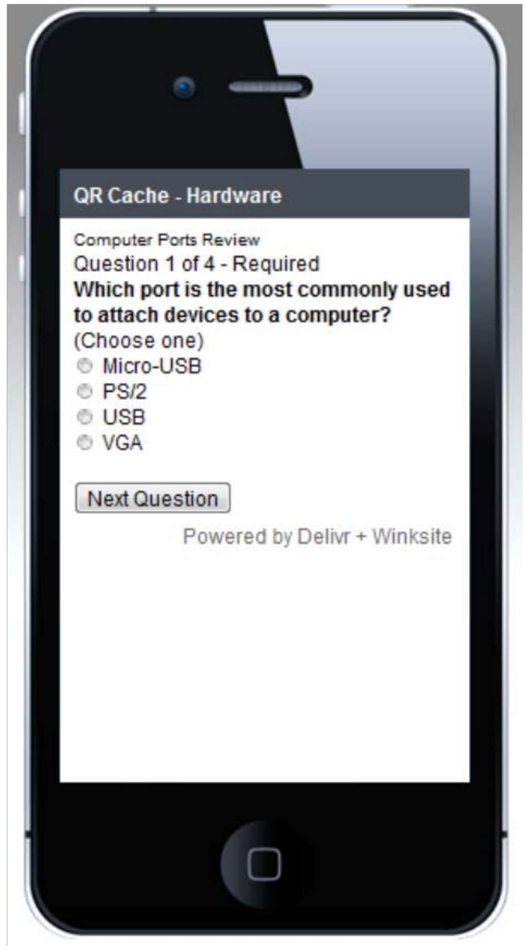


Figure 11: Screenshots from the *QR Cache* project RLOs (Power, 2012b, 2012c)

For the *THE2013* workshop presentation, a new mobile RLO was built using the same suite of free resources. The *Create Your Own Mobile RLOs RLO* (Power, 2013d) included channels that provided background information on instructional design considerations, such as the CSAM framework, as well as step-by-step instructions on how to use *Winksite*™ to build new RLOs and how to use QR codes to provide access to the RLOs. Workshop participants were provided with access to the *Create Your Own Mobile RLOs RLO* via a QR Code and the text-based website address. Participants were able to follow the content of the RLO on their own mobile devices as they collaborated with the workshop presenter to make decisions about the design for a new RLO. Figure

12 shows two screenshots from the *Create Your Own Mobile RLOs RLO* created for the *THE2013 Conference*.

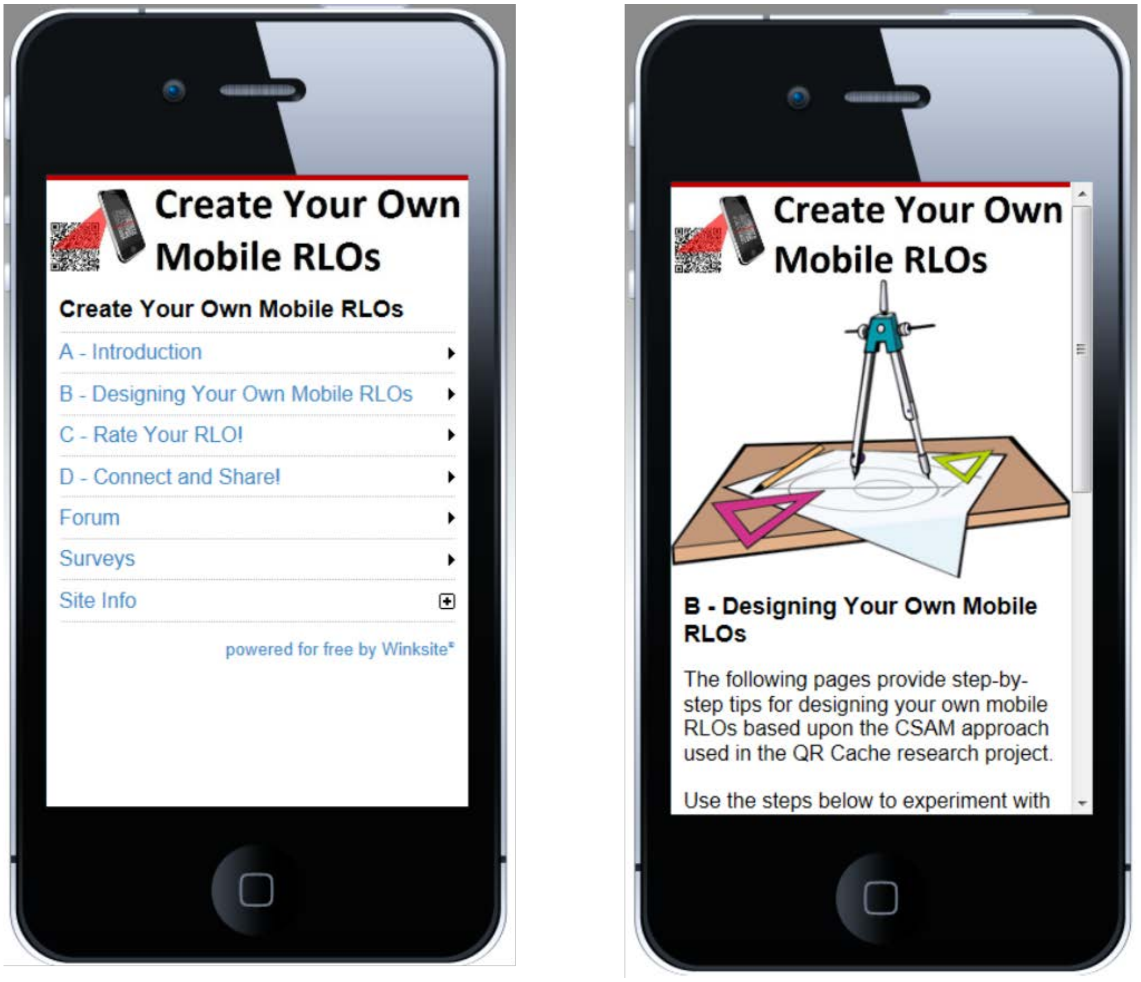


Figure 12: Screenshots from the Create Your Own Mobile RLOs RLO (Power, 2013d)

Figure 13 shows two screenshots from the new RLO designed and constructed by the workshop presenter in collaboration with participants at *THE2013*.

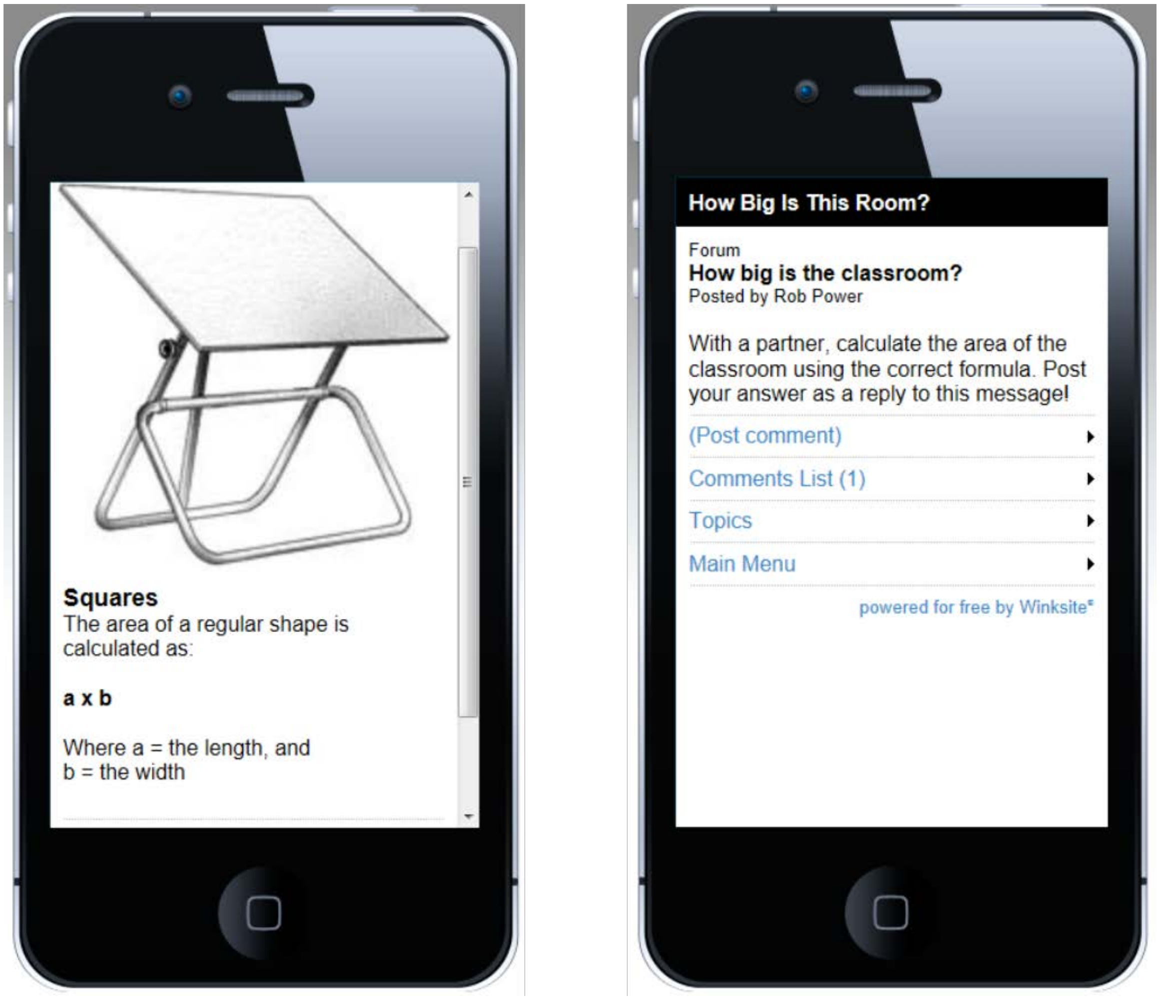


Figure 13: Screenshots from the RLO designed collaboratively at *THE2013*

The idea for the CSAM online professional development course originated from discussions with researchers from Ohio State University on how to adapt the original *THE2013* workshop presentation into a professional development tool for that institution's teaching faculty and graduate education students. The overall aim of the CSAM course was to provide an introduction to the CSAM framework, the use of the CSAM framework to guide instructional design decisions for the use of mobile RLOs, and an opportunity to use free online tools to build mobile RLOs based around the CSAM framework. The aim of the course was designed to satisfy the conditions stipulated in the conceptual framework that guided the research question for this study, namely:

> Would using the CSAM learning design framework foster increased interest in, and teacher's perceptions of self-efficacy towards, integrating mobile RLOs to facilitate or enhance collaborative learner interactions in teaching and learning practice?

Course Development and Components

The previous section presented the origins of the topics for the CSAM online professional development course. This section provides details on the development of the online course, including the choice of course delivery platform, the specific course modules and learning activities, and the integration of data collection instruments into the course design.

The CSAM professional development course was developed using the *Canvas*™ learning management system (LMS). *Canvas*™ is a cloud-based LMS, meaning that it is hosted across multiple servers and is accessed via a password-protected web-based login page. The *Canvas*™ LMS is considered open-access, and use of the LMS is free for individual instructors. *Canvas*™ is also available for institutional use on a license fee basis. As of 2013, the *Canvas*™ LMS platform is currently used by over six hundred educational institutions worldwide (Canvas, n.d.). Empsom (2013) notes that *Canvas*™ currently has over six million registered teacher and student users. Edutechnica (2014) places *Canvas*™ at approximately 7.5% of the market share for LMS adoption amongst institutions with more than one thousand enrolled students in the United States.

There were three main reasons for the decision to use the *Canvas*™ platform for the CSAM online professional development course. The first reason for the use of *Canvas*™ was because it is open-access. The use of *Canvas*™ allows potential participants to self-enroll in the professional development course, provided that they have the course enrollment web address (URL). The enrollment URL was provided to potential participants for this research study along with the recruitment information package. The ability to self-enroll in the online course facilitated the recruitment of potential participants from multiple institutions by eliminating the need to manage enrollment through any one institution's local LMS.

The second reason for the use of *Canvas*™ was also related to open-access. One of the core objectives of the course learning activities is to use free, online tools to build mobile reusable learning objects. A deliberate decision was made to use the *Canvas*™ LMS in order to remain consistent with the objectives and activities of the course itself.

The third reason for the use of *Canvas*™ is platform interoperability. *Canvas*™ is a web-based LMS, and can be accessed using a web browser application on any type of personal computer. The *Canvas*™ LMS is also optimized for access using mobile devices. *Canvas*™ can be accessed on any mobile operating system using a mobile web browser, or by using a customized app available for the Android operating system. Figure 14 shows a screenshot of the CSAM online professional development course home page as it appears when accessed using a desktop computer. Figure 15 shows a screenshot of the course home page as it appears when accessed using a mobile computing device.

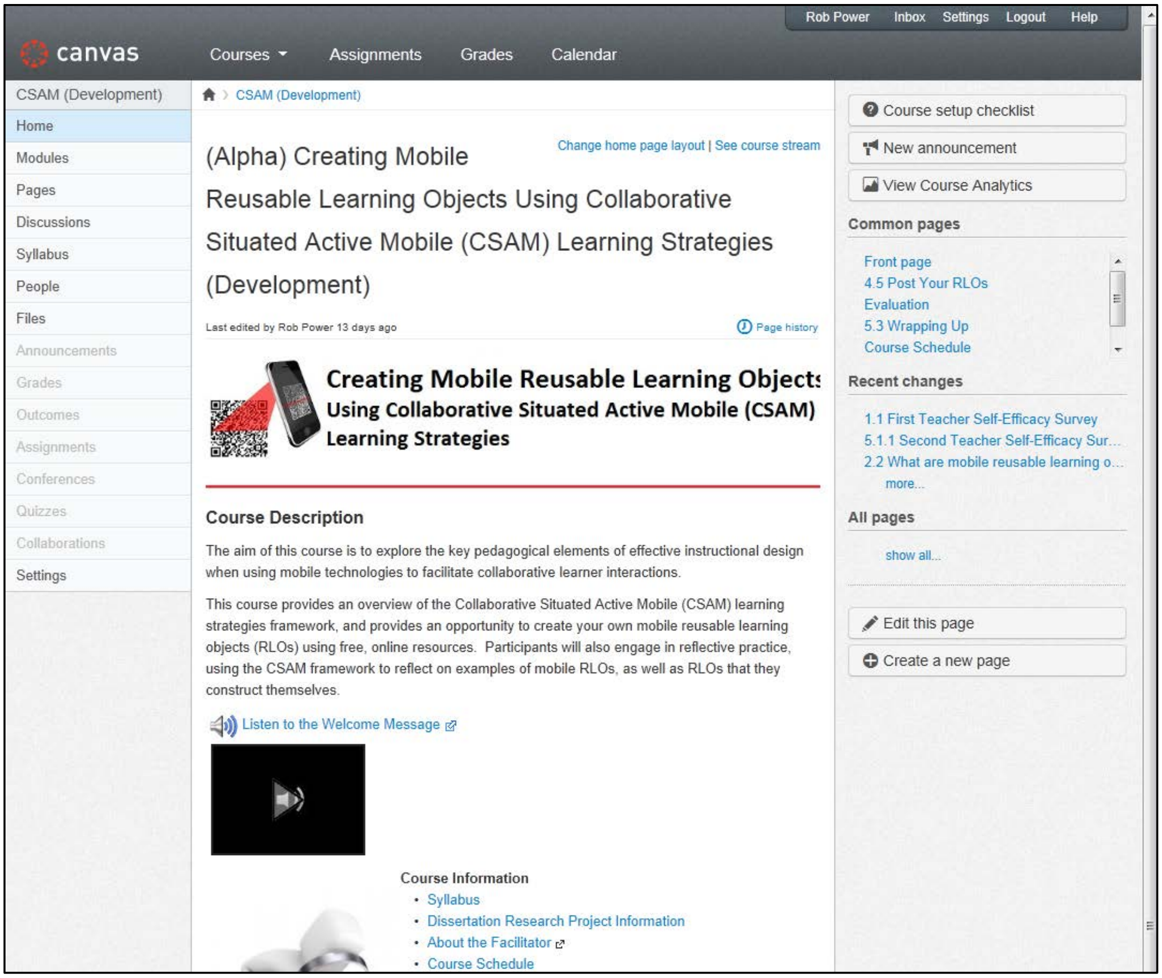


Figure 14: Screenshot of the CSAM course home page in *Canvas*™ as viewed on a desktop computer (Instructure, n.d.) (reproduced with permission)

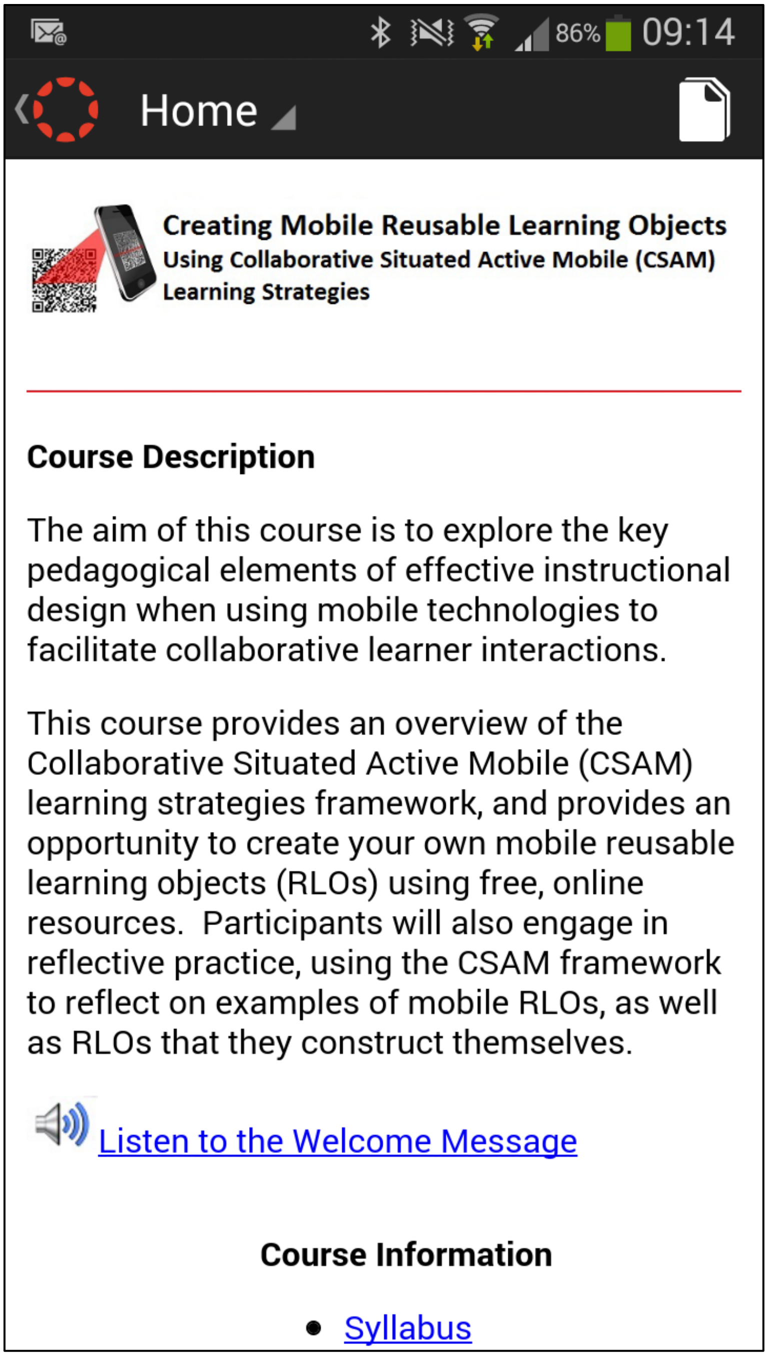


Figure 15: Screenshot of the CSAM course home page in Canvas™ as viewed on a mobile computing device (Instructure, n.d.) (reproduced with permission)

Course modules.

The CSAM professional development course was developed between October 2013 and March 2014. The specific components of the course site development included the course home page, critical information for participants, five learning modules, integrated learning activities, and the research study data collection instruments. The following excerpt is the Course Description from the CSAM course home page:

> The aim of this course is to explore the key pedagogical elements of effective instructional design when using mobile technologies to facilitate collaborative learner interactions.
>
> This course provides an overview of the Collaborative Situated Active Mobile (CSAM) learning strategies framework, and provides an opportunity to create your own mobile reusable learning objects (RLOs) using free, online resources. Participants will also engage in reflective practice, using the CSAM framework to reflect on examples of mobile RLOs, as well as RLOs that they construct themselves.

The critical information for participants components of the CSAM course site include information on this research project, information on course access and participation requirements and expectations, a detailed course syllabus, and a course delivery schedule. The course syllabus describes the five primary learning objectives for the CSAM course. A copy of the course syllabus is included in APPENDIX M.

The CSAM online professional development course consists of six modules, as outlined in Table 10.

Table 10

Course modules for Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies

Module	Topic
Module 0	Getting Started
Module 1	Exploring Your Skills with mLearning
Module 2	Introduction to Using Mobile RLOs for Collaborative Learning
Module 3	Planning to Use Mobile RLOs
Module 4	Creating Mobile RLOs
Module 5	Reflective Practice

The course was designed to be run over ten days (two working weeks). Each module was scheduled for two days, with access to a new module released every two days in sequence. Module 0: Getting Started was available before the official beginning of the course. Registered course participants could access Module 0 at any time to obtain general course information, dissertation research project information, the online Informed Consent Form, and the Welcome Discussion Forum.

Learning activities and resources.

The learning activities for the CSAM professional development course were designed to promote reflective practice amongst participants. The focus of the reflective practice was on the process of making decisions about the pedagogical components of instructional design for mobile learning. The CSAM framework was used to provide structure to pedagogical decision-making, as well as reflection upon the implementation of instructional designs in the form of RLOs constructed by course participants themselves.

In the first activity for the CSAM course, participants were asked to complete the combined Teacher's Sense of Efficacy Scale (TSES) (Tschannen-Moran & Woolfolk Hoy, 2001a, 2001b) and mobile Teacher's Sense of Efficacy Scale (mTSES) surveys. Scores on each of the categories for the two surveys were immediately provided to each participant, who were then asked to reflect upon what those scores told them about their own perceptions of efficacy with mobile learning strategies compared to that for their teaching practice in general. Participants were then asked to post a welcome message to the course discussion forum. In that posting, participants were asked to introduce themselves, and provide a reflection upon the results of the initial survey.

The second activity for the CSAM course came at the end of Module 2. In Module 2, participants explored concepts such as the definitions of mobile learning and reusable learning objects. Participants were also provided with an overview of the CSAM framework. The second learning activity asked participants to explore case studies of the use of mobile RLOs, and to identify the specific Collaborative, Situated, Active, and Mobile components as described in those case studies. Participants were asked to post their findings to a course discussion forum.

The third learning activity for the CSAM course came at the beginning of Module 3. Participants were asked to identify topics or learning activities from their own areas of teaching expertise which could be enhanced through the use of a mobile RLO. Participants were asked to post these ideas to a course discussion forum.

The fourth learning activity for the CSAM course came at the end of Module 3. Module 3 of the course used the CSAM framework to provide guidance to help participants make instructional design decisions for the development of a mobile RLO for a topic of their own choice. Participants were asked to develop an instructional design plan that incorporated the four components of the CSAM framework. The instructional design process outlined in the course included making decisions about the Collaborative, Situated, Active, and Mobile components for the proposed RLOs, developing detailed storyboards to illustrate what the proposed RLOs would look like, preparing content scripts, and gathering together any resources specified in the instructional design plans. Participants were then asked to post their completed plans to a course discussion forum. Participants were also encouraged to use the CSAM framework to provide feedback to each other on the instructional design plans that they posted.

The fifth activity for the CSAM course came in Module 4. Participants were asked to use free online resources, such as *Winksite*™ (Wireless Inc., 2014), to build a complete mobile RLO based upon the instructional design plans they had developed during Module 3. Once they constructed their mobile RLOs, participants were asked to post a hyperlink to a course discussion forum to allow other participants to view their RLOs using mobile devices.

The sixth learning activity for the CSAM course came in Module 5. Participants were asked to view RLOs developed by other participants. Participants were encouraged to use a mobile device to view the RLO projects. However, because mobile websites hosted using *Winksite*™ are displayed using a mobile browser emulator when viewed from a desktop computer-based web browser (Wireless Inc., 2014), all participants were able to assess the RLO projects from the perspective of a mobile device user. Participants were then asked to use the CSAM framework to structure feedback to each other in the course discussion forum about the mobile RLO projects that they had viewed.

Participants were also encouraged to engage in reflective practice by using the CSAM framework to reflect upon the RLOs that they had developed, and the feedback posted by their peers.

The final learning activity for the CSAM professional development course came at the end of Module 5. Participants were again asked to complete the combined TSES and mTSES surveys. Scores for each of the sub-components of the two survey instruments were immediately returned to each participant. Participants were asked to reflect upon what, if any, changes had occurred in their scores compared to their scores from the survey at the beginning of the course. Participants were asked to post their reflections to a course discussion forum.

Data collection instruments.

Specific aspects of the data collection instruments for this research study were outlined in Chapter III, including the selection of the TSES and mTSES survey instruments, methodologies for assessing the validity and reliability of the surveys, and the use of follow-up interviews. This section describes the integration of the survey instruments into the design of the CSAM online professional development course.

The TSES and mTSES survey instruments were integrated into the design of the CSAM online professional development course in order to solicit higher response rates and more candid responses to the survey questions. To do this, the questions from the two surveys were combined into a single survey instrument. The survey instrument was administered using Athabasca University's *LimeSurvey* tool. A direct link to the survey was embedded into the course LMS for the CSAM course.

The survey instrument was incorporated into the design of the CSAM professional development course as learning activities in Modules 1 and 5. Responses to the surveys were stored on the *LimeSurvey* account administered by Athabasca University. Participants' individual scores were immediately returned to them for use as part of reflective practice activities in Modules 1 and 5. In order to accommodate course participants who for any reason opted to withdraw from participation in the research study, links were provided within the online course to alternate versions of the survey instruments. These alternate survey versions were provided in the form of *Microsoft*™ *Excel*™ spreadsheets that would automatically calculate users' scores for each of the TSES and mTSES sub-components without transmitting that data to the researcher. The scores calculated by the alternate versions of the survey instruments could then be used by participants to complete the reflective practice activities in the course.

Quality Assurance

The previous sections of this chapter described the origins and development of the content and learning activities for the CSAM online professional development course. This section describes the methodology used to ensure adherence of the course to established quality assurance standards.

Quality assurance is defined by the Quality Matters™ organization as "a systematic program for determining whether a product or process is performing according to established standards" (Quality Matters, 2014b). Evaluation of adherence to quality assurance standards for the instructional design and technical implementation of an online course is important for two main reasons. One reason is to ensure that poor technical design and implementation do not preclude potential learners from participating in an online learning opportunity. A second reason is to ensure that poor technical design and implementation do not detract from instructional design intentions, thereby having a detrimental effect upon the integrity of data collected for this research study.

For the purposes of this research study, the standards established by the Quality Matters™ program were used to assess quality assurance. The Quality Matters™ program is a voluntary, non-profit organization established by the MarylandOnline consortium in 2003 to create a rubric for evaluating the design of online courses based upon the latest research into online learning instructional design (MarylandOnline, 2006; Quality Matters, 2013a, 2013b). As of 2014, the Quality Matters™ program had over eight hundred subscribing institutions in forty-six states in the United States, as well as in six countries (MarylandOnline, 2014). College of the North Atlantic-Qatar, which was one of the participating institutions in this research study, subscribes to the Quality Matters™ program to provide guidance and review for adherence to quality assurance standards for courses developed for its learning management system.

To guide the review of online course design, the Quality Matters™ program has created the Quality Matters™ Rubric (MarylandOnline, 2014). The rubric delineates eight general standards to be assessed before providing formal accreditation to an online or blended course. Those general standards are outlined in Table 11.

Table 11

General assessment standards in the Quality Matters™ Rubric (MarylandOnline, 2014, p. 2)

General Standard	Description
1.	The course overview and introduction
2.	Learning objectives and competencies
3.	Assessment and measurement
4.	Instructional materials
5.	Learner interaction and engagement
6.	Course technology
7.	Learner support
8.	Accessibility

Each of the Quality Matters™ Rubric general standards is divided into a number of sub-standards (MarylandOnline, 2014). The rubric contains 41 specific standards. Some standards are considered essential requirements, and are rated at 3-points each. Other standards are rated at either 2-points or 1-point each. There are a total of 95 possible points on the Quality Matters™ Rubric. However, formal accreditation requires that a course review meets all 21 of the required, 3-point criteria. The Quality Matters™ Rubric general standards and specific sub-standards are provided in APPENDIX M.

Accreditation as a Quality Matters™ certified online course requires a formal peer-review process using the Quality Matters™ Rubric (Quality Matters, 2013b). However, the formal peer-review and subsequent accreditation process is only available to official courses offered by institutions that subscribe to the Quality Matters™ program. The CSAM course was not affiliated with a specific educational institution, which meant that it was not eligible for formal review and subsequent Quality Matters™ accreditation. However, Quality Matters™ does provide an interactive self-review tool for individual use (Quality Matters, 2012). An account with the Quality Matters™ MyQM online portal is required in order to access to the Quality Matters™ Rubric self-review tool (Quality Matters, 2014). Creating an account with MyQM is free for employees of institutions that subscribe to the Quality Matters™ program. The researcher was able to access the MyQM portal and the self-review tool as an employee of a Quality Matters™ subscribing institution. The decision was made to use the Quality Matters™ self-review tool because the Quality Matters™ Rubric is considered the official benchmark of quality assurance for online course design by the researcher's employing institution.

The eight general standards and the 41 specific sub-standards of the Quality Matters™ Rubric were used as design guidelines during the design and development phase for the CSAM course. Quality assurance testing for the course was conducted in two phases. The first phase was Alpha testing. Craig and Jaskiel define Alpha testing as "an acceptance test that occurs at the development site as opposed to the customer site" (2002, p. 112). Alpha testing began after the initial version of the course site was built in the *Canvas*™ LMS. Alpha testing involved peer-review of the content and functionality of the course LMS site. The Alpha testing phase involved three stages which are outline in Table 12.

Table 12

Alpha testing for quality assurance of the Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies course

Stage	Description
1	Review of the course LMS site for overall impressions of topics and learning activities. Conducted by representatives of participating institutions.
2	Self-review of the course design using the interactive Quality Matters™ self-review tool.
3	Peer-review of the course design using the interactive Quality Matters™ self-review tool.

The CSAM online professional development course was initially designed following discussion with researchers from Ohio State University about collaboration with the researcher to deliver professional development training on mobile RLO design. Stage 1 of the Alpha testing process involved a review of the course topics, structure, and learning activities design, by mobile learning researchers from OSU, to ensure that the course satisfied their content expectations.

The second stage of the Alpha testing for the CSAM course involved a self-review by the researcher. The interactive Quality Matters™ self-review tool was used for the second stage of the Alpha testing. The results from the self-review tool are included in APPENDIX N. No major refinements were made to the design of the course after the self-review, as the Quality Matters™ Rubric elements had already been used by the researcher to guide the initial course development.

The third stage of the Alpha testing involved a peer-review of the design of the CSAM course. For this stage, three instructional developers responsible for designing and evaluating online course materials at a technical college in Doha, Qatar were granted access to the course LMS site. The instructional developers were asked to use the interactive Quality Matters™ self-review tool to complete an informal peer-review of the course site design, content, materials, and learning activities design. One of the instructional developers completed a peer-review of the course independently, and forwarded the results of the self-review tool to the researcher by email. Two of the instructional developers conducted the peer-review process collaboratively, using the self-review tool. They then forwarded the results from the self-review tool to the researcher by email. The complete results from the self and peer-reviews using the Quality Matters™ self-review tool are provided in APPENDIX N. The results of deficiencies identified by the self and peer-reviews of the CSAM professional development course are summarized in Table 13.

Table 13

Summary of self and peer-reviews using the Quality Matters Rubric

Standard	Required	Met Self	Met 1	Met 2-3	Comments
2.3	Yes	Yes	No	Yes	Should be written from the student' perspective (QM standard 2.3). For example, instead of saying "Participants will..." say "You will ...."
5.3	Yes	Yes	Yes	No	We could not locate any specific statement of this sort. The nature of this course may not require this as there are no real "for grades" assessments present.
6.5	No	Yes	No	Yes	Some videos not displaying on the content pages. The YouTube page displays "This video is currently unavailable."
7.1	Yes	Yes	Yes	No	As this course is not affiliated with an institution, it does not have a support service. We could not see any evidence during our review.
7.2	Yes	Yes	No	Yes	It is not possible to provide specific support for special accessibility requirements, and this is stated in the course. This course is being offered independent of a formal educational institution.
7.3	No	No	Yes	No	Institutional support n/a in this context, as this is an open, online course not affiliated with a specific institution This course is not associated with a student success department.
7.4	No	No	Yes	No	Institutional support n/a in this context, as this is an open, online course not affiliated with a specific institution This course is not associated with a student success department.
8.2	No	Yes	Yes	No	On images, viewed on a Mac, we could not see ALT tag content for text readers.
8.4	No	Yes	Yes	No	We could not see evidence of this.

Addressing peer-review feedback.

The self and peer-reviews of quality assurance for the CSAM professional development course identified deficiencies for nine of the 41 specific standards on the Quality Matters™ Rubric. Four of the identified deficiencies related to General Standard 7, which relates to learner support services. The specific sub-standards for General Standard 7 stipulate the articulation within the course site, or the provision of a link to, institutional support services such as learner support, technical support, and accessibility support policies and services. The CSAM was not affiliated with an educational institution, so it was not possible to satisfy these specific sub-standards. However, the Canvas learning management system does provide a link to the *Canvas*™ Guides (Canvas, n.d. b), which provide some support to users in the form of user manuals and answers to frequently asked questions. Instructions on where to find available support services through the *Canvas*™ Guides were added to the Course Accessibility and Participation page on the CSAM course site.

Three of the deficiencies identified through the peer-review process for the CSAM course related to technical issues. The first deficiency identified relates to specific standard 6.5. Specific standard 6.5 refers to the current status of the technologies embedded in the course design. One peer-reviewer noted that two of the embedded YouTube™ video links did not work at the time of the review. An investigation of the issue determined that the original YouTube™ links had become corrupted. Original copies of the two video files were available to the researcher. In order to address the identified deficiency, these video files were uploaded and embedded directly into the course LMS.

The second technical deficiency identified through the peer-review process related to specific standard 8.2. Specific standard 8.2 refers to the provision of “equivalent alternatives to auditory and visual content” (Quality Matters, 2012). The two instructional developers who completed their peer-review collaboratively commented about the absence of ALT tag content for instructional images in the course LMS. The Institute of Electrical and Electronics Engineers (IEEE, 2014) describe ALT tags as alternative text embedded in the web page that provide a meaningful description of an image. ALT tags are used to inform viewers of the content of an image if their Internet browser is unable to load the image file. IEEE (2013) notes that ALT tags can also be used by screen reader applications to provide an auditory alternative for users with visual impairments. MarylandOnline (2006, p. 14) cite Nielson (2000) and Zaboroski (in Shattuck, 2002) as indicating that failure to provide accessibility features such as ALT tags can exclude potential learners who otherwise cannot view learning content as presented, but that providing such features “can result in enhanced learning for all student[s].” In order to address the deficiency identified by the peer-review process, ALT tags were added for all instructional images in the CSAM course LMS site.

The third technical deficiency identified through the peer-review process related to specific standard 8.4. Specific standard 8.4 stipulates that “the course design accommodates the use of assistive technologies” (Quality Matters, 2012). The two instructional designers who completed their peer-review collaboratively indicated that they “could not see evidence of this” standard being addressed in the CSAM course LMS site. This specific standard is tied to other specific standards under General Standard 8 (MarylandOnline, 2014). The inclusion of ALT tags described above partially addresses the accommodation of assistive technologies, as it allows for the use of screen readers by users with visual impairments. Screen reader applications can also be used to create an auditory equivalent to the text-based content of all of the pages in the course LMS site.

The final deficiency addressed following the peer-review process for the CSAM professional development course related to specific standard 2.3. Specific standard 2.3 stipulates that “All learning objectives are stated clearly and written from the student’s perspective” (Quality Matters, 2012). Based upon the recommendations of one peer-reviewer, references to “participants will…” in the course learning objectives were updated to a more user-friendly term such as “you will….”

Beta testing.

Craig and Jaskiel (2002, p. 112) describe Beta testing as “an acceptance test conducted at a customer site” after the completion of formal functional testing by product developers. Beta testing frequently involves allowing users to play with a product to gather informal feedback on its appeal, and to ensure that all components still function properly. For the purposes of this research study, Beta testing involved a full run-through of the CSAM professional development course shortly before the commencement of the first professional development course offering.

The Beta testing process for the *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile Learning Strategies* course was conducted in April 2014. For the Beta testing, a copy of the full course was created using the *Canvas*™ LMS. Copies were also created of the survey instruments using Athabasca University’s *LimeSurvey* tool. The Beta, or pilot, version of the course was conducted with the researcher and two mobile learning researchers from a large university in a Midwestern

USA state, who were registered as instructors. Five faculty and staff members from a Midwestern USA university volunteered to participate in the Beta testing as students in the pilot course. The volunteer students were asked to review all of the learning materials and to complete all of the learning activities in the course. The Beta group students were asked to comment on the quality of the learning materials and the flow of the learning activities, and to report any functionality issues that they detected. A discussion forum was created in the pilot version of the course for reporting on pilot testing issues. Volunteer students were also provided with the email address of the principal researcher so that they could directly communicate with the researcher about any concerns or issues that arose.

The Beta testing process resulted in minor changes to text-based instructions that were provided for some of the learning activities in the course. The types of wording changes made to materials in the course primarily consisted of correcting typographical errors, as well as some minor clarifications to instructions. A new video file was also developed and integrated into the instructions for self-scoring after completing the first and second mTSES surveys. As outlined in Chapter III, Athabasca University's *LimeSurvey* tool was used to administer the survey instruments used for this research study. The use of the *LimeSurvey* tool meant that participants were required to copy their survey responses, and paste them into a downloadable mTSES self-scoring tool provided within the course LMS. Volunteer students in the Beta testing group suggested that a short video tutorial about how to complete the self-scoring process for the mTSES would be helpful to students in the research group section of the course. The new video tutorial included screenshots, animations, and audio instructions about where research participants could find the link to a copy their survey responses, which was provided in *LimeSurvey* on the survey completion pages for both the first and second mTSES. The video tutorial also provided screenshots, animations, and audio instructions about how to download and use the mTSES self-scoring tool provided in the course LMS.

Data collected using the Beta testing copies of the survey instruments in *LimeSurvey* was not used for purposes of the research study. Data from the Beta testing copies of the surveys was downloaded to a password-protected external hard disk device upon the completion of the pilot course. The data was downloaded for the sole purpose of testing the functionality of the survey instruments, and the display of the exported raw data as a comma-delimited (.csv) data file. Downloaded copies of the Beta course survey data were deleted from the external hard disk upon verification of the integrity and functionality of the data. Raw data from the Beta course surveys were expunged from *LimeSurvey* upon the completion of the Beta testing process.

Recruitment and Participation

The previous sections of this chapter focused on the course development procedures used in the development of the CSAM online professional development course. This chapter has described the development of the course content, as well as the quality assurance standards applied to the course design, and the pilot testing of the course prior to the beginning of the research study data collection. The following section describes the recruitment of participants for the online professional development course and research study. This is followed by a summary and description of the course and study participant demographics, and general feedback about the course collected through the End of Course Feedback survey tool administered using *LimeSurvey*.

Recruitment methods.

The first phase of data collection for this research study involved the offering of a free, online professional development course called *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies*. Participant recruitment for the course began on April 2, 2014. An information package was forwarded to potential participants, which included a course poster with links to the course self-registration portal and a copy of the Research Information Letter. The information package was forwarded to potential participants by personnel from appropriate departments as determined locally by one large university in a Midwestern USA state, one university in western Canada, one technical college in Doha, Qatar, and one technical and vocational college in Newfoundland and Labrador, Canada.

In addition to the four participating institutions already described, Ethics Approval to recruit participants was also obtained from a university in Newfoundland and Labrador, Canada. However, that approval documentation was not received in time to arrange for the dissemination of the call for participants prior to the start of the professional development course and research study data collection.

The CSAM professional development course was hosted on the *Canvas*™ (n.d. a) open learning management system with an official start date of May 5, 2014. The initial scheduled course end date was set for May 18, 2014. However, several requests were received from participants seeking extra time to complete the course activities. As a result, the official course end date was extended by one week, to May 25, 2014. In addition, participants were advised that, while the course discussion forums and the links to the live survey instruments in *LimeSurvey* would be locked as of June 1, 2014, the course shell would remain available indefinitely as a professional development resource.

Participant demographics and sample sizes.

A total of 72 people self-registered as student participants in the CSAM professional development course. However, not all of those who self-registered before May 5, 2014 actively participated in the course learning activities or research study data collection. Table 14 summarizes the course and data collection demographics and sample sizes.

Table 14

Course registration demographics and research study sample sizes

Demographic / Sample	Sample Size (*n*)
Student self-registrations	72
Formal withdrawals	4
Informed consent (research study participants)	41
First mTSES (pre-course)	36
Second mTSES (post-course)	22
End-of-Course Feedback Survey	13
Consent to be Contacted for a Follow-up Interview	5

Invitations to participate in the online professional development course and the research study were forwarded by collaborating institutions to graduate-level education students and teaching faculty. Table 15 summarizes demographic information related to the status and institutional affiliations of participants in the First mTSES, Second mTSES, and Third mTSES survey administrations, and the follow-up interview sessions.

Table 15

Detailed survey and interview participation demographics

		Status			Institutional Affiliation				
Demographic / Sample	Sample Size (*n*)	$n_{Faculty}$	$n_{Student}$	n_{Other}	$n_{Midwest}$	$n_{Western\ Canada}$	$n_{NL\text{-}TVET}$	$n_{Qatar\text{-}TVET}$	n_{Other}
First mTSES (pre-course)	36	23	5	8	12	10	1	11	2
Second mTSES (post-course)	22	16	1	5	9	1	1	9	2
Third mTSES (follow-up)	14	8	1	5	6	4		4	
Consent to be Contacted for a Follow-up Interview	5	4	1			1		4	

General Course Feedback

The previous sections of this chapter described the procedures used in the development of the CSAM online professional development course. Descriptions have been provided of the procedures used to minimize the potential that quality control issues related to course design and delivery would adversely affect the learning experience of participants. This chapter has also provided details on the procedures used to recruit participants for the professional development course and this research study. An overview has been provided of the participation demographics, including the sample sizes for the research study data collection instruments embedded into the course. This section describes participant feedback on their overall experiences in the professional development course.

Participants in the CSAM course were asked to complete an End of Course Feedback survey upon completion of the learning activities. Questions for the feedback survey were grouped as either closed response or open response. Closed response questions used a five-point Likert scale, with response options ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The survey contained a total of 12 closed response questions, which were sub-categorized under the headings of General (general course questions), Facilitator (questions about the course facilitator), Material (questions about the learning materials in the course), and LMS (questions about the course learning management system and overall course organization). Three open response questions were also posed, to solicit feedback on what participants liked most about the course, what they would change about the course, and any additional comments they would like to provide. The full script of the End of Course Feedback Survey is provided in APPENDIX F.

A total of n = 13 (31.7%) of the 41 enrolled participants who completed the research study Informed Consent form also completed the End of Course Feedback survey. The results of the closed response questions for the End of Course Feedback survey are summarized in Table 16.

Table 16

Responses to End of Course Feedback survey fixed response questions

	n				
Question	(1) Strongly Disagree	(2) Disagree	(3) Neither Agree nor Disagree	(4) Agree	(5) Strongly Agree
I found this to be a high quality course.	0	0	1	5	5
I would recommend this course to other people.	0	0	2	3	8
The instructor has expert knowledge about the material.	0	0	1	3	9
The instructor prompts a lot of discussion in the course.	0	0	1	5	7
The instructor provides useful feedback.	0	0	1	3	9
The course material was useful and easy to follow.	0	0	2	6	5
A variety of types of material were presented to help me understand course topics (i.e., audio, video, graphics, interactive tools).	0	0	2	6	5
The course activities were useful to my understanding.	0	0	1	6	6
The material covered will help me to integrate mobile learning strategies into my teaching and learning practice.	0	1	1	3	8
The course website was well organized.	0	0	0	6	7
The course website was easy to navigate.	0	0	1	6	6
The course website provided a range of tools for interaction between participants and with the instructor.	0	1	0	9	3

All of the respondents (100%, *n* = 13) indicated that the course website was well organized. 92% of respondents (*n* = 12) indicated that they either “Agreed” or “Strongly Agreed” that the professional development course was a high-quality course, and that the course website was easy to use. The same percentage of respondents (92%, *n* = 12) indicated that they perceived that course facilitator had expert knowledge, prompted adequate course interaction, and provided quality feedback to course participants. 85% of respondents (*n* = 11) indicated that they perceived the course learning materials to be easy to use and follow, and that a good variety of types of material were presented to help them understand the course topics. One respondent (8.3%) disagreed that the material covered would help them to integrate mobile learning strategies into their own teaching practice, and one respondent (8.3%) felt the course website did not provide an adequate range of tools for interaction between participants, or with the course facilitator. The remaining respondents provided responses of “Neither Agree nor Disagree” to the various closed response survey questions.

The responses to the closed response survey questions show an overall positive response to the professional development course. Participants indicated that they perceived the course to be well-organized, that a suitable range of learning materials were used, and that the learning activities were appropriate and contributed to their understanding of, and interest in, using mobile reusable learning objects. These general perceptions are reflected in the feedback provided for the open response survey questions. When asked “What did you like most about the course?” one respondent stated that “I thought the length was appropriate and the tasks we were asked to do were simple but effective measures of whether we understood course content.” Another respondent indicated that “it clearly defined relevant and helpful resources, and allow[ed] for ongoing exchange with the instructor and other participants.” One respondent remarked that the course content and learning activities were “broken down into small steps that seemed manageable and not overwhelming.” The range of media and resources provided were cited as highly valued by another participant:

> I liked the inclusion of videos to reduce the amount of reading required. My grad courses were all in online forums. It was difficult to keep up with all of the reading and was challenging to stay engaged. Videos in this course made it much easier to stay engaged.

When asked about what should be changed in the course, two respondents indicated that they felt more time should be allocated, particularly for the completion of Module 3 (Planning to Use Mobile RLOs) and Module 4 (Creating Mobile RLOs). Two respondents indicated a desire for more flexibility in the use of platforms to construct a mobile RLO. A third respondent expressed frustration with integrating other online resources with the *Winksite*™ (Wireless Inc., 2014) mobile website authoring tool, stating that “perhaps stating that you must use a specified set of tools would leave less user issues with tools.” One respondent indicated a desire to provide a formal opportunity to do “a closer critical review of working RLOs employing diverse platforms,” while another respondent stated that they would “like to add a second part in actually implementing a mRLO with learners to see how it works in action.” One of the respondents expressed frustration with using the self-scoring tool provided for participant self-reflection on the results of the First and Second mTSES surveys, which required users to copy their live survey responses (provided by *LimeSurvey*) and paste them into a

Microsoft™ *Excel*™ spreadsheet file that would calculate their scores on the three domains for both the mTSES and the original TSES surveys.

Recommendations

One of the stated aims of this research study was to serve as the first phase of a design-based research effort to develop an open-access professional development resource. The feedback from participants from the first offering of the CSAM online professional development course indicates a number of possible areas where iterative improvements could be made to the course design.

The first recommendation for iterative improvement to the professional course instructional design is to increase the time allocated for the completion of the learning modules. As discussed in the previous sections, a number of course participants requested extra time beyond the original two-week scope of the course. All participants appeared to be satisfied with the addition of a third week to the course timeframe.

The second recommendation for course improvement is to extend the range of mobile RLO authoring platforms discussed in Module 4, and to permit participants to choose alternate platforms for the completion of course learning activities.

The third recommendation is to use a standalone, self-scoring version of the mTSES survey for the reflective practice activities in Modules 1 and 5 of the course. This was not possible in the current context, where data from the mTSES surveys was also collected for analysis as part of this research study. However, a functional standalone self-scoring version of the survey tool was provided in Modules 1 and 5, for use by course participants who opted not to participate in the data collection for the research study.

The fourth recommendation for iterative course improvement is to consider adding an additional module at the end of the course. This new module could be used to provide participants with a practicum experience. Participants could be given the opportunity to field test their mobile RLOs, discuss their experiences with other course participants, and use the CSAM framework to engage in further reflective practice.

Further recommendations for iterative improvements to the CSAM course will be discussed in Chapter VI. Additional recommendations will be discussed in the context of the results of the quantitative analyses of the mTSES surveys and the qualitative analysis of researcher-led follow-up interviews with course participants.

Summary

This chapter provided a detailed description of the development of the online professional development course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies*. Details were provided on the procedures used in the determination of the course content, and the development of the course content and learning activities using the *Canvas*™ learning management system (LMS). A description was provided of the Quality Matters™ quality assurance standards used to guide the development of the course LMS site, and the results of a peer-review of the course site using the Quality Matters™ Self-Assessment tool. The pilot-testing process was also described, along with resultant amendments to the course site to address minor technical issues. The procedures delineated in this chapter were followed to ensure that participants in the research study were provided with an efficient user interface for the professional development course. Adherence to quality assurance standards was vital in order to minimize the potential that either technical or instructional design deficiencies would negatively affect the desired learning outcomes, or the data collected using the Mobile Teacher's Sense of Efficacy Scale (mTSES) survey instruments.

This chapter also provided an overview of the participant recruitment procedures used for the professional development course and the research study. Details were provided on the number of participants who self-enrolled for the professional development course, the number of participants who completed the online Informed Consent Form for the research study, and the number of participants who completed each of the quantitative research study survey instruments.

Results of the End-of-Course Feedback survey were presented in this chapter. The Feedback survey responses indicate that participants enjoyed the professional development course, and that they found the course site and learning materials to be well-designed and beneficial to their learning experience. The Feedback survey responses also indicate that course participants perceived themselves to be better prepared and more interested in integrating mobile learning strategies and mobile RLOs into their teaching and learning practice.

Chapter V includes the results, findings and interpretations from the quantitative analyses of the survey instruments used for this study. The procedures outlined by Benton-Borghi (2006) are used to determine the reliability and construct validity of the mTSES survey instruments compared to those established for the TSES by Tschannen-Moran and Woolfolk Hoy (2001a, 2001b). Data are analyzed from the pre and post-instruction surveys of teachers' perceptions of self-efficacy. The results of the two administrations of the survey are compared to delineate the changes that were observed in participants' perceptions of self-efficacy with respect to integrating mobile RLOs into their teaching and learning practice. These results are then compared to those of a subsequent re-administration of the survey conducted in September 2014. That analysis examines whether the observed increases in self-efficacy and interest in integrating mobile learning strategies were sustained, or translated into changes in personal teaching and learning practice.

Chapter V: QUANTITATIVE ANALYSES OF THE mTSES

Chapter IV described the first phase of this design-based research study. Chapter IV presented an analysis of general feedback from participants in the CSAM online professional development course, as collected using the End of Course Feedback survey. The analysis of the general feedback found that participants expressed a perception that the course, and the CSAM learning design framework, has helped to increase their interest in, and confidence with using mobile learning strategies and mobile RLOs. Chapter V presents the quantitative data analyses components of the second phase of this DBR study. This chapter presents a detailed quantitative examination of changes in participants' perceptions of self-efficacy across repeated administrations of the Mobile Teacher's Sense of Efficacy Scale (mTSES) survey instrument. This chapter begins with the presentation of response rates for the three administrations of the mTSES. This is followed by statistical analyses to determine the reliability and construct validity of the mTSES survey instrument, as compared to the original Ohio State Teacher's Sense of Efficacy Scale (TSES) (Tschannen-Moran, M., & Woolfolk Hoy, A., 2001a, 2001b). Results are presented from the repeated administrations of the mTSES, including analyses of changes in the specific sub-domain scores, net changes in the mean scores accounting for the effects of maturation, and analyses of changes in efficacy perception scores within different demographic groupings. This chapter concludes with an analysis of the closed-response CSAM framework feedback questions from the second (post-course) administration of the mTSES. Changes in participants' perceptions of self-efficacy, and the utility of the CSAM learning design framework, will be examined qualitatively in Chapter VI.

Survey Response Rates

The Mobile Teacher's Sense of Efficacy Scale (mTSES) survey was administered three times. The First mTSES was administered as a pre-course measurement of participants' perceptions of self-efficacy with respect to both general teaching skills (original TSES) and using mobile reusable learning objects (RLOs) and mobile learning strategies. The Second mTSES was administered during the final module of the online professional development course, as a post-training measure of changes to participants' perceptions of self-efficacy. The Third mTSES was administered approximately four months after the end of the professional development course (September 2014) as a measure of the extent to which changes in participants' perceptions of self-efficacy are sustained. Table 17 shows the response rates for the three mTSES surveys.

Table 17

Survey response rates

Demographic / Sample	Sample Size (*n*)
First mTSES (pre-course)	36
Second mTSES (post-course)	22
End-of-Course Feedback Survey	13
Third mTSES (four-month follow-up)	14

Participants in the professional development course and the research study represented a total of four identified host institutions. The highest numbers of participant responses to the mTSES surveys came from the Midwestern USA university (n_{mTSES1} = 12, n_{mTSES2} = 9, n_{mTSES3} = 5) and the technical college in Doha, Qatar (n_{mTSES1} = 11,

$n_{\text{mTSES2}} = 9$, $n_{\text{mTSES3}} = 4$). The breakdown of participant demographics by host institution is presented in Table 18.

Table 18

mTSES response rates by institution

Institution	n_{mTSES1}	$\%_{\text{mTSES1}}$	n_{mTSES2}	$\%_{\text{mTSES2}}$	n_{mTSES3}	$\%_{\text{mTSES3}}$
Midwestern USA University Count:	12	33.33%	9	40.91%	5	35.71%
NL College Count:	1	2.78%	1	4.55%	0	0.00%
Qatar College Count:	11	30.56%	9	40.91%	4	28.57%
Western Canadian University Count:	10	27.78%	1	4.55%	1	7.14%
Other Count:	2	5.56%	2	9.09%	5	35.71%
Total:	36		22		14	

The majority of respondents indicated that they were currently teaching faculty ($n_{\text{mTSES1}} = 23$, $n_{\text{mTSES2}} = 16$, $n_{\text{mTSES3}} = 8$). The survey response demographics by status are presented in Table 19.

Table 19

mTSES response rates by status

Status	n_{mTSES1}	$\%_{\text{mTSES1}}$	n_{mTSES2}	$\%_{\text{mTSES2}}$	n_{mTSES3}	$\%_{\text{mTSES3}}$
Faculty Count:	23	63.89%	16	72.73%	8	57.14%
Student Count:	5	13.89%	1	4.55%	1	7.14%
Other:	8	22.22%	5	22.73%	5	35.71%
Total:	36		22		14	

The highest percentage of survey responses for the First mTSES and Second mTSES surveys came from participants who indicated that they had 15 or more years of teaching experience (n_{mTSES1} = 12, n_{mTSES2} = 9), followed by participants who indicated that they had between 10-15 years of teaching experience (n_{mTSES1} = 8, n_{mTSES2} = 5). The highest percentage of survey responses for the Third mTSES survey came from participants who indicated that they had between 5-10 years of teaching experience (n_{mTSES3} = 4). The survey response demographics by years of teaching experience are presented in Table 20.

Table 20

mTSES response rates by years of teaching experience

Years	n_{mTSES1}	$\%_{mTSES1}$	n_{mTSES2}	$\%_{mTSES2}$	n_{mTSES3}	$\%_{mTSES3}$
0-2	7	19.44%	3	13.64%	3	21.43%
3-5	2	5.56%	1	4.55%	1	7.14%
5-10	7	19.44%	4	18.18%	4	28.57%
10-15	8	22.22%	5	22.73%	3	21.43%
>15	12	33.33%	9	40.91%	3	21.43%
Total:	36		22		14	

This section provided a detailed breakdown of participant demographics for the data collection in this research study. The next section examines the reliability scores for the Mobile Teacher’s Sense of Efficacy Scale (mTSES) survey instrument. The reliabilities for the TSES scale and mTSES scale questions are presented to determine the construct validity of the survey instrument compared to those established for the original TSES (Tschannen-Moran and Woolfolk Hoy, 2001) and the I-TSES (Benton-Borghi, 2006).

Reliability and Construct Validity for the mTSES

The Mobile Teacher's Sense of Efficacy Scale (mTSES) survey instrument was adapted from the original Ohio State Teacher's Sense of Efficacy Scale (TSES). Minor changes were made to the wording of some questions from the TSES in order to contextualize the questions for the use of mobile RLOs and mobile learning strategies. Benton-Borghi (2006) used a similar process to adapt the TSES for a survey instrument to measure teacher's perceptions of self-efficacy in the context of inclusion for students with disabilities (the I-TSES). This section compares the reliabilities established for the original TSES (Tschannen-Moran and Woolfolk Hoy, 2001) and the I-TSES (Benton-Borghi, 2006) to those calculated for the TSES and mTSES scores in this research study. Comparison of the instrument reliabilities was used to establish the construct validity for the mTSES.

The reliabilities for the original TSES (Tschannen-Moran and Woolfolk Hoy, 2001), the TSES scale questions from the I-TSES (Benton-Borghi, 2006), the TSES scale questions from the First mTSES and Second mTSES administrations, and the mTSES scale questions from the First mTSES and Second mTSES administrations are presented in Table 21. Reliabilities were determined by using *Microsoft*™ *Excel*™ to calculate Cronbach's alpha for each instrument as a whole, and for the subdomains of Student Engagement, Instructional Strategies, and Classroom Management.

Table 21

TSES, I-TSES and mTSES reliabilities

SCALES	Cronbach's alpha	Mean	SD	No. Items
Teachers' Sense of Efficacy Scale (TSES) (Tschannen-Moran and Woolfolk Hoy, 2001)				
Efficacy for Student Engagement	.85	27.39	5.06	4
Efficacy for Instructional Strategies	.89	30	4.76	4
Efficacy for Classroom Management	.91	29.54	5.01	4
Total TSES Efficacy	.93	87	12.69	12
Teachers Sense of Inclusion Efficacy Scale (I-TSES) (Benton-Borghi, 2006) Without Technology Items				
Efficacy for Student Engagement	.86	25.79	5.61	4
Efficacy for Instructional Strategies	.89	27.38	5.7	4
Efficacy for Classroom Management	.88	26.93	5.16	4
Total I-TSES	.93	80.17	14.49	12
First TSES				
Efficacy for Student Engagement	.86	48.56	9.73	8
Efficacy for Instructional Strategies	.87	55.11	8.07	8
Efficacy for Classroom Management	.78	54.89	7.67	8
Total TSES Efficacy	.93	158.56	22.89	24
Second TSES				
Efficacy for Student Engagement	.91	50.00	9.92	8
Efficacy for Instructional Strategies	.87	58.00	6.62	8
Efficacy for Classroom Management	.93	54.64	8.20	8
Total TSES Efficacy	.95	155.91	21.67	24
First mTSES				
Efficacy in Student Engagement with mLearning:	.88	47.06	10.68	8
Efficacy in Instructional Strategies with mLearning:	.84	52.31	9.16	8
Efficacy in Classroom Management with mLearning:	.77	54.64	7.52	8
Total mTSES Efficacy	.92	154.00	23.63	24
Second mTSES				
Efficacy in Student Engagement with mLearning:	.90	51.59	10.66	8
Efficacy in Instructional Strategies with mLearning:	.89	57.82	7.58	8
Efficacy in Classroom Management with mLearning:	.91	54.82	8.03	8
Total mTSES Efficacy	.96	164.23	24.34	24

The Cronbach's alpha reliabilities for the TSES total scale were α = .93 for Tschannen-Moran and Woolfolk Hoy (2001), α = .93 for the First mTSES administration in this research study, and α = .95 for the Second mTSES administration. The reliability scores for the original TSES (Tschannen-Moran and Woolfolk Hoy, 2001) and the TSES scales in the First mTSES and Second mTSES administrations are comparable because the scales include identical questions. The Cronbach's alpha reliability scores were α = .93 for Benton-Borghi's (2006) adapted TSES total scale (without additional technology-related questions), α = .92 for the adapted mTSES scale questions on the First mTSES survey administration for this research study, and α = .96 for the adapted mTSES scale questions on the Second mTSES survey administration. Benton-Borghi (2006) concluded that construct validity for the I-TSES and the original TSES scales were comparable because "the two scales are identical with the exception of the word "student(s)" changed to "student(s) with disabilities."" Benton-Borghi's conclusion was supported by the calculation of identical Cronbach's alpha scores for both the I-TSES and the original TSES total scales. The construct validity of the original TSES and the adapted mTSES total scale questions are comparable because they are also virtually identical, with the exception that the phrase "how much can you do to…" from the original TSES was changed to "how much can you use alternative (technology-based) resources to…" for the mTSES. The comparability of the of TSES and mTSES total scales is supported by the similarities in the Cronbach's alpha scores obtained for the TSES by Tschannen-Moran and Woolfolk Hoy (2001), the TSES scores obtained during the First and Second mTSES administrations in this research study, and the mTSES scores obtained during the First and Second mTSES administrations.

Construct validity of the TSES and mTSES sub-domain scales.

The original TSES (Tschannen-Moran and Woolfolk Hoy, 2001) established three sub-domains for teacher's perceptions of self-efficacy. The sub-domains are Efficacy with Student Engagement (Engagement), Efficacy with Instructional Strategies (Instruction), and Efficacy with Classroom Management (Management). Cronbach's alpha was calculated for the same sub-domains for the I-TSES (Benton-Borghi, 2006), and the TSES scale and mTSES scale for the First and Second mTSES survey administrations for this research study. The reliability scores were comparable for the Engagement and Instruction sub-domains of each of the total scales. Differences were noted in the reliability scores for the Management sub-domain.

The Cronbach's alpha scores for the Engagement sub-domain were $\alpha = .85$ for the original TSES, $\alpha = .86$ for the I-TSES, $\alpha = .86$ for the TSES scale of the First mTSES administration (First TSES), $\alpha = .91$ for the TSES scale of the Second mTSES administration (Second TSES), $\alpha = .88$ for the First mTSES scale, and $\alpha = .90$ for the second mTSES scale. The reliability scores for the Engagement sub-domain were comparable for all administrations, with a slight increase obtained for the post-course survey administrations in this research study. The slight increase in the post-course reliability scores may be attributable to the reduced sample size for the Second mTSES survey administration.

The Cronbach's alpha scores for the Instruction sub-domain were $\alpha = .89$ for the TSES, $\alpha = .89$ for the I-TSES, $\alpha = .87$ for the First TSES, $\alpha = .87$ for the Second TSES, $\alpha = .84$ for the First mTSES, and $\alpha = .89$ for the Second mTSES. The reliability scores for the Instruction sub-domain were comparable across all administrations.

The Cronbach's alpha scores for the Management sub-domain were α = .91 for the original TSES, α = .88 for the I-TSES, α = .78 for the First TSES, α = .93 for the Second mTSES, α = .77 for the First mTSES, and α = .91 for the Second mTSES. The reliability scores for the Management sub-domain were comparable for all administrations except for the First TSES and First mTSES administrations in this research study. The reliability scores for the First TSES and First mTSES ranged between .1 and .16 points lower than those for the other survey administrations. The Management subdomain scores for the Second TSES and the Second mTSES increased back to a comparable level to those of the original TSES and the I-TSES. It is possible that differences in the response rates and sample demographics for the First mTSES and the Second mTSES may have influenced the obtained reliabilities. Response rates for the First mTSES and the Second mTSES were different (see Table 20), and there was a notable decrease in the proportion of respondents with less than five years of teaching experience between the pre-test and post-test survey administrations ($\%_{mTSES1} = 25$, $\%_{mTSES2} = 18.19$).

The reliabilities obtained were comparable for the sub-domain scores for the TSES, I-TSES, First TSES, Second TSES, First mTSES, Second mTSES. Slight differences were noted for the Efficacy with Classroom Management scale reliabilities for the TSES scales in the First and Second survey administrations in this research study. The comparability of the reliability scores supports the conclusion of comparable construct validity between the TSES and the modified mTSES scales demonstrated by the analysis of the total scale reliability scores.

Results from the mTSES Surveys

The previous section established the construct validity of the Mobile Teacher's Sense of Efficacy Scale (mTSES) survey instrument by comparing Cronbach's alpha scores obtained in this research study to those obtained for the original TSES (Tschannen-Moran and Woolfolk Hoy, 2001) and Benton-Borghi's I-TSES (2006). This section examines participants' TSES scale and mTSES scale scores for the pre-course (First mTSES) and post-course (Second mTSES) survey administrations in this research study. Mean scores are reported for each administration for each of the subdomains of Engagement, Instructional Strategies, and Classroom Management. The analysis of the mean scores demonstrates an increase in participants' perceptions of self-efficacy for both the TSES and mTSES scales. A greater increase in subdomain scores was observed between the pre-course and post-course administrations for the mTSES scale than for the original TSES scale subdomains. The net increase in the mTSES subdomain post-course scores remains greater than those for the TSES scale subdomains after accounting for the potential effects of maturation. However, when examined by demographic groupings, some groups of participants showed greater levels of change in TSES and mTSES subdomain mean scores. Certain demographic groups displayed decreases in the mean scores for particular TSES or mTSES subdomains. The following sections present the overall domain score analysis, the calculation of net domain score changes accounting for the maturation effect, and an analysis of domain score changes amongst different participant demographic groups. The results from the third administration of the mTSES survey are presented later in this chapter to demonstrate the extent to the means of the

TSES and mTSES scale subdomain scores change after the conclusion of the professional development training.

Domain score analyses.

Raw data from participants' responses to the pre-course (First mTSES) and post-course (Second mTSES) surveys were exported from *LimeSurvey* into a *Microsoft*™ *Excel*™ spreadsheet format. *Microsoft*™ *Excel*™ was used to calculate the mean scores for each survey administration for each of the three subdomains of Engagement, Instructional Strategies, and Classroom Management, for both the TSES and the mTSES scales. Pre-course to post-course changes were also calculated for the mean scores of each subdomain of the TSES and mTSES scales. The mean scores for each subdomain for the TSES and mTSES scales are presented in Table 22.

Table 22

Changes in TSES and mTSES subdomain scores between 1st and 2nd administrations

SCALES	1st Admin	2nd Admin	M_{Change}
TSES Scoring	M_{mTSES1}	M_{mTSES2}	M_{Change}
Efficacy in Student Engagement:	6.04	6.23	0.19
Efficacy in Instructional Strategies:	6.94	7.25	0.31
Efficacy in Classroom Management:	6.86	6.87	0.01
mTSES Scoring	M_{mTSES1}	M_{mTSES2}	M_{Change}
Efficacy in Student Engagement with mLearning:	5.90	6.48	0.57
Efficacy in Instructional Strategies with mLearning:	6.59	7.27	0.68
Efficacy in Classroom Management with mLearning:	6.78	6.89	0.11

Participants expressed greater perceptions of self-efficacy for general teaching tasks (TSES scale) on the pre-course (First mTSES) survey than they did for the use of mobile learning strategies (mTSES scale). The pre-course mean score for Engagement was $M_{\text{mTSES1}} = 6.04$ for the TSES scale, compared to $M_{\text{mTSES1}} = 5.90$ for the mTSES scale.

The pre-course Instructional Strategies mean score was M_{mTSES1} = 6.94 for the TSES scale, compared to M_{mTSES1} = 6.59 for the mTSES scale. The pre-course mean score for the Classroom Management subdomain was M_{mTSES1} = 6.86 for the TSES scale, compared to M_{mTSES1} = 6.78 for the mTSES scale.

Upon the completion of the professional development course, participants expressed greater perceptions of self-efficacy for mobile learning strategies (mTSES scale) than they did for general teaching tasks (TSES scale). The post-course (Second mTSES) mean score for Engagement was M_{mTSES2} = 6.48 for the mTSES scale, compared to M_{mTSES2} = 6.23 for the TSES scale. The post-course mean score for Instructional Strategies was M_{mTSES2} = 7.27 for the mTSES scale, compared to M_{mTSES2} = 7.25 for the TSES scale. The mean post-course score for the Classroom Management subdomain was observed at M_{mTSES2} = 6.89 for the mTSES scale, compared to M_{mTSES2} = 6.87 for the TSES scale.

Greater increases were observed in the mTSES scale mean scores for Engagement (M_{Change} = .57) and Instructional Strategies (M_{Change} = .68) than were observed for the TSES scale mean scores, which were Engagement (M_{Change} = .19) and Instructional Strategies (M_{Change} = .31). The mTSES scale mean score change for Classroom Management was observed at M_{Change} = .11, while the observed change for the TSES scale mean score for Classroom Management was just M_{Change} = .01.

The calculated mean scores show that participants began the professional development course with greater perceptions of self-efficacy with respect to general teaching tasks (TSES scale), but expressed greater perceptions of self-efficacy for mobile learning strategies upon the completion of the training. The calculated changes in the mean scores for each subdomain show that participants' perceptions of self-efficacy with respect to mobile learning strategies increased more than did their perceptions of self-efficacy for teaching and learning tasks in general.

Net changes accounting for maturation.

In order to ensure that the changes reported in participants' perceptions of self-efficacy with mobile RLOs and mLearning strategies were an effect of the intervention (exposure to the CSAM learning design framework, and the online professional development course), it was necessary to account for the influence of maturation. A maturation effect is a naturally occurring change over time (Kirk, 2004). In this case, a potential maturation effect would be a natural increase in perceptions of self-efficacy resulting from the passage of time, and participation in a professional development exercise. It is assumed that maturation would have a similar effect upon perceptions of self-efficacy for both the original Ohio State Teacher's Sense of Efficacy Scale (TSES) subdomain scores and those of the Mobile Teacher's Sense of Efficacy Scale subdomain scores. The net change in subdomain scores for the TSES and the mTSES between the pre-course (First mTSES) and post-course (Second mTSES) survey administrations was calculated to determine the actual intervention effect. The intervention effect for each subdomain was calculated using the formula:

$$(\mathrm{mTSES}_2 - \mathrm{mTSES}_1) - (\mathrm{TSES}_2 - \mathrm{TSES}_1) = \text{Net Change}_{\text{(Intervention Effect)}}$$

Table 23 shows the changes ($\mathrm{mTSES}_2 - \mathrm{mTSES}_1$) in the mTSES scores for the subdomains of Student Engagement, Instructional Strategies, and Classroom Management, from the First mTSES (pre-course) to the Second mTSES (post-course) survey administrations.

Table 23

Changes in mTSES domain scores from the First mTSES to the Second mTSES

Domain	$mTSES_1$	$mTSES_2$	Gross Difference
Student Engagement	5.90	6.48	0.57
Instructional Strategies	6.59	7.27	0.68
Classroom Management	6.78	6.89	0.11

Table 24 shows the changes ($TSES_2 – TSES_1$) in the original TSES (Tschannen-Moran, M., & Woolfolk Hoy, A., 2001a, 2001b) scores for the subdomains of Student Engagement, Instructional Strategies, and Classroom Management, from the First mTSES (pre-course) to the Second mTSES (post-course) survey administrations.

Table 24

Changes in TSES domain scores from the First mTSES to the Second mTSES

Domain	$TSES_1$	$TSES_2$	Gross Difference
Student Engagement	6.04	6.23	0.19
Instructional Strategies	6.94	7.25	0.31
Classroom Management	6.86	6.87	0.01

Table 25 shows the calculated net changes (Intervention Effect), accounting for the effects of maturation, for each subdomain of the TSES and mTSES surveys.

Table 25

Net change (intervention effect)

Domain	Net Change $(mTSES_2 - mTSES_1) - (TSES_2 - TSES_1)$
Student Engagement	.38
Instructional Strategies	.37
Classroom Management	.11

The net change calculation accounting for maturation indicates that the Intervention Effect for the Engagement subdomain was an increase in the mean self-efficacy perception score of $M = .38$ for the mTSES scale. The Intervention Effect for the Instructional Strategies subdomain of the mTSES scale was $M = .37$. The Intervention Effect for the Classroom Management subdomain of the mTSES scale was $M = .11$. A net increase was observed for perceptions of self-efficacy for all three subdomains on the mTSES scale compared to changes observed on the mean subdomain scores for the TSES scale. The calculated net changes for each subdomain support the conclusion that increases in participants' perceptions of self-efficacy with mobile learning strategies and mobile RLOs were the result of the intervention in this research study (exposure to the CSAM learning design framework, and the online professional development course).

Analyses by Demographic Breakdown

The previous sections demonstrated net increases in participants' mean scores for each of the subdomains of the mTSES scale compared to those for the TSES scale. However, the overall net increases in perceptions of self-efficacy were not consistent across different demographic groupings. This section examines the changes in the subdomain mean scores for the TSES and mTSES scales according to years of teaching experience, participant status (teacher versus graduate-level education student), and participants' institutional affiliations. Some demographic groups demonstrated differing levels of changes in perceptions of self-efficacy for the TSES and mTSES scale subdomains. In some cases, specific demographic groups demonstrated decreases in their perceptions of self-efficacy.

As indicated in the first section of this chapter, some of the demographic groupings from the mTSES surveys used in the data collection phase of this research study had low response rates. Some of the demographic groupings from the mTSES survey administrations have been combined for purposes of statistical analysis. The Years of Teaching Experience groupings of 0-2 years and 3-5 years have been combined for statistical analysis. The institutional groupings of Athabasca University (AU), College of the North Atlantic-Newfoundland (CNA-NL), and Other have also been combined for statistical analysis. Table 26 shows the changes in the TSES and mTSES subdomain scores analyzed by demographic group.

Table 26

Changes in TSES and mTSES scores by demographic

	TSES Domains			mTSES Domains		
	Student Eng.	Instr. Strategies	Classroom Mgt	Student Eng (mobile)	Instr. Strategies (mobile)	Classroom Mgt (mobile)
Teaching Experience						
0-5 years	-.01	-.06	-.51	-.15	.06	-.31
5-10 years	.83	.91	.41	1.25	1.49	.48
10-15 years	-.18	-.09	-.02	.39	.39	.14
>15 years	-.03	.25	-.13	.49	.60	-.09
Status						
Teacher	-.03	.26	-.13	.28	.56	-.01
Student	.68	.34	.25	1.19	.85	.35
Institution						
AU and other	.06	.20	.03	.11	.43	.05
CNA-Q	-.08	.21	-.04	.31	.58	.05
OSU	.25	.40	-.03	.75	.83	.14

Years of teaching experience.

Participants who identified themselves as having between 5-10 years of teaching experience ($n_1 = 7$, $n_2 = 4$) demonstrated the greatest increases in mean scores for the three subdomains on both the TSES and mTSES scales. Participants in the 5-10 years of teaching experience group demonstrated mean score increases on the Engagement subdomain of $M_{\text{Change}} = .83$ for the TSES scale and $M_{\text{Change}} = 1.25$ for the mTSES scale. Instructional Strategies mean scores for the 5-10 years of teaching experience group changed by $M_{\text{Change}} = .91$ for the TSES scale, and $M_{\text{Change}} = 1.49$ for the mTSES scale. Classroom Management subdomain mean scores for the 5-10 years of teaching experience group increased by $M_{\text{Change}} = .41$ for the TSES scale, and $M_{\text{Change}} = .48$ for the mTSES scale.

The lowest gains in subdomain mean scores were observed for participants who had less than five years of teaching experience. Participants in the 0-5 years of teaching experience group ($n_1 = 9$, $n_2 = 4$) saw decreases on the TSES scale of $M_{\text{Change}} = -.01$ for Engagement, $M_{\text{Change}} = -.06$ for Instructional Strategies, and $M_{\text{Change}} = -.51$ for Classroom Management. Participants in the 0-5 years of teaching experience group saw mean score decreases on the mTSES scale of $M_{\text{Change}} = -.15$ for Engagement, and $M_{\text{Change}} = -.31$ for Classroom Management. The only category in which participants in the 0-5 years of teaching experience group recorded an increased mean score was for Instructional Strategies on the mTSES scale, which was $M_{\text{Change}} = .06$.

Participants with 10-15 years of teaching experience ($n_1 = 8$, $n_2 = 5$) recorded decreases in subdomain mean scores on the TSES scale of $M_{\text{Change}} = -.18$ for Engagement, $M_{\text{Change}} = -.09$ for Instructional Strategies, and $M_{\text{Change}} = -.02$ for Classroom Management, but showed increases in their mean scores for each of the subdomains on the mTSES scale. Participants with greater than 15 years of teaching experience ($n_1 = 12$, $n_2 = 9$) also demonstrated decreases on two of the TSES scale subdomain scores ($M_{\text{Change}} = -.03$ for Engagement, $M_{\text{Change}} = -.13$ for Classroom Management), as well as a decrease of $M_{\text{Change}} = -.09$ for Classroom Management on the mTSES scale.

Participant status (teacher versus student).

Participants who identified themselves as practicing teachers ($n_1 = 23$, $n_2 = 16$) demonstrated less overall gains in perceptions of self-efficacy on both the TSES scale and the mTSES scale compared to participants identified as graduate-level education students ($n_1 = 13$, $n_2 = 6$). Participants in the Teacher group recorded decreases in the mean subdomain scores on the TSES scale of $M_{\text{Change}} = -0.3$ for Engagement, and $M_{\text{Change}} = -.13$ for Classroom Management, as well as a decreased mean score of $M_{\text{Change}} = -.01$ for Classroom Management on the mTSES scale. Participants in the Student group demonstrated increases in the mean scores for the subdomains of both the TSES scale and the mTSES scale. The Student group subdomain mean scores increased the most for Engagement (M_{Change} = .68 for the TSES, M_{Change} =1.19 for the mTSES) and Instructional Strategies (M_{Change} = .34 for the TSES, M_{Change} = .85 for the mTSES).

Institutional affiliation.

Participants affiliated with the Midwestern USA university (n_1 = 12, n_2 = 9) showed the greatest overall increases in reported perceptions of self-efficacy, with subdomain mean scores increases for Engagement of M_{Change} = .25 for the TSES scale, and M_{Change} = .75 for the mTSES scale. The Midwestern USA university-affiliated participants demonstrated mean score increases of M_{Change} = .40 for Instructional Strategies on the TSES scale, and M_{Change} = .83 on the mTSES Scale. However, Midwestern USA university-affiliated participants demonstrated a decrease of M_{Change} = -.03 for Classroom Management on the TSES scale, compared to an increase of M_{Change} = .14 for Classroom Management on the mTSES scale.

Participants affiliated with the technical college in Doha, Qatar (n_1 = 11, n_2 = 9) showed their greatest mean score increase for the Instructional Strategies subdomain on the mTSES scale of M_{Change} = .58, compared to M_{Change} = .21 for Instructional Strategies on the TSES scale. However, the Qatar-based participants showed decreases in their mean scores on the TSES scale for the subdomains of Engagement (M_{Change} = -.08) and Classroom Management (M_{Change} = -.04), compared to increases on the mTSES scale of M_{Change} = .31 for Engagement and M_{Change} = .05 for Classroom Management.

Participants affiliated with the western Canadian university and other unspecified institutions (n_1 = 13, n_2 = 4) showed increases in the mean scores for all subdomains on both the TSES scale and the mTSES scale. Participants in western Canadian university and other institutions group demonstrated the greatest mean score increase for the Instructional Strategies subdomain on the mTSES scale (M_{Change} = .43).

Analysis of the Third mTSES Survey Results

The Third mTSES survey was administered four months after the completion of the *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile Learning Strategies* professional development course (September 2014). The purpose of the Third mTSES survey was to follow-up with participants to determine how their overall TSES and mTSES scale scores had changed after the completion of the training. Table 27 presents the changes in the TSES and mTSES subdomain scores between the First and Third mTSES administrations.

Table 27

Changes in TSES and mTSES subdomain scores between 1st and 3rd administrations

SCALES	1st Admin	3rd Admin	M_{Change}
TSES Scoring	M_{mTSES1}	M_{mTSES3}	M_{Change}
Efficacy in Student Engagement:	6.04	6.22	.18
Efficacy in Instructional Strategies:	6.94	6.94	.00
Efficacy in Classroom Management:	6.86	6.94	.08
mTSES Scoring	M_{mTSES1}	M_{mTSES3}	M_{Change}
Efficacy in Student Engagement with mLearning:	5.90	6.26	.36
Efficacy in Instructional Strategies with mLearning:	6.59	6.89	.31
Efficacy in Classroom Management with mLearning:	6.78	6.95	.17

Participants showed slight increases in their scores for the Engagement subdomain (M_{Change} = .18) and the Classroom Management subdomain (M_{Change} = .08) on the original TSES scale questions between the First and Third mTSES survey administrations. No change was recorded in the subdomain scores for Instructional

Strategies. Participants showed increases on their mTSES subdomain scores of Engagement (M_{Change} = .36), Instructional Strategies (M_{Change} = .31), and Classroom Management (M_{Change} = .17). However, participants showed decreases on some subdomain scores between the Second and Third mTSES administrations. The changes in the TSES and mTSES subdomain scores between the Second and Third mTSES administrations are presented in Table 28.

Table 28

Changes in TSES and mTSES subdomain scores between 2nd and 3rd administrations

SCALES	2nd Admin	3rd Admin	M_{Change}
TSES Scoring	M_{mTSES2}	M_{mTSES3}	M_{Change}
Efficacy in Student Engagement:	6.23	6.22	-.01
Efficacy in Instructional Strategies:	7.25	6.94	-.31
Efficacy in Classroom Management:	6.87	6.94	.07
mTSES Scoring	M_{mTSES2}	M_{mTSES3}	M_{Change}
Efficacy in Student Engagement with mLearning:	6.48	6.26	-.21
Efficacy in Instructional Strategies with mLearning:	7.27	6.89	-.38
Efficacy in Classroom Management with mLearning:	6.89	6.95	.06

Participants' scores for the Engagement subdomain decreased between the Second and Third mTSES administrations for both the TSES scale (M_{Change} = -.01) and the mTSES scale (M_{Change} = -.21). Subdomain scores for Instructional Strategies also decreased for both the TSES scale (M_{Change} = -.31) and the mTSES scale (M_{Change} = -.38). However, participants' subdomain scores for Classroom Management increased for both the TSES scale (M_{Change} = .07) and the mTSES scale (M_{Change} = .06).

Calculations to account for a potential maturation effect upon the results of the mTSES survey administrations show a net increase in participants' scores across all mTSES subdomains between the First (pre-training) and Third (follow-up) mTSES survey administrations. However, calculations to account for maturation show a slight decrease in participants' scores for all mTSES subdomains between the Second (post-training) and Third (follow-up) survey administrations. The results of the calculations for net change, accounting for maturation, are presented in Table 29.

Table 29

Net Change (Intervention Effect) for the Third mTSES

Domain	$mTSES_1 > mTSES_3$	$mTSES_2 > mTSES_3$
Student Engagement	0.18	-0.20
Instructional Strategies	0.30	-0.06
Classroom Management	0.09	-0.01

CSAM Feedback Question Analysis

Previous sections of this chapter analyzed the results of the TSES and mTSES scale components of the various administrations of the Mobile Teacher's Sense of Efficacy Scale (mTSES) survey instrument in this research study. Those analyses demonstrated the reliabilities and construct validity of the mTSES instrument, as well as the changes in participants' perceptions of self-efficacy as measured using the instrument. This section provides an analysis of the closed-response CSAM feedback question items included in the post-course (Second mTSES) survey administration. A total of n = 22 participants completed the Second mTSES survey, and the CSAM feedback questions. The closed-response questions asked respondents to rate their responses to ten questions about the CSAM learning design framework, and mobile RLOs. The possible closed-response CSAM feedback question responses ranged from 1 = Nothing to 9 = A Great Deal. The overall mean score for the ten question items was M = 6.35, with a standard deviation of *SD* = 1.75. Overall mean participant responses to the CSAM feedback questions fell within the range of *M* = 5.86 and *M* = 6.68. A score of 5 on the survey rating scale means that participants indicated that the CSAM learning design framework had “Some Influence” for them with respect to the question item. A score of 7 on the survey rating scale indicates that the CSAM learning design framework had “Quite a Bit” of influence for participants. The mean scores and standard deviations for each of the ten CSAM feedback questions are presented in Table 30.

Table 30

Analysis of responses to CSAM feedback questions in second mTSES survey

Item #	Question	*M*	*SD*
1	How much has the CSAM learning strategies framework had an influence on your interest in using mobile reusable learning objects to facilitate collaborative learning for your students?	6.14	1.83
2	How much does the CSAM learning strategies framework influence your decision-making about pedagogical design for collaborative learning activities involving mobile reusable learning objects?	5.86	1.81
3	How much does the CSAM learning strategies framework influence your reflection on collaborative learning activities involving mobile reusable learning objects?	6.41	1.76
4	How well can you identify appropriate collaborative learning activities for your students that could be facilitated through the use of a mobile RLO?	6.41	1.59
5	How well can you identify opportunities to use mobile RLOs to situate a collaborative learning activity in a realistic context?	6.23	1.69
6	How well can you develop a plan for students to actively interact with content to produce new knowledge or artefacts (evidence of learning)?	6.55	1.34
7	How well can you identify opportunities to use mobile RLOs to allow students to actively explore alternative learning environments?	6.18	1.47
8	Do you find the Collaborative Situated Active Mobile (CSAM) learning strategies framework useful in helping you to plan for the integration of mobile reusable learning objects (RLOs) into your lesson planning?	6.50	1.77
9	Do you feel more comfortable with planning to integrate mobile devices and mobile RLOs into your lesson planning when using the CSAM learning strategies framework to guide instructional design decisions?	6.59	2.11
10	Has use of the CSAM learning strategies framework influenced your plans to use mobile RLOs with your students?	6.68	2.17
TOTALS		6.35	1.75

The highest mean score on the CSAM feedback survey was $M = 6.68$ for question #10. Participants indicated a mean ranking of close to 7 = Quite a Bit for question #10, which related to perceptions as to whether or not the CSAM framework has influenced their plans to use mobile RLOs with their students. The second highest mean score was recorded for question #9 ($M = 6.59$), which relates to perceptions of increased comfort with planning to integrate mobile RLOs into lesson planning when using the CSAM framework. Questions #6 ($M = 6.55$) and #8 ($M = 6.5$) were also ranked at approximately the “Quite a Bit” of influence level. Question #6 relates to participants’ perceptions of their ability to develop plans for students to engage in Active Learning strategies. Question #8 relates to participants’ perceptions of the usefulness of the CSAM framework in planning lessons to include mobile RLOs.

The lowest mean score on the CSAM feedback survey was for question #2, which relates to participants’ perceptions of how much influence the CSAM framework has on their overall pedagogical decision-making with respect to collaborative learning involving mobile RLOs. The mean score of $M = 5.86$ for question #2 is approximately half way between the rankings of 5 = Some Influence and 7 = Quite a Bit of influence.

The CSAM feedback survey component of the Second mTSES survey also included four open-response question items. Responses to the open-response CSAM feedback questions are qualitatively examined in Chapter VI.

Summary

Chapter V presented the quantitative data analyses components of the second phase of this DBR study. This chapter presented the results and analyses of the quantitative data collected using the mTSES survey instrument for this research study.

The analyses of the *Cronbach's* alpha reliability scores for the TSES Total Scale, mTSES Total Scale, and the respective subdomain scales of Engagement, Instructional Strategies, and Classroom Management, demonstrated levels of construct validity on par with those previously determined for the original TSES by Tschannen-Moran and Woolfolk Hoy (2001) and for the I-TSES by Benton-Borghi (2006).

The domain score analysis section of this chapter demonstrated increases in participants' perceptions of self-efficacy with mobile learning strategies and mobile RLOs compared to their increases in perceived self-efficacy on general teaching tasks as measured by the original TSES scale. The effects of maturation on the mean mTSES scale and subdomain scores, and mean TSES scale and subdomain scores were calculated to demonstrate a positive increase in perceptions of self-efficacy measured by the mTSES scale compared to those measured using the TSES scale.

The Analysis by Demographic Breakdown section of this chapter presented the mean changes in participants' measured perceptions of self-efficacy for the mTSES scale and the TSES scale. Teachers with between 5-10 years of teaching experience demonstrated the greatest overall increases in perceptions of self-efficacy on both the mTSES and TSES scales. Participants identified as graduate-level education students demonstrated greater increases in their perceived levels of self-efficacy compared to participants identified as teachers. Participants affiliated with the Midwestern USA university tended to demonstrate greater increases in their perceived levels of self-efficacy compared to their counterparts affiliated with the other institutions that collaborated in this research study.

The Analysis of the Third mTSES Survey Results section of this chapter presented the results from the third administration of the mTSES survey instrument. That survey was administered approximately four months after the completion of the professional development course, in September 2014. The mean scores of participants for the TSES Total Scale and mTSES Total Scale, as well as those from the respective subdomains of Engagement, Instructional Strategies, and Classroom Management, were compared to the results obtained from the First and Second mTSES survey administrations. The results showed an overall increase in participants' scores on the mTSES scale between the First (pre-training) and Third (follow-up) survey administrations. However, participants showed an overall decrease in their scores for the Engagement and Instructional Strategies subdomains between the Second (post-training) and Third (follow-up) survey administrations. When accounting for maturation effects, participants' mTSES scores showed a net increase between the First and Third mTSES administrations, and an overall decrease between the Second and Third mTSES administrations.

The CSAM Feedback Question Analysis section of this chapter presented the mean scores on a nine-point Likert-scale ranking system for ten closed-response feedback questions about the CSAM learning design framework. Participants' overall mean score placed their perceived influence of the CSAM framework on their sense of efficacy and personal practices with mobile RLOs between the "Some Influence" and "Quite a Bit" of influence levels. The highest mean score from the ten closed-response feedback questions was for participants' plans to use mobile RLOs with their students (M = 6.68). The lowest mean score from the ten question was for the influence of the CSAM framework on participants' decision-making about pedagogical design for collaborative learning activities using mobile RLOs (*M* = 5.86).

Results from the open-response question items of the CSAM feedback component of the Second mTSES survey are qualitatively analyzed in Chapter VI. Chapter VI also presents a qualitative analysis of responses from participants during researcher-led follow-up interview sessions conducted after the completion of the CSAM professional development course.

Chapter VI: RESULTS FROM THE QUALITATIVE ANALYSES

Chapter V presented the quantitative analyses of data collected using the Mobile Teacher's Sense of Efficacy Scale (mTSES) survey instrument. The quantitative analyses included feedback on the Collaborative Situated Active Mobile (CSAM) learning design framework collected using fixed-response questions items included with the post-training (Second mTSES) survey. Chapter VI presents the qualitative analyses components of the second phase of this design-based research study. This chapter presents the qualitative analyses of open-response question items from the Second mTSES survey, as well as the transcripts of researcher-led follow-up interviews conducted with volunteer participants. The qualitative analyses present detailed insights into participant's perceptions of self-efficacy with the use of mobile RLOs, the utility of the CSAM learning design framework, the impact of the CSAM online professional development course. The purpose of the analyses of the open-response CSAM feedback survey questions and the follow-up interviews is to triangulate the quantitative data findings, and to provide context to the quantitative data findings.

This chapter begins with brief descriptions of the interview participant recruitment process, and of the interview participants. The qualitative analysis section of this chapter includes an overview of the dominant themes emerging from the transcript analyses. Results of the transcript analyses are presented in the context of four main themes, including participants' observations on the CSAM framework, observations on the CSAM professional development course, perceptions of efficacy and interest in the use of mobile RLOs, and perceived supports and barriers to the integration of mobile RLOs into personal teaching practice. In general, the interviewees perceived the CSAM learning design framework to be comprehensive, to be easy to use, and to be useful as an aid for both instructional design planning and reflective practice. Interviewees predominantly indicated that they found the CSAM professional development course to be well-designed and comprehensive, with appropriate levels of interaction with peers and the facilitator. Interviewees indicated that they found the course to be personally beneficial, and that participation in the course had a positive influence on their perceptions of self-efficacy with, and interest in integrating mobile RLOs into their personal teaching practices. Interviewees also indicated that they felt constrained in their abilities to integrate mobile RLOs into teaching practice as a result of a range of barriers, including infrastructure, funding, and institutional and peer perceptions. Interviewees suggested a range of supports that they felt would help them to be better able to integrate the use of mobile RLOs into their teaching practices.

Interview Participants

Participants in the CSAM professional development course were asked to volunteer to participate in a researcher-led follow-up interview session. Information about the follow-up interview sessions was provided in the initial research study Information Letter (APPENDIX B), as well as on the *Information About the Dissertation Research Project* page on the course learning management system site. An invitation to participate in the follow-up interviews was included in the course LMS, along with a link to a survey called "Consent to be Contacted for a Follow-Up Interview," which was administered using Athabasca University's *LimeSurvey* tool.

A total of five participants from the professional development course volunteered to participate in the researcher-led follow-up interviews. Four participants came from a technical college in Doha, Qatar. The Qatar-based participants included one male and three female faculty members. All four Qatar-based participants had more than ten years of teaching experience, and were employed in instructional leadership roles at their institution. One interviewee was a female graduate-level education student in a master's level education program at a western Canadian university. The western Canadian participant was also working in an instructional capacity in a dental assistance training program at a Canadian post-secondary institution. There were no volunteers for the follow-up interview sessions affiliated with either the Midwestern USA university or the technical and vocational college in Newfoundland and Labrador, Canada.

Qualitative Analysis of the CSAM Feedback Survey and Follow-Up Interview Transcripts

This section presents the themes that emerged during the qualitative coding and analyses of the follow-up interview transcripts and the open-response feedback questions from the Second mTSES survey. This section begins with an overview of participant response themes. Participants' responses are then analyzed according to the major themes of strengths and weaknesses of the CSAM framework, strengths and weaknesses of the CSAM professional development course, participants' efficacy and interest with mobile RLOs, and supports and barriers to the integration of mobile RLOs in teaching practice.

Overview of response themes.

The development the primary and simultaneous codes used for the qualitative analyses of the interview transcripts and the open-response feedback questions from the Second mTSES survey was described in Chapter III. Those codes were developed from the preliminary analysis of responses to the open-response questions from the Second mTSES. The development of the codes began with the collation of key words and phrases from the open survey responses. The key words and phrases were then arranged according to thematic groupings, and titles were assigned to each grouping. These thematic titles were used as the primary coding level for the detailed qualitative analyses of the interview transcripts and survey responses (see Chapter III, Table 8). The original sets of key words and phrases were used as the simultaneous (second level) codes during the qualitative coding process. A total of eight primary codes and 37 simultaneous codes were specified for the qualitative coding process (see APPENDIX P). The coded interview responses and open-response feedback questions from the Second mTSES survey were collated using *MicroSoft*™ *Excel*™ software, and sorted based upon the primary coding levels. Table 31 shows the dominant themes that emerged from frequency counts of the codes assigned to the comments made by interview and survey participants.

Table 31:

Frequency counts of primary comment codes

Primary Codes	Descriptions	n_{Survey}	$n_{\text{Interviews}}$	n_{Total}
000	Not Coded	7	37	44
100	Framework Strengths	21	35	56
200	Framework Weaknesses	1	12	13
300	Course Strengths	1	50	51
400	Course Weaknesses	6	12	18
500	Self-Efficacy	0	0	0
600	Interest	11	31	42
700	Other Barriers	1	22	23
800	Other Supports	6	25	31
Totals		54	224	278

A total of *n* = 278 data units were coded in the survey responses and interview transcripts. The perceived strengths of the CSAM learning design framework (n = 56) comprised the most common theme addressed by participants' comments between the survey responses (n = 21) and the interview transcripts (n = 35). The most frequent theme reflected in the comments of interview participants was the perceived strengths of the CSAM course (n = 50). Participants in both the feedback survey and the interview sessions also commented frequently about their level of interest in integrating mobile RLOs into their personal teaching practice (n = 42). However, no participants commented directly on changes in their perceptions of self-efficacy. The least common themes reflected in participants' coded responses were perceived weaknesses of the professional development course (n = 18) and perceived weaknesses of the CSAM learning design framework (n = 13).

Observations on the CSAM framework.

Participants' perceptions of the strengths of the CSAM learning design framework were the most commonly addressed themes reflected in the open-response survey questions and the follow-up interviews. A total of n = 56 of participants' comments related to perceived strengths of the framework, compared to n = 13 comments related to perceived weaknesses. Table 32 shows the frequencies of the simultaneous (sub-theme) codes that were assigned to the survey and interview responses that were assigned primary codes of Framework Strengths and Framework Weaknesses.

Table 32:

Frequency counts of simultaneous codes for comments on the CSAM framework

Simultaneous Codes	Descriptions	n_{Survey}	$n_{Interviews}$	n_{Total}
Framework Strengths				
101	Simplicity / Clarity	3	4	7
102	Ease of use	1	2	3
103	Comprehensive	2	3	5
104	Balanced	1	0	1
105	Guidance	14	12	26
106	Usefulness	0	5	5
Framework Weaknesses				
201	Too advanced	0	2	2
202	Too prescriptive	0	1	1
205	Further explanation of the different CSAM elements	0	1	1
206	Too narrow in scope	1	5	6
Totals		22	35	57

Participants most frequently commented on the guidance that the CSAM framework provided for instructional design and reflective practice on the integration of mobile RLOs into teaching practice. One survey respondent noted that “CSAM has given me the planning tools I needed,” while another survey respondent remarked that it is “always good to have an easy way to measure effectiveness.” However, one interview participant expressed reluctance to rely too heavily upon a framework to guide instructional design:

> I suppose if I have anything that amounts to any kind of a concern or something... my predisposition is to be wary of formulaic ways of going at anything. So from that predisposition my worry would be that the framework would be taken as a hard and fast rule for the measures that you’ll go by.

Other survey respondents and interview participants expanded upon the types of guidance provided by the CSAM framework. One interview participant commented on how the CSAM framework helped her during the stages of planning, developing, and evaluating a completed mobile RLO by saying it helped her to think about:

> how am I going to develop this? And what points do I need to cover? And, then, as I'm developing it, thinking, am I hitting on all points of this framework? And, then, as I'm finished, [I have] something to evaluate it with.

Multiple participants described the benefit of using the CSAM learning design framework to help them focus on critical pedagogical components in mobile RLO design and use. As one survey respondent commented:

> CSAM provides a way to consider and develop collaborative learning tools. It helps me to think about situating those activities so they are meaningful for the learner and to help them to actively develop new knowledge (vs. passive reception). In my teaching environment, students are disadvantaged in an academic and cognitive sense. Therefore, I feel an mRLO can help to stimulate self-direction and critical thinking, even on a simple and practical level.

One interview participant remarked that he appreciated the power of the framework to help him recognize when important pedagogical elements were missing from the instructional design of a mobile RLO. He also noted that the framework provided a basis for reflecting on the justification for either integrating or omitting those weak or missing components:

> If I felt that there wasn't, say, for instance, a collaborative element, that was weak there, or something, then saying, well is that something that, to which there is benefit that I beef up, I somehow integrate that or can I justify leaving it just as it

> is? Or some other aspect of the framework that perhaps is not there at all and, is that a problem, or does it matter?

One survey respondent explained that the CSAM framework helped with the recognition of pedagogically beneficial factors that are often overlooked in instructional design, such as “asking if it is situated.” The respondent remarked that “I think we often think about creating activities where students work together and are active and mobile, but really analyzing if the lesson is situated… is very useful.”

Two participants pointed to the collaborative and situated components of the CSAM framework as potential weak points for teachers who are trying to figure out how to integrate mobile RLOs. One interview participant listed the situated element as somewhat difficult to understand, while another interviewee expressed difficulty in determining how to integrate collaborative interaction into mobile RLO instructional design:

> It’s kind of a difficult one to use, and, as you expressed in the course, well, not all of them are going to be collaborative. There’s only a certain percent. But I think I always felt like something must be missing if I didn’t have it, because it is part of the framework. Like, it doesn’t appear to be an optional part. And, especially because it comes first in the framework, you kind of feel like that’s a really important part, and I have to find a way to incorporate it… when that isn’t necessarily the truth. That it may be present, or that it may not be present.

While some participants commented on difficulties in envisioning how to incorporate collaborative or situated instructional design components, multiple participants listed clarity and practicality as strong points of the CSAM framework. As one interview participant stated, “it’s simple. It’s clear. It’s practical. It’s useful. It’s pedagogically sound.” However, another interview participant pointed to the scope of the CSAM framework as a potential drawback when planning for the integration of mobile RLOs, remarking that “there are many other things that have to be considered.”

Observations on the CSAM professional development course.

Participants’ impressions of the CSAM professional development course comprised the second most frequently occurring theme in the survey responses and follow-up interview transcripts. A total of *n* = 69 comments were coded as related to either Course Strengths or Course Weaknesses. Simultaneous codes were assigned to *n* = 62 comments about course strengths and weaknesses during the qualitative analysis process. Table 33 shows the frequencies of the simultaneous codes assigned to participants’ comments about the professional development course.

Table 33:

Frequency counts of simultaneous codes for comments on the CSAM professional development course

Simultaneous Codes		n_{Survey}	$n_{Interviews}$	n_{Total}
Course Strengths				
301	Content and organization	1	8	9
302	Length	0	3	3
303	Multiple learning resources	0	11	11
304	Practical learning activities	0	4	4
305	Interaction / Feedback	0	19	19
Course Weaknesses				
402	Development tools (i.e. *Winksite*™)	2	6	8
403	Length (more time needed)	0	3	3
405	No opportunity to test / redevelop RLO projects	2	3	5
Totals		5	57	62

A total of $n = 46$ comments were assigned simultaneous codes referring to perceived Course Strengths, compared to $n = 16$ comments referring to perceived Course Weaknesses. The largest number of comments referred to participants' positive feelings about the types of interaction and feedback designed into the course. As one interview participant remarked, "I liked the interaction with the other people and seeing what they were developing. I liked seeing the range of the kind of stuff that people developed."

Multiple participants commented about the range of learning resources incorporated into the instructional design of the professional development course. The majority of such comments indicated that participants found the variety of learning resources to be beneficial to their learning experience. One interview participant remarked that "it attracted all types of learners with your videos, with your audio, with your things you could read, your resources." Another interview participant felt that the *Winksite*™ mobile website development tool helped with the contextualization of the concepts covered in the course, and the facilitation of learner interactions while experimenting with mobile RLO designs. The participant remarked that:

> It was quite a good simulation of what you would be visualizing and trying to achieve for mobile devices, and so that was also a nice component of it. And the opportunity there as it unfolded for the exchange that occurred, in part with my colleagues here at the College, but also with people who were participating from all over, with their approaches and having a sense of their… teachers' sensibilities, you know, with their concerns for that objective of serving the student and then applying this tool to serve the student. It was nice to see them

> engage in that. So that the tool, the technology, wasn't erecting barriers, but rather was facilitating engagement.

However, another interview participant indicated that she would have liked to have seen "more support through the *Winksite*™ website," and that she felt the online mobile website development tool was "lacking a little bit in instruction and support." One interviewee also noted that he "found it really difficult to find specific other people's comments" in the discussion forums in the *Canvas*™ learning management system.

Positive perceptions of the content and organization of the professional development course were the subject of comments by multiple survey respondents and interview participants. One interviewee remarked that "I'm taking two courses from another university, and I only wish my professors had their materials as organized… I really felt it was easy to follow." Another interview participant commented on the benefit of contextualizing the CSAM learning design framework with hands-on learning activities, and remarked:

> I liked the whole idea of the course…that everybody chose their own little project that they thought would be suitable for their context and we used the framework when we were planning to help us guide our thinking about what we were doing… then afterwards we went back to the model and evaluated whether we had actually used a, or created a… a model learning object.

The duration of the professional development course was the focus of mixed reactions from participants. While one participant stated that "I think we all loved the fact that it was a package that lasted only so long," others indicated that they desired more time to complete the practical learning activities. One survey respondent indicated a desire for more “time to play and work at my own pace without obligations in my school.” One interview participant elaborated that:

> I found that I often didn’t think that I had enough time. Like, to start with, I was like, “oh, this will be more than enough time.” But when I got into the Module 3, I kind of felt like, “Oh, God, I’ve gotten behind! Should I continue? Or should I not continue?” I just found like I didn’t have enough time, maybe, in the last two modules… to stay on schedule…. I kind of didn’t have enough time to do my own thing really well… I felt like I wasn’t contributing to other people’s [work] as well, because I wasn’t posting as much.

Other participants also indicated a desire for more time to experiment with and test their own mobile RLO designs. One interviewee felt that a formal practicum module would be beneficial “because the object that I created in the course is one that I haven’t yet trialed with a real audience and that’s the next step.” One survey respondent suggested the addition of a course “resource section on classroom management techniques with mobile reusable learning objects.”

Overall, participants’ comments indicated that content and organization of the professional development course had led them to consider integrating mobile RLOs into their own teaching practice. One interview participant noted that the “process that you led us through… interested me and so I think I’m a bit more open to it.” Multiple participants noted that they planned to keep their course login credentials in order to use the materials for future reference. One interview participant indicated that she liked that she “can go back and use that as a resource for me, when I go to try to implement it into my… work… it’ll be a huge resource for me.”

Efficacy and interest in using mobile RLOs.

No survey respondents or interview participants directly commented on their perceptions of self-efficacy with respect to the integration of mobile RLOs into their teaching and learning practice. However, a total of n = 42 participant comments were coded as relating to perceptions of interest in using mobile RLOs. Simultaneous codes were assigned to n = 27 comments related to participants' interest in using mobile RLOs during the qualitative analysis process. Table 34 presents the frequencies of the simultaneous codes assigned to participants' comments about their interest in using mobile RLOs.

Table 34:

Frequency counts of simultaneous codes for comments on efficacy and interest

Simultaneous Codes		n_{Survey}	$n_{Interviews}$	n_{Total}
601	Will definitely use mRLOs	1	1	2
602	Likely to use mRLOs	2	1	3
603	May use mRLOs if appropriate opportunity arises	5	13	18
604	Not sure how mRLOs could be used in personal context	1	2	3
605	Not likely to use mRLOs	1	0	1
Totals		10	17	27

After completing the professional development course, some survey respondents and interview participants expressed enthusiasm to begin integrating mobile RLOs into their teaching practice as soon as possible. Example comments included "Oh! I would love to try to put it right into class in Fall 2014, if it's possible," and "I am going to include this ASAP in my teaching and learning activities. Wow… love it for the students." Other participants provided more detailed responses about how the CSAM framework and the professional development course have influenced their plans to use mobile RLOs. One interview participant remarked that:

> Since doing it, I think I have… probably just decided that I can look even more closely. I can take a more active approach at looking closely at some of these technologies and how we can integrate them.

One survey respondent explained that the CSAM framework has provided strong rationale for integrating mobile RLOs into instructional design:

> The CSAM framework is a tool that allows me to optimize the overall learning opportunities within instructional design and lesson planning. It is helpful for me to consider the pedagogical reasons for implementing a mRLO. I have yet to integrate a mRLO into my teaching and learning practice, but I plan to do so soon.

Another survey respondent remarked that “at this point, I feel I have a fuller understanding of mLearning/RLOs, both the positives and the drawbacks,” and that:

> For my teaching purposes, I do not feel that the positives are so compelling that I will actively seek ways to integrate them in my course delivery. Nor will I exclude using them out of hand. I expect that instructional events will on occasion occur to me as particularly amenable to mLearning/RLOs.

However, the majority of participants’ comments about their interest in using mobile RLOs in teaching practice (n = 18) indicated that they might use mobile RLOs if an appropriate opportunity arose. One survey respondent remarked that despite feeling “far behind in experience compared to most in the course… I felt a growing interest in using this framework as it provided some confidence to me that my initial efforts at design would be useful.” One interview participant stated that the CSAM framework and the professional development course "has put [mobile RLOs] now in my plans. That's the influence."

Supports and barriers to integrating mobile RLOs into teaching practice.

Participants were asked to comment on their perceptions of the strengths and weaknesses of the CSAM framework and of the professional development course, as well as how the framework and the course had influenced their interest in using mobile RLOs. Participants were also asked to comment on what they perceived to be barriers to the integration of mobile RLOs, and what additional supports they felt they needed in order to help them to use mobile RLOs in their teaching practice. A total of n = 54 comments from the survey responses and interview transcripts were coded as addressing perceived barriers and required supports. Required supports comprised n = 31 of the coded comments, compared to n = 23 comments about perceived barriers. A total of n = 45 comments coded as related to barriers or supports were also assigned simultaneous codes during the qualitative analysis process. Table 35 shows the frequencies of the simultaneous codes assigned to participants' comments about perceived barriers and required supports.

Table 35:

Frequency counts of simultaneous codes for comments on the supports and barriers to mobile RLO integration

Simultaneous Codes		n_{Survey}	$n_{Interviews}$	n_{Total}
Other Barriers				
701	Developmental Resources (time, money, etc…)	1	2	3
703	Lack of institutional interest	0	5	5
704	Negative institutional perceptions	0	2	2
705	Lack of technology (student / teacher devices)	0	3	3
706	Lack of professional experience/background	0	3	3
Other Supports				
802	Formal or informal institutional support	1	6	7
803	Face-to-Face training	2	5	7
804	Practicum (opportunity to build and test)	2	5	7
805	Informal community of practitioners	1	7	8
Totals:		7	38	45

A total of n = 9 comments from one interview participant discussed how institutional perceptions, lack of institutional interest, and lack of development resources constituted barriers to her ability to integrate mobile RLOs into her teaching practice. The interviewee explained that she perceived that:

> The ideas that come from technology, people are so quick to say ‘Who’s going to pay for that? And who’s going to maintain it? Who’s going to support it?’ And, it always seems to be a financial struggle. Let’s just keep doing what we’re doing, because it seems to be working, on paper.

One survey respondent also expressed a need for “more support in the workplace to implement RLOs” as a required support in order to integrate mobile RLOs into teaching practice. One interview participant explained that she would also like “the support of knowing, ok, if I want to get more engaged in this… what support would I have? Would there be help here, within our college, if we wanted to move forward on this more?" Another interview participant from the same institution indicated that he perceived the ability to avail of a high level of formal institutional support. The interviewee remarked that "we have in this institution something that appears to me to be quite enviable, the technology support, many institutions would like it." The interviewee also commented on how a lack of formal technical support can be a barrier to innovation with resources such as mobile RLOs:

> I think for many instructors, particularly in my generation, I suppose, there's a certain exoticism about it all and how it melds or conflicts with more conventional and traditional teaching practices. And, where in those other institutions you might find people getting ramped up or excited about the application of technology but not having the technical support anywhere around to help them engage it and to help them troubleshoot or to refine it over time.

Lack of technical infrastructure was also cited by participants as a barrier to integrating mobile RLOs into teaching practice. One interview participant commented on her unease with using technology-based learning resources that could suffer from inconsistent connectivity throughout her campus:

> The biggest barrier here is WiFi capacity… I might be able to use a reusable learning object with one class, with my class if I were a teacher in a class, but in my current job I have to promote the use of learning in all classes and I can't promote the use of WiFi-connected device[s] in all our classes because that would create chaos here because we don't have the infrastructure to support that yet. I know it's coming, but we don't currently have it and so that's the biggest barrier.

In addition to barriers stemming from a lack of “familiarity with the technical aspects,” the interview participant also discussed teachers’ level of comfort with “the classroom management part.” She remarked that “that’s a barrier, an easily overcome barrier, but that’s also a barrier. It takes time for people to be comfortable.”

Multiple survey and interview participants indicated that they would like to see support for mobile RLO integration in the form of ongoing formal and informal training opportunities. One interview participant suggested that those training opportunities should include “hands on and subject specific brainstorming.” Another participant suggested the addition of a practicum module in the CSAM course, or “perhaps, if the course couldn't include a "practicum" using the mRLO, there could be a chance to watch videos of a lesson using the mRLO.” A third interview participant also called for more opportunities to practice developing and using mobile RLOs in an authentic context:

> I think I would need more opportunities to create more learning objects that I could try and test, and get a reaction from students and actually apply in a classroom, in a real context… I have to share it and see what the audience thinks of it and how it works in a real situation.

Another interview participant called for support in the form of regular workshops, presentations, and:

> anecdotes or reports of the successes and stuff within a real context, with our immediate context… I think there’s a lot of instructors, myself specifically… would benefit by a more frequent kind of workplace orientation and training and workshopping from time to time, at least in terms of voluntary participation in those kinds of activities, and even just presentations about what is the latest thing.

The most frequently assigned simultaneous code amongst comments that were assigned primary codes related to barriers or supports was “informal community of practitioners” (n = 8). The ability to draw upon draw upon the skills, opinions, and encouragement from colleagues was cited most frequently as a potential support to participants’ abilities to integrate mobile RLOs into their teaching practice. One survey respondent commented that “you like to know that you have a support group there” in case “you run into troubles or difficulties, or you want to bounce an idea off someone.” Another survey respondent discussed the importance of having a local informal support group “with our immediate context” because “we can go through lots of media to talk about what’s happening in California, what’s happening in South Africa… I want to see it on the ground here.”

Summary

This chapter presented the results of the qualitative analysis of open-response feedback questions on the CSAM learning design framework included in the Second mTSES survey, and the transcripts of follow-up interviews with five volunteer participants. The qualitative analysis was conducted in order to triangulate and contextualize the results from the quantitative analyses reported in Chapter V.

Survey respondents and interview participants commented most frequently about the strengths of the CSAM learning design framework, and the CSAM professional development course. Participants indicated that they perceived the strengths of the CSAM framework to include the guidance it provided them during and after the development of mobile RLOs, and the simplicity, clarity, comprehensiveness, and ease-of-use of the framework. Participants cited the strengths of the professional development course as frequent interaction, the inclusion of multiple learning resources, and the content and organization of the course.

Participants did not comment as frequently about perceived weaknesses of the CSAM framework and the professional development course. Some participants noted a desire to see mobile learning deployment factors addressed that were not included in the scope of the CSAM framework, such as technological infrastructure and stakeholder familiarity with technology. One participant indicated wariness about prescriptive adherence to a framework such as CSAM, and other participants indicated that they needed further explanation for one or more of the CSAM pedagogical elements. Perceived weaknesses of the professional development course included difficulties using learning and developmental tools such as the *Canvas*™ LMS discussion forum, and the *Winksite*™ mobile website building tool.

The majority of the survey respondents and interview participants indicated that they had become more interested in integrating mobile RLOs into their personal teaching practice. Participants indicated that the CSAM framework, and their participation in the professional development course, had helped them to recognize mobile RLOs as a potential tool that could benefit the learning experience for their students. Most participant comments related to interest were coded as indicating that the participants "may use mRLOs if appropriate opportunity arises."

Participants provided commentary on what they perceived to be barriers to the integration of mobile RLOs into their teaching practice, and the types of supports that would help them to begin integrating mobile RLOs. Negative institutional perceptions, lack of institutional interest, and lack of developmental resources were the most commonly cited barriers. Other barriers to mobile RLO integration noted by participants included lack of technological infrastructure and lack of professional experience or background. Participants most frequently indicated that an informal community of practitioners would be a valuable support in their efforts to integrate mobile RLOs. Other desired supports listed by participants included formal or informal institutional support, including technical support, and formal or informal professional development training such as workshops and presentations. Participants also indicated a desire for further practical experience with designing, building, and testing mobile RLOs in authentic contexts, such as a practicum element for the CSAM professional development course.

The next chapter will present a discussion of the results of the quantitative analyses from Chapter V and the qualitative analyses from Chapter VI. Chapter VII will frame the discussion of the quantitative and qualitative analyses results in the context of the original research questions for this study.

Chapter VII: DISCUSSION

Chapters V-VI presented the quantitative and qualitative data analyses components of the second phase of this design-based research study. This chapter presents a discussion of results of those data analyses.

Teacher self-efficacy has been identified as an important factor in increasing the integration of mobile learning strategies, such as the use of mobile reusable learning objects (RLOs) (Ally, et al., 2013). However, there has been a lack of research into teachers' perceptions of self-efficacy in relation to mobile learning (Kenny, et al., 2010). This research study was undertaken to investigate the impact on teachers' perceptions of self-efficacy of participation in professional development training focused on pedagogical decision-making for the use of mobile RLOs. Results have indicated a positive influence on participants' perceptions of self-efficacy.

This research study was undertaken with the aim of determining if the Collaborative Situated Active Mobile (CSAM) learning design framework could be used to help teachers to become more interested in, comfortable, and confident with the use of mobile reusable learning objects to facilitate collaborative learner interactions. An online professional development course was developed in which participants used the CSAM framework to contextualize examples of mobile RLOs from recent literature, and then to guide the development and assessment of their own mobile RLOs. The development of the professional development course, and the analyses of the data collected from participants constitute the first phase of a design-based research (DBR) project. The results of this research study will be used in future DBR phases to inform iterative improvements to the professional development course.

A free, web-based tool was used by participants during the professional development course to complete the actual development of their own mobile RLOs. Participants in the online course, and this research study, included practicing primary, elementary, secondary, and post-secondary teachers, as well as graduate-level education students. Data on participants' perceptions of self-efficacy with the use of mobile RLOs was collected using the Mobile Teacher's Sense of Efficacy Scale (mTSES) survey at the beginning of the course, upon completion of the training, and four months after the completion of the training. Participants were also asked to provide feedback on their perceptions of the CSAM framework, the professional development course, and their interest in the use of mobile RLOs, in the forms of closed and open-response survey questions, as well as follow-up interview sessions.

Previous chapters have provided an overview of the research design and methodology for this study, the development, testing, and participation in the professional development course, the quantitative analyses of closed-response survey data, and the qualitative analyses of open-response survey questions and follow-up interview transcripts. This chapter begins with a restatement of the research questions that guided this study. This is followed by a discussion of the quantitative and qualitative data analyses results, in the context of the original research questions.

Restatement of the Research Questions

The primary problem investigated by this research study was whether using the CSAM framework to guide pedagogical decisions could help to increase teachers' perceptions of self-efficacy with the use of mobile RLOs. As outline in Chapter I, the specific research questions for this study were:

1. Does the Collaborative Situated Active Mobile (CSAM) learning design framework provide teachers with an increased sense of self-efficacy in the use of mobile reusable learning objects (RLOs) to facilitate or enhance collaborative learner interactions?
    a. Do teachers perceive greater self-efficacy when using the CSAM framework?
    b. Do teachers perceive their use of mobile RLOs to be more effective when using the CSAM framework?

The following sections will use the original research questions to frame the discussion of the results of the quantitative and qualitative data analyses that were presented in Chapters V-VI.

Discussion of the Quantitative and Qualitative Analyses Results

The initial research question was broken down into two related sub-questions. The first sub-question was "do teachers perceive greater self-efficacy when using the CSAM framework?" Chapter V presented the results of the quantitative analyses of data on participants' perceptions of self-efficacy. These data were collected using repeated applications of the Mobile Teacher's Sense of Efficacy Scale (mTSES) survey instrument. Data from the repeated applications were compared to show an overall trend towards increased perceptions of self-efficacy with the use of mobile RLOs upon the completion of the CSAM professional development course. This trend toward increased perceptions of self-efficacy was maintained between the beginning of the training and a follow-up survey administration four months after the completion of the training, in September 2014. However, data from the second and third administrations of the mTSES survey demonstrated that participants' perceptions of self-efficacy with the use of mobile RLOs had decreased between the end of the training and the follow-up survey.

Participants' scores on the mTSES subdomains of Efficacy with Engagement, Efficacy with Instructional Strategies, and Efficacy with Classroom Management, all showed increases for the overall participant sample between the pre-training and post-training survey administrations. Calculations of the same subdomain scores for the original TSES instrument (general perceptions of teacher self-efficacy) support the findings, and showed that increased mTSES subdomain scores were greater than what would be expected from a maturation effect alone.

The quantitative data results from Chapter V are supported by the qualitative analyses of participants' perceptions as reported in Chapter VI. When asked about their interest in using mobile RLOs, survey respondents and interview participants indicated that they would consider using mobile RLOs if an appropriate opportunity arose. Participants also discussed what they saw as the strengths of the CSAM framework, and the professional development course. They predominantly described the CSAM framework as easy to understand, comprehensive, and easy to use. They also described the CSAM framework as a useful tool to help them plan the instructional designs of mobile RLOs, to guide them through the development process, and to reflect upon the success of their efforts to use mobile RLOs. Participants also discussed how they perceived that the CSAM professional development course had benefited them. They listed the level of interaction in the course, the variety of learning resources, and the structured use of the CSAM framework to guide their mobile RLO development projects as strong points of the course.

The quantitative data analyzed in Chapter V revealed that not all demographic groups saw equal changes in their perceptions of self-efficacy with the use of mobile RLOs. For instance, participants identified as graduate-level education students demonstrated greater increases in their overall mean mTSES scores compared to those identified as practicing teachers. Graduate-level education students also demonstrated greater gains on the mean mTSES subdomain scores for Engagement and Classroom Management. Teachers who identified themselves as having between five to ten years of teaching experience also demonstrated greater overall gains on the mTSES scores compared to all other demographic groups. The reasons for these differences were not explored in this research study.

The overall lowest levels of improvements in mean mTSES subdomain scores were recorded for the Classroom Management subdomain. Where Classroom Management subdomain scores did increase for various demographic groups between the First mTSES and the Second mTSES, those increases were lower than the increases recorded for either the Engagement or Instructional Strategies subdomains. The Classroom Management subdomain also witnessed the most frequent decreases between the First mTSES and Second mTSES administrations. The lower measures of perceived efficacy with classroom management strategies were reflected in participants' direct calls for the inclusion of either a module or a course resources section dedicated to classroom management for mobile learning.

Comments from participants in the open-response survey questions and interview transcripts highlighted additional areas where the CSAM framework and the professional development course could be used to further increase perceptions of self-efficacy. For instance, participants discussed perceived barriers to their efforts to integrate mobile RLOs into their teaching practice. Some of these barriers were institutional, and related to either a lack of will, infrastructure, or other required resources required. However, some of the comments about perceived barriers related to a lack of professional background or experience with using mobile RLOs. Participants also discussed what types of supports they felt they needed in order to integrate mobile RLOs into their practice. The majority of participants' comments indicated a need for more professional development, including opportunities to develop and deploy mobile RLOs in authentic settings. Other comments indicated a desire to share more examples of mobile RLOs using the CSAM framework, and the establishment of informal communities of fellow practitioners. The types of supports described by participants should be integrated into future iterations of the CSAM professional development course.

The second sub-question for this research study was "do teachers perceive their use of mobile RLOs to be more effective when using the CSAM framework?" The research design for this study did not allow for an analysis of participants' perceptions of impacts on effectiveness in terms of student achievement of learning outcomes. Answering this question directly would require an extended research design, and to follow-up with study participants as they deployed mobile RLOs in an authentic setting. However, a number of questions from the CSAM Feedback Survey and the follow-up interview sessions do address participants' perceptions of the effectiveness of their personal practice with mobile RLOs. Participants were asked to rate their perceptions of the influence of the CSAM framework on their ability to make instructional design decisions for the use of mobile RLOs, to engage in reflective practice, and to identify potential learning scenarios where they could benefit from integrating mobile RLOs into instructional design. The overall mean score for the CSAM Feedback Survey was M = 6.35 (out of 9), indicating that participants perceived that the CSAM framework has had "Quite a Bit" of influence on helping them to become more effective at integrating mobile RLOs into instructional design.

Participants' ratings from the closed-response CSAM Feedback Survey questions were reinforced by their comments in the open-response survey questions and the follow-up interview transcripts. As presented in Chapter VI (see Table 31), the majority of participants' comments about the CSAM framework were coded as related to the provision of guidance for instructional design and development with one survey respondent summarizing that "CSAM has given me the planning tools I needed."

As discussed in Chapter VI, one interview participant expressed caution about overreliance on a single, simplified framework to guide planning for the integration of mobile RLOs into instructional design. While that interviewee had previously expressed optimism for the clarity and guidance provided by the framework, he indicated that he was wary of using a single framework as a "hard and fast rule for the measures that you'll go by" in any instructional design scenario. The participant discussed the importance of considering a number of factors that were "beyond the scope" of the intentions of the CSAM framework.

Counter-Intuitive Results

Participants with differing amounts of teaching experience demonstrated different levels of change in their mTSES scores for perceptions of self-efficacy with mobile learning. The greatest increases in mTSES scores for all sub-domains were recorded for teachers with between five to ten years of teaching experience. mTSES subdomain score increases were lower for those teachers with more than ten years of teaching experience. One possible reason for this difference was suggested by an interview participant, who remarked that "I think for many instructors, particularly in my generation… there's a certain exoticism about it all and how it melds or conflicts with more conventional and traditional teaching practices." This comment suggests that teachers with more teaching experience may realize smaller increases in perceptions of self-efficacy because they have more anxiety about the efficacy of integrating new technologies into their practice. However, participants with between five and ten years of teaching experience also so the greatest increases in their perceptions of self-efficacy on the sub-domains of the original TSES instrument. The concurrently higher levels of change for both the TSES and mTSES scores may indicate that participants in that demographic group are more likely than their more experienced peers to experience benefits to their sense of self-efficacy as a result of participating in professional development activities. Future stages of this ongoing design-based research project would benefit from a more detailed examination of participants' perceptions of the reasons for changes to their sense of self-efficacy.

This research study was prompted by the premise that teachers' perceptions of self-efficacy represents the most significant current barrier to wider adoption of mobile learning strategies and the use of mobile RLOs. However, findings from the qualitative analyses of the follow-up interview transcripts show that addressing perceptions of self-efficacy may not be sufficient to increase the use of mobile learning strategies. As one interview participant remarked, the CSAM framework "has a limited scope, and there are many other things that have to be considered." The most frequently mentioned concern amongst participants was a lack of technical support from their institutions. One interview participant remarked that "it's… not the CSAM framework that's influencing [plans to integrate mobile RLOs into teaching practice]. It's my context." A second interview participant elaborated that knowing "what support would I have" is an important factor in deciding to use mobile RLOs. A third participant remarked that those responsible for providing support for technology integration at her institution were often quick to dismiss new initiatives with such comments as "Who's going to pay for that? And who's going to maintain it?" The number of participant comments about perceived lack of institutional support shows that perceptions of technical barriers continue to prevent teachers from integrating mobile learning strategies. Participants have indicated that, in addition to instructional design guidance, they require confidence that their use of new technologies will be supported at the institutional level.

Summary

This research study was undertaken to examine changes in participants' perceptions of self-efficacy with the use of mobile RLOs when drawing upon the CSAM learning design framework in an online professional development course. This chapter provided a discussion of the results of the quantitative data presented in Chapter V and the qualitative data analyzed in Chapter VI. The discussion of the quantitative and qualitative data was framed in the context of the original research questions. Those questions asked whether participants perceived increased self-efficacy with using mobile RLOs, and whether they perceived their use of mobile RLOs to be more effective as a result of participation in the professional development course. Chapter VIII presents the conclusions, limitations and significance of the research study. Also presented in Chapter

VIII are recommendations for improvements to the CSAM online professional development course, and recommendations for future research.

Chapter VIII: CONCLUSIONS AND RECOMMENDATIONS

Chapter VII provided a discussion of the quantitative and qualitative data analyses from Chapters V-VI. Chapter VIII presents conclusions and discusses the limitations of the first and second phases of this design-based research study. This chapter also provides recommendations for future research and practice that could constitute subsequent phases of this DBR project.

The discussion in Chapter VII of the quantitative and qualitative data analyses from Chapters V-VI was presented in the context of the original research question for this study. That question was examined from the perspective of two sub-questions.

The first sub-question related to teachers' perceptions of self-efficacy when using the CSAM learning design framework to guide instructional design and reflective practice for the use of mobile RLOs. Based upon the results from the repeated applications of the mTSES survey, and from the qualitative survey questions and interview transcripts, participants in this study did perceive greater self-efficacy when using the CSAM framework. The results of this research study are consistent with the rationale behind recent trends in teacher professional development policy (DeMonte, 2013; Koehler & Mishra, 2008; mdk12.orf, 2014; National College for School Leadership, 2003). That is, professional development on the use of educational technologies should focus on developing teachers' abilities to make pedagogical decisions about why and how to integrate specific technologies, as opposed to concentrating on basic technical skills (Koehler & Mishra, 2008; mdk12.orf, 2014). Professional development that uses a framework to guide instructional design decisions is an effective means to increase teachers' perceptions of self-efficacy. In turn, increased perceptions of self-efficacy result in more willingness to experiment with new teaching strategies, and higher rates of integration of new technology tools into teaching and learning practice (Tschannen-Moran & Woolfolk Hoy, 2001). The findings from this research study add further support to the recent calls to design professional development around the context of supporting pedagogical decision-making. The consistency with the results of research used to support recent professional development policy also means that the findings of this research study may be generalizable beyond the context of the participants from the CSAM course. The findings from this research study can be used to support research and the design of professional development in educational technology contexts beyond the use of mobile RLOs.

The second sub-question related to teachers' perceptions of the effectiveness of the integration of mobile RLOs into their instructional designs when using the CSAM framework. While participants were not specifically asked to rate their perceptions of the effectiveness of integrating mobile RLOs, they were asked to rate their perceptions of their abilities to make instructional design decisions when using the CSAM framework. Based upon the results from the CSAM Feedback Survey, and the analysis of comments from the interview transcripts, it can be concluded that participants did perceive themselves to be more effective at instructional design for mobile RLOs.

Limitations of the Research Study

Participants in this research study were invited to self-enroll in the CSAM professional development course. Invitations were forwarded to prospective participants through partnerships with four post-secondary institutions. These institutions included a large university in a Midwestern USA state, a western Canadian university, a technical and vocational training college in Newfoundland and Labrador, Canada, and a technical and vocational training college in Doha, Qatar. Invitations were forwarded to practicing K-12 and post-secondary instructors, as well as graduate-level education students. Participation in the course, and the research study, was voluntary.

The target demographics and the voluntary nature of participation are factors that represent potential limitations to the generalizability of the findings of this research study. The fact that invitations to participate were forwarded by partner institutions to practicing teachers and post-secondary instructors meant that unemployed teachers were excluded from the sample population. The fact that invitations to participate were forwarded to current graduate-level education students meant that undergraduate-level education students, who may have soon entered the teaching workforce, were also excluded from the sample population. The fact that invitations were only forwarded to potential participants affiliated with the four aforementioned partner institutions meant that the sample population was not representative of teaching professionals from regions other than Canada, the USA, and Qatar. Also, the target participants affiliated with College of the North Atlantic-Qatar were exclusively comprised of Canadian citizens. The voluntary, self-enrollment nature of participation in the professional development course and the study meant that the sample population likely excluded teachers and education students who either had low-interest or low perceptions of self-efficacy with the use of educational technologies and mobile learning strategies. As a result of the target demographics and voluntary nature of participation, it is not possible to generalize the findings of this study to all teaching professionals.

As outlined in Chapter IV, a total of *n* = 72 participants self-enrolled in the CSAM online professional development course. A total of *n* = 41 course participants also completed the online Informed Consent form, and officially enrolled as participants in the research study. While *n* = 36 participants completed the First mTSES (pre-training) survey, only *n* = 22 participants completed the Second mTSES (post-training), and *n* = 14 participants completed the Third mTSES (four-month follow-up) survey. There were *n* = 13 participant submissions for the CSAM End-of-Course Follow-Up survey, and *n* = 5 volunteer participants for the researcher-led follow-up interviews. While participant attrition is common in multiple survey research designs (Cohen, et al., 2011), the lower response rates for the Second and Third mTSES, and the End-of-Course Feedback Survey, mean that it may not be possible to generalize the survey results across the entire original participant population. The low number of participants who completed the Consent to be Contacted for a Follow-Up Interview survey form meant that it was not possible to use either a random or a stratified random sampling strategy for the selection of volunteers to participate in the follow-up interviews. Instead, researcher-led interviews were conducted with all five volunteers. Four interview participants were affiliated with the same institution from Doha, Qatar, while the fifth participant was a graduate-level education student affiliated with a western Canadian university. There were no interview participants affiliated with either the technical and vocational training college from Newfoundland and Labrador, Canada, or the Midwestern USA university. The volunteer interview participant demographics mean that it is not possible to generalize the findings from the qualitative analyses of the interview transcripts across the entire original research study population sample.

Recommendations for Research and Practice

The meta-analysis in Chapter II of mobile RLO examples presented in recent mobile learning literature shows that the four constituent components of the CSAM learning design framework are factored into the instructional designs of the majority of mobile RLOs used to facilitate collaborative learner interactions. The results of the quantitative analyses of the mTSES surveys presented in Chapter V demonstrated that using the CSAM framework to guide instructional design decisions, and to engage in reflective practice, does have a positive effect upon participants' perceptions of self-efficacy with the use of mobile RLOs. The results of the qualitative analyses of the CSAM feedback survey questions and the follow-up interview transcripts presented in Chapter VI showed that participants perceived benefits to using the CSAM framework. As a result of these findings, it is possible to recommend the use of the CSAM learning design framework as a professional development tool to help teachers become more interested in, and confident with the use of mobile RLOs. It is also possible to recommend the use of the CSAM learning design framework as a tool to guide instructional design decisions and reflection on the pedagogical effectiveness of mobile RLOs used to facilitate collaborative learner interactions. The following sections present specific recommendations for the CSAM professional development course and for future research.

Recommendations for the CSAM professional development course.

Participants in the CSAM professional development course expressed positive responses to their experiences in the training. The quantitative data analyses presented in Chapter V also showed an overall positive effect upon participants' perceptions of self-efficacy with the use of mobile RLOs. Participants also suggested potential improvements which could be integrated into future iterations of the professional development course. The primary recommendations for refinements to the CSAM professional development course include:

- Longer duration. Participants expressed a desire for additional time to accommodate the development of their mobile RLO projects.
- Incorporate a practicum. Participants expressed a desire for an opportunity to deploy their mobile RLO projects in an authentic setting, and then to engage in reflective practice and refinements guided by the CSAM framework.
- Incorporate a module or resource section on classroom management considerations for mobile learning.
- Alternative development tools. Participants expressed a desire to use a range of development tools, in addition to *Winksite*™, for the development of their mobile RLO projects. Participants also expressed a desire to see and share examples of CSAM mobile RLOs developed using a variety of development tools.
- Standalone mTSES tool. Completion of the First mTSES survey in Module 1 of the professional development course, and of the Second mTSES survey in Module 5, required participants to be redirected to the survey instrument hosted using Athabasca University’s LimeSurvey™ tool. Self-scoring of the mTSES for purposes of the reflective practice exercises in Modules 1 and 5 required participants to then copy their raw responses into a preformatted *Microsoft*™ *Excel*™ spreadsheet template, which could be downloaded from the course Learning Management System (LMS). It is recommended that this system be

replaced with a standalone self-scoring tool, accessed through the course LMS. This will help participants to avoid confusion and frustration resulting from switching between multiple platforms.

- Multimedia tutorials. Participants expressed a desire to see more step-by-step tutorials and help resources related to the development of mobile websites using *Winksite*™.
- Community of practitioners. Participants indicated that membership in an informal community of practitioners would be a useful support to help them in their ongoing efforts to integrate mobile RLOs into their teaching practice. It is recommended that an open forum be developed for course graduates (and anyone else interested in mobile RLO development and integration).

Recommendations for future research.

This study constituted the first and second phases of a design-based research project. Future DBR phases should include developing and seeking feedback on the recommended refinements to the CSAM professional development course. Additional research is recommended to verify the findings of the quantitative and qualitative data analyses from this study, and the applicability of those findings to wider subsets of the overall population of teaching professionals and graduate-level education students. The survey instruments and follow-up interview questions should also be redeveloped to include questions pertaining to the reasons why participants perceived changes in their perceptions of self-efficacy. Additional research is also recommended to investigate the impacts of the CSAM learning design framework, and teacher participation in the CSAM professional development course, upon:

- the effectiveness of the use of mobile RLOs to increase student engagement in learning activities;
- the effectiveness of the use of mobile RLOs to increase student collaboration when engaged in learning activities; and
- the effectiveness of the use of mobile RLOs to increase student achievement of learning outcomes.

Expanded research efforts should include future offerings of the CSAM professional development course in association with the four partner institutions from this study. This should also include seeking partnerships with additional institutions and organizations, and disbursement of open participation invitations to a wider range of education students, teaching professionals, and instructional designers and developers.

Significance of the Study

This research study was significant because it demonstrated the utility of the Collaborative Situated Active Mobile learning design framework in helping to prepare teachers to make use of mobile learning strategies in instructional design. This study explored the potential for professional development training focused on the CSAM framework to increase teachers' perceptions of self-efficacy with respect to mobile learning, particularly with respect to the development and use of mobile reusable learning objects (RLOs). This study also resulted in the development of an instrument that can be used to gauge teachers' perceptions of self-efficacy with respect to the use of mobile RLOs. The Mobile Teacher's Sense of Efficacy Scale (mTSES) survey is significant because it can be used to compare the effects of training interventions on teachers' perceptions of self-efficacy with mobile learning strategies.

From the perspective of distance education research and practice, this study was significant because it explored issues of instructional design competency and teachers' perceptions of self-efficacy with the use of technologies that are becoming increasingly pervasive. As mobile technologies become increasingly pervasive, they are becoming a mainstream mode of accessing learning opportunities and learning content. The evolution and growing pervasiveness of technologies available to mediate access to education is resulting in breakdowns in the distinctions between different modes of learning, such as face-to-face, distance or distributed learning, and mobile learning. Mobile technologies will play an increasingly common role in the design and delivery of education (Ally, 2014). This research was significant from the perspective that it has contributed to the body of knowledge about how to better prepare teachers to integrate mobile learning strategies and resources into instructional design at any level of the education system.

Summary

Teacher's perceptions of self-efficacy can create barriers to their willingness to integrate mobile learning strategies, including the use of mobile RLOs, into their teaching and learning practice. This research study was undertaken to explore the ability of the Collaborative Situated Active Mobile (CSAM) learning design framework to help increase teachers' perceptions of self-efficacy with the use of mobile RLOs to facilitate collaborative learner interactions. The CSAM framework was derived from an analysis of the common pedagogical elements described for examples of collaborative mobile RLOs presented in recent mobile learning literature. The CSAM framework was then used as the focus of an online professional development course dedicated to designing and developing mobile RLOs for collaborative learner interactions. The professional development course drew upon free online tools to handle the technical aspects of building the mobile RLOs, so that participants could focus their attentions on instructional design and reflective practice.

A new survey instrument was developed for this research study, based upon the Ohio State Teacher's Sense of Efficacy Scale (TSES). The Mobile Teacher's Sense of Efficacy Scale (mTSES) survey contextualized questions from the original TSES instrument for mobile learning instructional design. The mTSES survey was compared to the TSES survey to establish reliability and construct validity, and to help determine the extent of the changes in survey scores during the course of this study. Participants in the CSAM professional development course completed the mTSES survey at the beginning of the course, the completion of the course, and four months after the completion of the training. Results from the quantitative analyses of the mTSES survey results showed that participants did experience increases in their perceptions of self-efficacy with mobile learning strategies after participating in the CSAM course. These findings were triangulated using qualitative techniques to analyze data collected through follow-up survey questions and interview sessions. Participants expressed interest in, and optimism for their ability to integrate mobile RLOs into their teaching practice. Participants also described a positive experience in the professional development course, and made recommendations for further improvements to the course design.

The *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies* professional development course was developed and implemented in this research study as the first and second phases in a design-based research (DBR) project. The results of this study indicate that the course had a positive influence on teachers' perceptions of self-efficacy with mobile learning. Lessons learned from this study, and recommendations made by study participants, will be used to inform decisions about improvements for future iterations of the professional development course, and future DBR research phases. The results of this study also support the use of the CSAM learning design framework to help frame decisions about the pedagogical components of instructional design when planning to use mobile reusable learning objects to support collaborative learner interactions.

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APPENDICES

APPENDIX A: Consent Form

NOTE – the following is a print copy of the Consent Form. For purposes of the research study, the Consent Form will be distributed and completed via an electronic survey link within the *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies* online professional development course. A downloadable / printable copy of the research study information letter referenced in the Consent Form will also be posted to the course site.

For further information:
Robert Power
Tel: +974-5513-3561
Email: robpower@hotmail.com

Research Center, Athabasca University
Tel: 1-800-788-9041 ext. 6651
Fax: (780) 675-6722
Email: research@athabascau.ca

January 23, 2014

A Framework for Promoting Teacher Self-Efficacy with Mobile Reusable Learning Objects

CONSENT FORM

I, (please print)____ have read and understood the information on the research study **A Framework for Promoting Teacher Self-Efficacy with Mobile Reusable Learning Objects** which is to be conducted by Robert Power. I agree to voluntarily participate in this research study and give my consent freely. I understand that the project will be conducted in accordance with the Information Letter, a copy of which I have retained for my records. I understand I can withdraw from the project at any time, without penalty, and do not have to give any reason for withdrawal.

I consent to:

Completing a series of questionnaires.	Yes/No
Participating in a short online course.	Yes/No
Providing feedback on the effectiveness of the course through a survey and/or participating in researcher-led interview.	Yes/No

Print Name: ____________________________________

Signature: ____
Date: ____

This study has been reviewed by the Athabasca University Research Ethics Board. Should you have any comments or concerns regarding your treatment as a participant in this study, please contact the Office of Research Ethics at or 1-800-788-9041 ext. 6718 or by e-mail to rebsec@athabascau.ca.

APPENDIX B: Information Letter

For further information:
Robert Power
Tel: +974-5513-3561
Email: robpower@hotmail.com

Research Center, Athabasca University
Tel: 1-800-788-9041 ext. 6651
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January 23, 2014

A Framework for Promoting Teacher Self-Efficacy with Mobile Reusable Learning Objects

Participant Information Letter

Dear *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies* participant,

Study Name: *A Framework for Promoting Teacher Self-Efficacy with Mobile Reusable Learning Objects*

Researcher: Robert Power (Doctor of Education in Distance Education student, Center for Distance Education, Athabasca University, Canada)

Purpose of Research Study: The purpose of this research study is to evaluate the utility of the Collaborative Situated Active Mobile (CSAM) learning design framework towards developing teachers' interest in and perceptions of self-efficacy towards using free online resources to develop and integrate mobile reusable learning objects to facilitate collaborative learner interactions in teaching and learning practice. This study is being conducted as part of the lead researcher's dissertation for the Doctor of Education in Distance Education program with the Center for Distance Education at Athabasca University, Canada.

What you will be asked to do in the Research Group: You will be asked to participate in an online professional development course called *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies*. As part of the course, you will be asked to complete a number of online surveys. These surveys are designed to evaluate your own perceptions of self-efficacy with respect to using mobile learning strategies to facilitate collaborative learner interactions in teaching and learning practice. These surveys will also ask for your impressions of the CSAM learning design framework. You may also be asked to participate in a follow-up interview to provide more detailed feedback on your perceptions of self-efficacy, your interest in and experience with using mobile learning strategies, and your impressions of the CSAM learning design framework.

Notification of Research Results: The final report of the results of this research study will be submitted as a dissertation in partial requirement for the completion of the Doctor of Education in Distance Education program with the Center for Distance Education at Athabasca University, Canada. Upon successful completion of the dissertation defense, and all program requirements, the dissertation document will be published in Athabasca University's graduate dissertation archives. If you would like to participate as an observer at the lead researcher's dissertation defense, you may request details regarding scheduling from the lead researcher or from the Faculty of Graduate Studies, Athabasca University.

Risks and Discomforts: We do not foresee any risks or discomfort from your participation in the research study.

Benefits of the Research and Benefits to You: It is hoped that this research study will help researchers and practitioners to be better able to use mobile devices, such as mobile phones, to provide students with more learning resources and an enriched learning experience. It is also hoped that participation in this research study will enable you to make better use of your mobile devices to assist you in your teaching and learning practice.

Voluntary Participation: Your participation in the study is completely voluntary and you may choose to stop participating at any point during the online course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile Learning Strategies*. Should you choose to stop participating in the research study, you will still be able to continue participating in the online course. Alternative options are provided within the course so that you will be able to complete all required learning activities without any penalty.

Withdrawal from the Study: You can stop participating in the study at any point during the online course *Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile Learning Strategies*, for any reason, if you so decide. Your decision to stop participating, or to refuse to answer particular questions, will not affect your relationship with the researcher, Athabasca University, or any other group associated with this project. You are not required to provide any explanation if you decide to withdraw from participation in this study. Should you choose to stop participating in the research study, you will still be able to continue participating in the online course. Alternative options are provided within the course so that you will be able to complete all required learning activities without any penalty. However, it is not possible to remove data once submitted through one of the research study survey instruments. Once you have completed a particular survey, your responses cannot be withdrawn from the system because your responses are not linked to your personal identification information. If you choose to participate in a researcher-led follow-up interview session, your interview responses will be transcribed and forwarded to you for verification. It will not be possible to withdraw your interview responses after you have verified their accuracy and you have provided consent to include your interview responses for the data analysis stage of the research study.

Confidentiality: No information will be collected through the survey instruments in this research study that could in any way identify you as a participant, with the exception of the Informed Consent form and the Consent to be Contacted for a Follow-Up Interview form. Unless you choose otherwise, all information you supply during the research study will be held in confidence and unless you specifically indicate your consent, your name will not appear in any report or publication of the research study. Your data will be safely stored in a locked facility and only research staff will have access to this information. Confidentiality will be provided to the fullest extent possible by law. Personally identifiable data collected through the Informed Consent form and the Consent to be Contacted for a Follow-Up Interview form will be destroyed upon the completion of the research study.

Questions About the Research? If you have questions about the research study in general or about your role in the study, please feel free to contact Robert Power by telephone at (974) 5513-3561, or by email (robpower@hotmail.com), or Dr. Mohamed Ally, Athabasca University, by telephone at 1-866-916-8650, or by email (mohameda@athabascau.ca).

This study has been reviewed by the Athabasca University Research Ethics Board. Should you have any comments or concerns regarding your treatment as a participant in this study, please contact the Office of Research Ethics at or 1-800-788-9041 ext. 6718 or by e-mail to rebsec@athabascau.ca.

Thank-you for considering this invitation,

Robert Power
Doctoral Student, Doctor of Education in Distance Education Program, Center for Distance Education, Athabasca University

APPENDIX C: Combined Teacher's Sense of Efficacy Scale (TSES) and Mobile Teacher's Sense of Efficacy Scale (mTSES) Survey
(Tschannen-Moran, & Woolfolk Hoy, 2001b)

Introduction.

Welcome to the First (or Second) Mobile Teacher's Sense of Efficacy Scale (mTSES) survey. This survey is part of the research study A Framework for Promoting Teacher Self-Efficacy with Mobile Reusable Learning Objects, and the online professional development course Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies.

Demographic questions.

Please select a response for each of the following basic demographic questions. Please note, no personally identifiable information will be collected or reported as part of this research study.

1. With which institution are you affiliated?
2. Are you a faculty member at the institution listed in Question 1?
3. Are you a student at the institution listed in Question 1?
4. Please indicate your number of years of teaching experience:
    a. 0-2
    b. 3-5
    c. 5-10
    d. 10-15
    e. > 15
5. In which sector do you have the most teaching experience?
    a. K-12
    b. Post-Secondary
    c. Corporate or Industry
    d. N/A

TSES and mTSES questions.

This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers when integrating technology-based resources (such as mobile devices and mobile reusable learning objects) in their school activities. Please indicate your opinion about each of the statements below. Your responses are confidential, and are not linked to any information that could potentially identify you (such as the email address where you received the link to access this survey).

	Teacher Beliefs	How much can you do?								
		Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal
1	How much can you do to get through to the most difficult students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2	How much can you do to control disruptive behavior during collaborative learning activities?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3	How much can you use alternative (technology-based) resources to motivate students who show low interest in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
4	How much can you gauge student comprehension of content delivered using technology resources?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5	How much can you use alternative (technology-based) resources to get through to the most difficult students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6	How well can you respond to difficult questions from your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
7	How much can you do to adjust your lessons to the proper level for individual students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
8	To what extent can you craft good collaborative learning activities for your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
9	How well can you provide appropriate challenges for very capable students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10	How well can you respond to defiant students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
11	How much can you do to calm a student who is disruptive?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
12	How much can you use alternative (technology-based) resources to help your students value learning?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
13	How much can you do to get students to follow classroom	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

	rules?									
14	How well can you implement alternative (technology-based) strategies in your classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
15	How much can you use a variety of technology-based assessment strategies?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
16	How much can you use alternative (technology-based) resources to help your students think critically?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
17	To what extent can you make your expectations clear about student behavior?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
18	How much can you gauge student comprehension of what you have taught?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
19	How much can you do to foster student creativity?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
20	How much can you use a variety of assessment strategies?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
21	How well can you implement alternative strategies in your classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
22	How much can you assist families in helping their children do well in school?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
23	How well can you establish a classroom management system with each group of students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
24	How much can you do to improve the understanding of a student who is failing?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
25	How much can you do to help your students think critically?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
26	How much can you do to motivate students who show low interest in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
27	How well can you establish routines to keep activities running smoothly?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
28	How much can you do to help your students value learning?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
29	How much can you use technology to foster student creativity?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
30	How much can you use alternative (technology-	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

	based) resources to improve the understanding of a student who is failing?									
31	How much can you use technology to adjust your lessons to the proper level for individual students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
32	To what extent can you provide an alternative explanation or example when students are confused?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
33	How well can you keep a few problem students from ruining an entire lesson?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
34	How much can you do to get students to believe they can do well in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
35	How much can you do to control disruptive behavior in the classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
36	To what extent can you craft good questions for your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
37	How well can you keep a few problem students from ruining an entire collaborative learning activity?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
38	How well can you use technology to provide appropriate challenges for very capable students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

APPENDIX D: Directions for Scoring the combined Teacher's Sense of Efficacy Scale (TSES) and Mobile Teacher's Sense of Efficacy Scale (mTSES)
(Tschannen-Moran, & Woolfolk Hoy, 2001b)

NOTE – the following instructions are presented here exactly as the text appears in Tschannen-Moran and Woolfolk Hoy (2001b) (with minor formatting adjustments)

Factor analysis.

It is important to conduct a factor analysis to determine how your participants respond to the questions. We have consistently found three moderately correlated factors: *Efficacy in Student Engagement, Efficacy in Instructional Practices,* and *Efficacy in Classroom Management*, but at times the make-up of the scales varies slightly.

Subscale scores.

To determine the *Efficacy in Student Engagement, Efficacy in Instructional Practices, Efficacy in Classroom Management, Efficacy in Student Engagement with mLearning, Efficacy in Instructional Practices with mLearning,* and *Efficacy in Classroom Management with mLearning* subscale scores, we compute unweighted means of the items that load on each factor. Generally these groupings are:

TSES.

Efficacy in Student Engagement: Items 1, 19, 22, 24, 25, 26, 28, 34
Efficacy in Instructional Strategies: Items 6, 7, 9, 18, 20, 21, 32, 36
Efficacy in Classroom Management: Items 10, 11, 13, 17, 23, 27, 33, 35

mTSES.

Efficacy in Student Engagement with mLearning: Items 3, 5, 12, 16, 22, 29, 30, 34
Efficacy in Instructional Strategies with mLearning: Items 4, 6, 8, 14, 15, 21, 32, 38
Efficacy in Classroom Management with mLearning: Items 2, 10, 11, 13, 17, 23, 27, 37

Reliabilities.

In Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing and elusive construct. *Teaching and Teacher Education, 17,* 783-805, the following were found**:**

	Mean	SD	alpha
OSTSES	7.1	.94	.94
Engagement	7.3	1.1	.87
Instruction	7.3	1.1	.91
Management	6.7	1.1	.90

APPENDIX E: CSAM Feedback Questions

Introduction.

This questionnaire is designed to help us gain a better understanding of how useful this course was for you, and how we might be able to improve this course for future participants. Please indicate your opinion about each of the statements below. Your answers are confidential. Your responses are confidential, and are not linked to any information that could potentially identify you (such as the email address where you received the link to access this survey).

Closed response questions.

Use of CSAM **How much can you do?**

		Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal
1	How much has the CSAM learning design framework had an influence on your interest in using mobile reusable learning objects to facilitate collaborative learning for your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2	How much does the CSAM learning design framework influence your decision-making about pedagogical design for collaborative learning activities involving mobile reusable learning objects?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3	How much does the CSAM learning design framework influence your reflection on collaborative learning activities involving mobile reusable learning objects?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
4	How well can you identify appropriate collaborative learning activities for your students that could be facilitated through the use of a mobile RLO?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5	How well can you identify opportunities to use mobile RLOs to situate a collaborative learning activity in a realistic context?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6	How well can you develop a plan for students to actively interact with content to produce new knowledge or artifacts (evidence of learning)?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

7	How well can you identify opportunities to use mobile RLOs to allow students to actively explore alternative learning environments?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
8	Do you find the Collaborative Situated Active Mobile (CSAM) learning design framework useful in helping you to plan for the integration of mobile reusable learning objects (RLOs) into your lesson planning?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
9	Do you feel more comfortable with planning to integrate mobile devices and mobile RLOs into your lesson planning when using the CSAM learning design framework to guide instructional design decisions?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10	Has use of the CSAM learning design framework influenced your plans to use mobile RLOs with your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Open response questions.

1 How has the CSAM learning design framework influenced your plans to use mobile RLOs in your teaching and learning practice?

2 What do you feel are the strong points of the CSAM learning design framework?

3 What do you feel are the weak points of the CSAM learning design framework?

4 What additional guidance (if any) would help you to become more interested in or comfortable with integrating mobile reusable learning objects (RLOs) into your lesson planning?

APPENDIX F: End-of-Course Feedback Survey Questions

Introduction.

Welcome to the Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies End-of-Course Feedback Survey!

Closed response questions.

This questionnaire is designed to help us gain a better understanding of how useful this course was for you, and how we might be able to improve this course for future participants. Please indicate your opinion about each of the statements below. Your answers are confidential. Your responses are confidential, and are not linked to any information that could potentially identify you (such as the email address where you received the link to access this survey).

	General Course Feedback	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree
1	I found this to be a high quality course.	(1)	(2)	(3)	(4)	(5)
2	I would recommend this course to other people.	(1)	(2)	(3)	(4)	(5)
	Feedback About the Instructor / Facilitator	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree
3	The instructor has expert knowledge about the material.	(1)	(2)	(3)	(4)	(5)
4	The instructor prompts a lot of discussion in the course.	(1)	(2)	(3)	(4)	(5)
5	The instructor provides useful feedback.	(1)	(2)	(3)	(4)	(5)
	Questions About the Material	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree
6	The course material was useful and easy to follow.	(1)	(2)	(3)	(4)	(5)
7	A variety of types of material were presented to help me understand course topics (i.e., audio, video, graphics, interactive tools).	(1)	(2)	(3)	(4)	(5)
8	The course activities were useful to my understanding.	(1)	(2)	(3)	(4)	(5)

9	The material covered will help me to integrate mobile learning strategies into my teaching and learning practice.	(1)	(2)	(3)	(4)	(5)
	Questions About the Course LMS	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree
10	The course website was well organized.	(1)	(2)	(3)	(4)	(5)
11	The course website was easy to navigate.	(1)	(2)	(3)	(4)	(5)
12	The course website provided a range of tools for interaction between participants and with the instructor / facilitator.	(1)	(2)	(3)	(4)	(5)

Open response questions.

This questionnaire is designed to help us gain a better understanding of how useful this course was for you, and how we might be able to improve this course for future participants. Please provide answers for about each of the questions below. Your answers are confidential. Your responses are confidential, and are not linked to any information that could potentially identify you (such as the email address where you received the link to access this survey).

13 What did you like best about this course?

14 What would you change about this course?

15 Is there anything else you would like to tell us about your experience in this course?

APPENDIX G: Follow-up Interview Script

Note – the follow-up interview script will use the same open-response questions included for the second and third administrations of the online mTSES survey. An open format will be used during the interview process, and additional questions will be determined as prompted by individual participants' responses.

Open Response Questions

1 How has the CSAM learning design framework influenced your plans to use mobile RLOs in your teaching and learning practice?

2 What do you feel are the strong points of the CSAM learning design framework?

3 What do you feel are the weak points of the CSAM learning design framework?

4 What additional guidance (if any) would help you to become more interested in or comfortable with integrating mobile reusable learning objects (RLOs) into your lesson planning?

APPENDIX H: Research Ethics Approval

Athabasca University
CENTRE FOR DISTANCE EDUCATION

Focused on the future of learning.

Memorandum

DATE:	April 2, 2014
TO:	Mr. Rob Power
COPY:	Dr. Mohamed Ally, (Research Supervisor) Gail Leicht, Research Ethics Officer, Athabasca University Research Ethics Board Dr. Vive Kumar, Chair, Athabasca University Research Ethics Board
FROM:	Dr. Debra Hoven, Acting Chair, CDE Research Ethics Review Committee
SUBJECT:	**Ethics Proposal #CDE-14-01: "A Framework for Promoting Teacher Self-Efficacy with Mobile Reusable Learning Objects"**

Thank you for providing the revised application requested by the Centre for Distance Education (CDE) Research Ethics Review Committee.

I am pleased to advise that this project has now been awarded **APPROVAL TO PROCEED**.

IMPORTANT: AU Institutional Permission: Prior to recruitment, please await receipt of AU Institutional Permission, issued by the Vice-President Academic, enabling access to AU systems and student or staff contact for research purposes.

The AU Research Ethics office will assist in requesting the institutional permission from the Vice-President Academic by forwarding a copy of the final revised/approved ethics application, along with a request on behalf of the researcher.

After you have received institutional permission, you may begin your research immediately.

This approval of your application will be reported to the Athabasca University Research Ethics Board (REB) at their next monthly meeting. The REB retains the right to request further information, or to revoke the interim approval, at any time.

The approval for the study "as presented" is valid for a period of one year from the date of this memo. If required, an extension must be sought in writing prior to the expiry of the existing approval. **A Final Report is to be submitted when the research project is completed.** The reporting form can be found online at http://www.athabascau.ca/research/ethics/ .

As implementation of the proposal progresses, if you need to make any significant changes or modifications, please forward this information immediately to the CDE Research Ethics Review Committee via rebsec@athabascau.ca for further review.

If you have any questions, please do not hesitate to contact the Research Ethics Officer at rebsec@athabascau.ca .

Sincerely,

Debra Hoven, PhD

Centre for Distance Education, Research Ethics Review Committee
(A Sub-Committee of the Athabasca University Research Ethics Board)
1 University Drive, Athabasca, AB, T9S 3A3 Canada
P: 780.675.6179 | Toll-free (CAN/U.S.) 1.800.561.4650 (6179)
mde@athabascau.ca | cde.athabascau.ca | athabascau.ca

APPENDIX I: College of the North Atlantic-Qatar Statement Regarding Local Ethics Review

Wed 1/29/2014 2:09 PM

MacRae, Bruce

RE: Dissertation Research Question

To Power, Robert; Long, Mike

You replied to this message on 1/29/2014 2:11 PM.

Hi guys,

Sorry for the delay, have had my nose buried post HMC meeting today in priorities.

Rob, you do not need to submit an ethical application as the nature of the research is minimal risk intervention, there is no sensitive personal information solicited, the target population is not vulnerable, there are no identifiers on the data solicited and the research may or may not be conducted at CNA-Q (online course, surveys, interviews etc.). The inclusion criteria could just have easily be open to all teachers in Qatar and conducted in their own homes or away from their place of work.

If you run into any snags let me know and you can always apply for an expedited review.

Mike, thanks for providing Rob a letter of support.

COLLEGE OF THE NORTH ATLANTIC QATAR

Bruce MacRae | Clinical Coordinator
School of Health Sciences
Office: 20.1.76c
Phone: +974 4495 2600
Mobile: +974 6667 4482

P. O. Box 24449
Doha, Qatar
www.cna-qatar.com

APPENDIX J: Ohio State University Statement Regarding Local Ethics Review

RE: IRP Applications for Non-OSU Students

Stoddard, Jacob (stoddard.13@osu.edu) Add to contacts 29/01/2014
To: robpower
Cc: Cristol, Dean, Gimbert, Belinda

Hello Rob,

Our office looked through the submission you sent and determined that at this time OSU nor its' personnel are engaged in the research and thus no IRB approval or review would be needed at this time. For this study it appears that OSU is a site and thus it is up to the individual departments and instructors to choose to allow you research access to potential participants. Note: OSU personnel can make students aware of an ongoing study however not encourage study participation as this would them make them engaged as study personnel.

In the future if you and OSU researchers choose to collaborate on a project you will want to contact our office to inquiry if IRB approval is needed.

Thank you

-Jake

Jacob R. Stoddard, BA, CIP
Senior IRB Protocol Analyst
The Ohio State University
Office of Responsible Research Practices
Research Administration Building, 1960 Kenny Road, Rm. 300, Columbus, OH 43210
614-292-0526 Office / 614-688-0366 Fax
stoddard.13@osu.edu www.orrp.osu.edu

APPENDIX K: Institutional Letters of Support

Institutional Permission

gleicht@athabascau.ca Add to contacts 08/04/2014
To: Mr. Rob Power (Principal Investigator)
Cc: Dr. Mohamed Ally (Supervisor), FabbroMark, ParkerNancy, RabinBonnie, gleicht@athabascau.ca

MEMORANDUM
Office of the Vice President Academic

April 08, 2014

TO: Mr. Rob Power, Doctor of Education (EdD) in Distance Education (Athabasca University)

COPY: Dr. Mohamed Ally (Supervisor)
Acting Registrar
Institutional Studies
Office of the Vice President Academic

SUBJECT: Institutional Permission - REB File # 21285

You have been approved to contact Athabasca University staff, students and systems for your research proposal "A Framework for Promoting Teacher Self -Efficacy with Mobile Reusable Learning Objects " subject to the following conditions:

1. Your research proposal has been approved by the Athabasca University Research Ethics Board (AUREB);
2. Staff and student information is used solely for the purpose outlined in the research proposal submitted to the AUREB;
3. Secondary uses of data or subsequent research proposal(s) will require additional approval of the AUREB, permission of the staff or former staff, students or former students and institutional permission if the individual is still an Athabasca University staff or student;
4. Staff and student participants will be provided with information about how information will be represented in documentation, reports and publications;
5. Staff and student information will not be shared with a third party;
6. The nature of communication with staff and students is that outlined in the research proposal submitted to the AUREB;
7. Staff and students demographic information will be used solely within the research project;
8. Documentation such as staff and student responses to questionnaires, interview responses (written or taped), observations of individual staff or student behaviors, etc. will not be used for any purpose other than that outlined in the research proposal submitted to the AUREB;
9. Staff and student information will be kept confidential until it is destroyed after a period not in excess of 10 years;
10. Use of personal information will be in compliance with the **Freedom of Information, Protection of Privacy (FOIP)** legislation of the province of Alberta, Canada.

I wish you every success with your research project.

Dr. Alex Kondra
Acting Vice President Academic

COLLEGE OF THE NORTH ATLANTIC - QATAR

P.O. Box 24449
68 Al Tarafa, Duhail North
Doha, Qatar

T +974 4495 2222
F +974 4495 2200
E info@cna-qatar.edu.qa

January 30, 2014

Research Center
Athabasca University
1 University Drive
Athabasca, AB, T9S 3A3
Canada
Tel: 1-800-788-9041 ext. 6651
Fax: (780) 675-6722
Email: rebsec@athabascau.ca

Dear Athabasca University Research Center,

Robert Power is a student in the Doctor of Education in Distance Education program with the Center for Distance Education, Athabasca University, an Instructional Developer with the Advanced Learning Technologies Center, College of the North Atlantic-Qatar, and a Member-at-Large with the Executive of the International Association for Mobile Learning. He has proposed a doctoral thesis project entitled *A Framework for Promoting Teacher Self-Efficacy with Mobile Reusable Learning Objects*. The study will take place May 2014 to May 2015.

I am aware that his research study involves recruiting employees of College of the North Atlantic-Qatar, and that this study will (1) ask participants to participate in an online professional development course on mobile learning instructional design, (2) complete a series of online surveys, and (3) participate in a follow-up interview session. I am aware that this research study will be conducted online, but that participant recruitment may include the distribution of information letters and flyers to employees by paper and via email at College of the North Atlantic-Qatar.

I understand that all information collected from individuals will be done with informed consent from participating individuals, and that employees of College of the North Atlantic-Qatar can refuse or withdraw from participation at any time with no consequences for said individual. I understand that this research study will undergo ethical review by the Research Center, Athabasca University, prior to the commencement of research activities and request a copy of this review once completed.

CNA-QATAR.COM

COLLEGE OF THE NORTH ATLANTIC QATAR

COLLEGE OF THE NORTH ATLANTIC - QATAR

I support the conduct of this research at College of the North Atlantic-Qatar.

Sincerely,

Michael Long, PhD.
Chair, Office of Applied Research
College of the North Atlantic-Qatar
PO Box 24449
Doha, Qatar
Tel: +974-4495-2236
Email: mike.long@cna-qatar.edu.qa

Cc

Robert Power
Instructional Developer, Advanced Learning Technologies Center
College of the North Atlantic-Qatar
EdD student, Center for Distance Education
Athabasca University
Tel (o): +974-4495-2520
Tel (m): +974-5513-3561
Email (o): robert.power@cna-qatar.edu.qa
Email (h): robpower@hotmail.com

The Ohio State University at Lima

4240 Campus Drive
Lima, OH 45804

January 31, 2014

Robert Power
EdD student, Center for Distance Education
Athabasca University
Tel: +974-5513-3561
Email: robpower@hotmail.com

Research Center
Athabasca University
1 University Drive
Athabasca, AB, T9S 3A3
Canada
Tel: 1-800-788-9041 ext. 6651
Fax: (780) 675-6722
Email: rebsec@athabascau.ca

Dear Athabasca University Research Center,

Robert Power is a student in the Doctor of Education in Distance Education program with the Center for Distance Education, Athabasca University, an Instructional Developer with the Advanced Learning Technologies Center, College of the North Atlantic-Qatar, and a Member-at-Large with the Executive of the International Association for Mobile Learning. He has proposed a doctoral thesis project entitled *A Framework for Promoting Teacher Self-Efficacy with Mobile Reusable Learning Objects*. The study will take place May 2014 to May 2015.

I am aware that his research study involves recruiting employees and students of Ohio State University, and that this study will ask participants to participate in an online professional development course on mobile learning instructional design, complete a series of online surveys, and participate in a follow-up interview session. I am aware that this research study will be conducted online, but that participant recruitment may include the distribution of information letters and flyers to employees and students by paper, via email, and / or the posting of hyperlinks to the course home pages of relevant courses as determined by the Department of Teaching and Learning, College of Education and Human Ecology, the Ohio State University.

I understand that all information collected from individuals will be done with duly informed consent from participating individuals, and that employees and students of the Ohio State University can refuse or withdraw from participation at any time with no consequences for said individual. I understand that this research study will undergo full ethics standards review by the Research Center, Athabasca University, prior to the commencement of research activities.

I support the conduct of this research in the College of Education and Human Ecology, the Ohio State University.

Sincerely,

Dean Cristol

Dean Cristol, PhD.
Associate Professor
Department of Teaching and Learning
College of Education and Human Ecology
The Ohio State University
470-E GA Galvin Hall, 4240 Campus Drive
Lima, OH, 45804
United States of America
Tel: (419) 995-8274
Email: cristol.2@osu.edu

Wed 4/9/2014 8:53 PM

King, Stephanie <stephanie.king@cna.nl.ca>

RE: Question about Site Access for Dissertation Research

To Power, Robert

You replied to this message on 4/9/2014 9:27 PM.
This message is part of a tracked conversation. Click here to find all related messages or to open the original flagged message.

Hi Robert,

After further discussion with my Director, the college will support your research with a subset of Business instructors. Please forward your email, and we'll make sure it is distributed to the appropriate people.

Thanks,
Stephanie

Stephanie King, B.A. (Hons.), MASP
Institutional Research & Planning Development Analyst
Academic Programs & Institutional Research
College of the North Atlantic
69 Pleasant Street
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Interdisciplinary Committee on
Ethics in Human Research (ICEHR)

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ICEHR Number:	**20150017-EX**
Approval Period:	April 11, 2014 – April 30, 2015
Funding Source:	
Responsible Faculty:	Dr. Mohamed Ally Center for Distance Education Athabasca University
Title of Project:	*A Framework for Promoting Teacher Self-Efficacy with Mobile Reusable Learning Objects*

April 11, 2014

ICEHR No. 20150017-EX

Mr. Robert Power
Center for Distance Education
Athabasca University

Dear Mr. Power:

Thank you for your submission to the Interdisciplinary Committee on Ethics in Human Research (ICEHR) with Athabasca University Research Ethics Board approval for your Ph.D. project # CDE-14-01.

The Committee has reviewed the documents and agrees that the proposed project is consistent with the guidelines of the *Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans (TCPS2)*. Full ethics clearance is granted for you to send an email invitation to faculty members and graduate students in the M.Ed. (IT) program at Memorial University of Newfoundland to participate in the online professional development course, surveys, and follow-up interviews with selected online course participants, provided all previously approved protocols are followed.

If you need to make changes during the course of the project, which may raise ethical concerns, please forward an amendment request form with a description of these changes to icehr@mun.ca for the Committee's consideration.

The *TCPS2* requires that you submit an annual update form to ICEHR before April 30, 2015. If you plan to continue the project, you need to request renewal of your ethics clearance, and include a brief summary on the progress of your research. When the project no longer requires contact with human participants, is completed and/or terminated, you need to provide the annual update form with a final brief summary, and your file will be closed.

The annual update form and amendment request form are on the ICEHR website at http://www.mun.ca/research/ethics/humans/icehr/applications/. We wish you success with your research.

Yours sincerely,

M Shute

Michael Shute, Th.D.
Chair, Interdisciplinary Committee on
Ethics in Human Research

MS/th

copy: Supervisor – Dr. Mohamed Ally, Center for Distance Education, Athabasca University

APPENDIX L: Course Syllabus for Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies

Course description.

The aim of this course is to explore the key pedagogical elements of effective instructional design when using mobile technologies to facilitate collaborative learner interactions.

This course provides an overview of the Collaborative Situated Active Mobile (CSAM) learning strategies framework, and provides an opportunity to create your own mobile reusable learning objects (RLOs) using free, online resources. Participants will also engage in reflective practice, using the CSAM framework to reflect on examples of mobile RLOs, as well as RLOs that they construct themselves.

Course objectives.

1.0 Participants will explore their own interest in and self-efficacy with respect to integrating mobile reusable learning objects (RLOs) into their teaching and learning practice.

2.0 Participants will be able to differentiate between mobile RLOs and other forms of mobile accessible learning objects.

- 2.1 Participants will identify the fundamental pedagogical elements of instructional design for collaborative learner interactions facilitated by mobile RLOs (CSAM).
- 2.2 Participants will identify examples of mobile RLOs used to facilitate or enhance collaborative learner interactions.
- 2.3 Participants will identify the key pedagogical elements guiding the instructional design of collaborative learner interactions facilitated by mobile RLOs.

3.0 Participants will identify appropriate learning activities from their own teaching and / or learning practice which could be facilitated or enhanced through the integration of mobile RLOs.

- 3.1 Participants will use appropriate processes to plan the development of a mobile RLO to facilitate appropriate collaborative learner interaction activities for an appropriate topic identified from their own teaching and / or learning practice.

4.0 Participants will use free, online resources to construct a mobile RLO to facilitate or enhance collaborative learner interaction activities for an appropriate topic identified from their own teaching and / or learning practice.

5.0 Participants will use the CSAM learning strategies framework to reflect upon the instructional design decisions for a mobile RLO that they have created.

Course activities.

Activity 1: Welcome Posting
- Complete the Teacher Self-Efficacy Survey
- Post to the Welcome Posting Discussion Forum

Activity 2: CSAM RLO Examples
- Post to the Module 2 Discussion Forum, discussing the CSAM elements of examples of collaborative learning RLOs, and providing a new example of an RLO used to facilitate collaborative learner interactions

Activity 3: Planning to Use Mobile RLOs
- Part A: Post to the Module 3 Discussion Forum, and identify examples of appropriate topics from their own teaching and / or learning context for which mobile RLOs could be used to facilitate or enhance collaborative learner interaction.
  - Include an overview of the pedagogical elements that would guide the development of one personal RLO, using the CSAM framework.
- Part B: Create a plan for the production of a CSAM mobile RLO for a topic selected by each participant, including:
  - Content scripting
  - Storyboarding
  - List of required resources (including multimedia elements)
- Part C: Post your plan to the Module 3 Discussion Forum, either as a detailed post, or as a link to an external blog containing your detailed plan.
- Part D: Read at least two (2) other participants’ RLO plans, and provide feedback using the CSAM framework.

Activity 4: Build Your Own RLO
- Build a mobile RLO using *Winksite*™
- Post a link to the RLO in the Module 4 Discussion Forum, and share the automatically generated Quick Response (QR) Code to access the RLO

Activity 5: Reflective Practice
- View (work through) at least two (2) other participants’ RLO projects.
  - Provide feedback using the CSAM framework (by posting a response to the participant(s) in the Module 4 Discussion Forum).
- Post a reflection on your own RLO projects using the CSAM framework, and the feedback provided by other participants.
- Re-take the Teacher Self-Efficacy Survey

- Post to the Module 5 Discussion Forum, reflecting on the self-efficacy survey results.
    - Include a discussion of any changes from the results of the first survey

APPENDIX M: The Quality Matters Rubric General Standards and Specific Sub-Standards

Standard	Required	Description	Point Value
1.1	Yes	Instructions make clear how to get started and where to find various course components.	3
1.2	Yes	Students are introduced to the purpose and structure of the course.	3
1.3		Etiquette expectations (sometimes called “netiquette”) for online discussions, email, and other forms of communication are stated clearly.	2
1.4		Course and/or institutional policies with which the student is expected to comply are clearly stated, or a link to current policies is provided.	2
1.5		Prerequisite knowledge in the discipline and/or any required competencies are clearly stated.	1
1.6		Minimum technical skills expected of the student are clearly stated.	1
1.7		The self-introduction by the instructor is appropriate and is available online.	1
1.8		Students are asked to introduce themselves to the class.	1
2.1	Yes	The course learning objectives describe outcomes that are measurable.	3
2.2	Yes	The module/unit learning objectives describe outcomes that are measurable and consistent with the course-level objectives.	3
2.3	Yes	All learning objectives are stated clearly and written from the student’s perspective.	3
2.4	Yes	Instructions to students on how to meet the learning objectives are adequate and stated clearly.	3
2.5	Yes	The learning objectives are appropriately designed for the level of the course.	3
3.1	Yes	The types of assessments selected measure the stated learning objectives and are consistent with course activities and resources.	3
3.2	Yes	The course grading policy is stated clearly.	3
3.3	Yes	Specific and descriptive criteria are provided for the evaluation of students’ work and participation and are tied to the course grading policy.	3
3.4		The assessment instruments selected are sequenced, varied, and appropriate to the student work being assessed.	2
3.5		Students have multiple opportunities to measure their	2

		own learning progress.	
4.1	Yes	The instructional materials contribute to the achievement of the stated course and module/unit learning objectives.	3
4.2	Yes	The purpose of instructional materials and how the materials are to be used for learning activities are clearly explained.	3
4.3		All resources and materials used in the course are appropriately cited.	2
4.4		The instructional materials are current.	2
4.5		The instructional materials present a variety of perspectives on the course content.	1
4.6		The distinction between required and optional materials is clearly explained.	1
5.1	Yes	The learning activities promote the achievement of the stated learning objectives.	3
5.2	Yes	Learning activities provide opportunities for interaction that support active learning.	3
5.3	Yes	The instructor’s plan for classroom response time and feedback on assignments is clearly stated.	3
5.4		The requirements for student interaction are clearly articulated.	2
6.1	Yes	The tools and media support the course learning objectives.	3
6.2	Yes	Course tools and media support student engagement and guide the student to become an active learner.	3
6.3	Yes	Navigation throughout the online components of the course is logical, consistent, and efficient.	3
6.4		Students can readily access the technologies required in the course.	2
6.5		The course technologies are current.	1
7.1	Yes	The course instructions articulate or link to a clear description of the technical support offered and how to access it.	3
7.2	Yes	Course instructions articulate or link to the institution’s accessibility policies and services.	3
7.3		Course instructions articulate or link to an explanation of how the institution’s academic support services and resources can help students succeed in the course and how students can access the services.	2
7.4		Course instructions articulate or link to an explanation of how the institution’s student support services can help students succeed and how students can access the services.	1

8.1	Yes	The course employs accessible technologies and provides guidance on how to obtain accommodation.	3
8.2		The course contains equivalent alternatives to auditory and visual content.	2
8.3		The course design facilitates readability and minimizes distractions.	2
8.4		The course design accommodates the use of assistive technologies.	2

APPENDIX N: Self and Peer-Review Results for the Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Course Using the Quality Matters Rubric

Self-review results.

Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM)

General Standard 1: The overall design of the course is made clear to the student at the beginning of the course..
The course introduction sets the tone for the course, lets students know what to expect, and provides guidance to ensure they get off to a good start.

STANDARD 1.1 - (3 Points) Required
1.1 Instructions make clear how to get started and where to find various course components.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Via course homepage

STANDARD 1.2 - (3 Points) Required
1.2 Students are introduced to the purpose and structure of the course.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Course Homepage
Syllabus page

STANDARD 1.3 - (2 Points)
1.3 Etiquette expectations (sometimes called “netiquette”) for online discussions, email, and other forms of communication are stated clearly.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
Course Accessibility and Participation page

STANDARD 1.4 - (2 Points)
1.4 Course and/or institutional policies with which the student is expected to comply are clearly stated, or a link to current policies is provided.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
Institutional policies not applicable in this context.

STANDARD 1.5 - (1 Point)
1.5 Prerequisite knowledge in the discipline and/or any required competencies are clearly stated.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET

Recommendations:
Course Accessibility and Participation page

STANDARD 1.6 - (1 Point)
1.6 Minimum technical skills expected of the student are clearly stated.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
Course Accessibility and Participation page

STANDARD 1.7 - (1 Point)
1.7 The self-introduction by the instructor is appropriate and is available online.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
Audio welcome message
Link to instructor's personal profile site
Dissertation Research Project Information page

STANDARD 1.8 - (1 Point)
1.8 Students are asked to introduce themselves to the class.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
Welcome Forum discussion posting

General Standard 2: Learning objectives are measurable and are clearly stated..
The learning objectives establish a foundation upon which the rest of the course is based.

STANDARD 2.1 - (3 Points) Required
2.1 The course learning objectives describe outcomes that are measurable.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Syllabus page

STANDARD 2.2 - (3 Points) Required
2.2 The module/unit learning objectives describe outcomes that are measurable and consistent with the course-level objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Landing page for each course module

STANDARD 2.3 - (3 Points) Required
2.3 All learning objectives are stated clearly and written from the student's perspective.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Syllabus

Landing page for each course module

STANDARD 2.4 - (3 Points) Required
2.4 Instructions to students on how to meet the learning objectives are adequate and stated clearly.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Course Homepage
Syllabus
Course Accessibility and Participation Page
Landing page for each module
"Activities" overview pages within each module
Within Discussion Forum headers

STANDARD 2.5 - (3 Points) Required
2.5 The learning objectives are appropriately designed for the level of the course.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

General Standard 3: Assessment strategies are designed to evaluate student progress by reference to stated learning objectives; to measure the effectiveness of student learning; and to be integral to the learning process..
Assessment is implemented in a manner that not only allows the instructor a broad perspective on the students' mastery of the content, but also allows students to measure their own learning throughout the course.

STANDARD 3.1 - (3 Points) Required
3.1 The types of assessments selected measure the stated learning objectives and are consistent with course activities and resources.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Assessment is done on a self-assessment basis, using the mTSES survey instrument and discussion postings to encourage reflective practice, along with peer-feedback in the course discussion forums.

STANDARD 3.2 - (3 Points) Required
3.2 The course grading policy is stated clearly.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
This course is not graded.
Assessment is handled via participant self-assessment and reflective practice.

STANDARD 3.3 - (3 Points) Required
3.3 Specific and descriptive criteria are provided for the evaluation of students' work and participation and are tied to the course grading policy.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

Recommendations:
N/A

STANDARD 3.4 - (2 Points)
3.4 The assessment instruments selected are sequenced, varied, and appropriate to the student work being assessed.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
mTSES Survey Instrument.
Discussion forum postings.
Posting of a detailed instructional development plan for a mobile RLO.
Construction of mobile RLOs and posting of links within the course.

STANDARD 3.5 - (2 Points)
3.5 Students have multiple opportunities to measure their own learning progress.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
mTSES survey instruments (pre and post-learning administrations, with feedback emailed to participants)
Discussion forum postings with reflective practice exercises and peer-feedback

General Standard 4: Instructional materials are sufficiently comprehensive to achieve stated course objectives and learning outcomes..
The instructional materials form the core of the course, and these standards respect the instructor's prerogative in selecting them. The focus of this standard is on supporting the course objectives and competencies, rather than on qualitative judgments about the materials.

STANDARD 4.1 - (3 Points) Required
4.1 The instructional materials contribute to the achievement of the stated course and module/unit learning objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 4.2 - (3 Points) Required
4.2 The purpose of instructional materials and how the materials are to be used for learning activities are clearly explained.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 4.3 - (2 Points)
4.3 All resources and materials used in the course are appropriately cited.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
APA format in-text citations
References in footnotes of each relevant course page
Master Course References page

STANDARD 4.4 - (2 Points)
4.4 The instructional materials are current.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 4.5 - (1 Point)
4.5 The instructional materials present a variety of perspectives on the course content.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET

STANDARD 4.6 - (1 Point)
4.6 The distinction between required and optional materials is clearly explained.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
Clear statement that participation in the related research study is voluntary, and optional resources are provided so that course participants who are not participating in the research project can meet the module objectives.

General Standard 5: Forms of interaction incorporated in the course motivate students and promote learning..
Engaging students to become active learners contributes to the learning process and to student persistence.

STANDARD 5.1 - (3 Points) Required
5.1 The learning activities promote the achievement of the stated learning objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 5.2 - (3 Points) Required
5.2 Learning activities provide opportunities for interaction that support active learning.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Course discussion forums with reflective practice exercises and peer-feedback
Posting of instructional design plans with peer-feedback
Posting of links to completed RLOs, with reflective practice exercises and peer-feedback

STANDARD 5.3 - (3 Points) Required
5.3 The instructor’s plan for classroom response time and feedback on assignments is clearly stated.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Course Accessibility and Participation page

STANDARD 5.4 - (2 Points)
5.4 The requirements for student interaction are clearly articulated.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:

Course homepage
Course Accessibility and Participation page

General Standard 6: Course navigation and technology support student engagement and ensure access to course components..
The technology enabling the various course components facilitates the student's learning experience and is easy to use, rather than impeding the student's progress.

STANDARD 6.1 - (3 Points) Required
6.1 The tools and media support the course learning objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 6.2 - (3 Points) Required
6.2 Course tools and media support student engagement and guide the student to become an active learner.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 6.3 - (3 Points) Required
6.3 Navigation throughout the online components of the course is logical, consistent, and efficient.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 6.4 - (2 Points)
6.4 Students can readily access the technologies required in the course.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 6.5 - (1 Point)
6.5 The course technologies are current.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET

General Standard 7: The course facilitates student access to institutional support services essential to student success..
In the learner support standard, four different kinds of support services are addressed: technical support, accessibility support, academic services support, and student services support.

STANDARD 7.1 - (3 Points) Required
7.1 The course instructions articulate or link to a clear description of the technical support offered and how to access it.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Institutional support n/a in this context, as this is an open, online course not affiliated with a specific institution
Availability of technical support through the course LMS "Canvas Guides" explained and linked under the Course Accessibility and Participation page

STANDARD 7.2 - (3 Points) Required
7.2 Course instructions articulate or link to the institution's accessibility policies and services.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Institutional policies n/a in this context, as this is an open, online course not affiliated with a specific institution
Accessibility policies and services available through the course LMS "Canvas Guides" explained and linked under the Course Accessibility and Participation page

STANDARD 7.3 - (2 Points)
7.3 Course instructions articulate or link to an explanation of how the institution's academic support services and resources can help students succeed in the course and how students can access the services.
Points Possible: 2 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
Institutional support n/a in this context, as this is an open, online course not affiliated with a specific institution

STANDARD 7.4 - (1 Point)
7.4 Course instructions articulate or link to an explanation of how the institution's student support services can help students succeed and how students can access the services.
Points Possible: 1 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
Institutional support n/a in this context, as this is an open, online course not affiliated with a specific institution

General Standard 8: The course demonstrates a commitment to accessibility for all students..
The accessibility standard incorporates the principles of Universal Design for Learning (UDL) and is consistent with Web Content Accessibility Guidelines (WCAG).

STANDARD 8.1 - (3 Points) Required
8.1 The course employs accessible technologies and provides guidance on how to obtain accommodation.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Accessibility policies and services available through the course LMS "Canvas Guides" explained and linked under the Course Accessibility and
Participation page

STANDARD 8.2 - (2 Points)
8.2 The course contains equivalent alternatives to auditory and visual content.

Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
Text-based explanations are provided for all multimedia elements within the course

STANDARD 8.3 - (2 Points)
8.3 The course design facilitates readability and minimizes distractions.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 8.4 - (2 Points)
8.4 The course design accommodates the use of assistive technologies.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
Browser access allows for enlargement of text, changing to a high-contrast display, and the use of screen reader tools.

TOTAL POINTS AWARDED: 92
FINAL RESULT: MET STANDARDS

Results from peer-reviewer #1.

Creating Mobile Reusable Learning Objects

General Standard 1: The overall design of the course is made clear to the student at the beginning of the course..
The course introduction sets the tone for the course, lets students know what to expect, and provides guidance to ensure they get off to a good start.

STANDARD 1.1 - (3 Points) Required
1.1 Instructions make clear how to get started and where to find various course components.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
The audio clip is a very good added value.

STANDARD 1.2 - (3 Points) Required
1.2 Students are introduced to the purpose and structure of the course.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 1.3 - (2 Points)
1.3 Etiquette expectations (sometimes called “netiquette”) for online discussions, email, and other forms of communication are stated clearly.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 1.4 - (2 Points)
1.4 Course and/or institutional policies with which the student is expected to comply are clearly stated, or a link to current policies is provided.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 1.5 - (1 Point)
1.5 Prerequisite knowledge in the discipline and/or any required competencies are clearly stated.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
Stated under "Minimum Technical Skills"

STANDARD 1.6 - (1 Point)
1.6 Minimum technical skills expected of the student are clearly stated.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET

STANDARD 1.7 - (1 Point)
1.7 The self-introduction by the instructor is appropriate and is available online.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
Well done.

STANDARD 1.8 - (1 Point)
1.8 Students are asked to introduce themselves to the class.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET

General Standard 2: Learning objectives are measurable and are clearly stated..
The learning objectives establish a foundation upon which the rest of the course is based.

STANDARD 2.1 - (3 Points) Required
2.1 The course learning objectives describe outcomes that are measurable.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 2.2 - (3 Points) Required
2.2 The module/unit learning objectives describe outcomes that are measurable and consistent with the course-level objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Good interactivity (student-to-student, student-to-instructor, and student-to-content.

STANDARD 2.3 - (3 Points) Required
2.3 All learning objectives are stated clearly and written from the student's perspective.
Points Possible: 3 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
Should be written from the student' perspective (QM standard 2.3). For example, instead of saying "Participants will..." say "You will ...."

STANDARD 2.4 - (3 Points) Required
2.4 Instructions to students on how to meet the learning objectives are adequate and stated clearly.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 2.5 - (3 Points) Required
2.5 The learning objectives are appropriately designed for the level of the course.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
General Standard 3: Assessment strategies are designed to evaluate student progress by reference to stated learning objectives; to measure the effectiveness of student learning; and to be integral to the learning process..
Assessment is implemented in a manner that not only allows the instructor a broad perspective on the students' mastery of the content, but also allows students to measure their own learning throughout the course.

STANDARD 3.1 - (3 Points) Required
3.1 The types of assessments selected measure the stated learning objectives and are consistent with course activities and resources.

Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 3.2 - (3 Points) Required
3.2 The course grading policy is stated clearly.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 3.3 - (3 Points) Required
3.3 Specific and descriptive criteria are provided for the evaluation of students' work and participation and are tied to the course grading policy.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 3.4 - (2 Points)
3.4 The assessment instruments selected are sequenced, varied, and appropriate to the student work being assessed.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 3.5 - (2 Points)
3.5 Students have multiple opportunities to measure their own learning progress.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
General Standard 4: Instructional materials are sufficiently comprehensive to achieve stated course objectives and learning outcomes..
The instructional materials form the core of the course, and these standards respect the instructor's prerogative in selecting them. The focus of this standard is on supporting the course objectives and competencies, rather than on qualitative judgments about the materials.

STANDARD 4.1 - (3 Points) Required
4.1 The instructional materials contribute to the achievement of the stated course and module/unit learning objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 4.2 - (3 Points) Required
4.2 The purpose of instructional materials and how the materials are to be used for learning activities are clearly explained.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 4.3 - (2 Points)
4.3 All resources and materials used in the course are appropriately cited.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 4.4 - (2 Points)
4.4 The instructional materials are current.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 4.5 - (1 Point)
4.5 The instructional materials present a variety of perspectives on the course content.

Points Possible: 1 **Points Awarded:** 1 **Result:** MET

STANDARD 4.6 - (1 Point)
4.6 The distinction between required and optional materials is clearly explained.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET

General Standard 5: Forms of interaction incorporated in the course motivate students and promote learning..
Engaging students to become active learners contributes to the learning process and to student persistence.

STANDARD 5.1 - (3 Points) Required
5.1 The learning activities promote the achievement of the stated learning objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 5.2 - (3 Points) Required
5.2 Learning activities provide opportunities for interaction that support active learning.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 5.3 - (3 Points) Required
5.3 The instructor's plan for classroom response time and feedback on assignments is clearly stated.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Within 24 hours

STANDARD 5.4 - (2 Points)
5.4 The requirements for student interaction are clearly articulated.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

General Standard 6: Course navigation and technology support student engagement and ensure access to course components..
The technology enabling the various course components facilitates the student's learning experience and is easy to use, rather than impeding the student's progress.

STANDARD 6.1 - (3 Points) Required
6.1 The tools and media support the course learning objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 6.2 - (3 Points) Required
6.2 Course tools and media support student engagement and guide the student to become an active learner.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 6.3 - (3 Points) Required
6.3 Navigation throughout the online components of the course is logical, consistent, and efficient.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 6.4 - (2 Points)
6.4 Students can readily access the technologies required in the course.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 6.5 - (1 Point)
6.5 The course technologies are current.
Points Possible: 1 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
Some videos not displaying on the content pages. The YouTube page displays "This video is currently unavailable.".

General Standard 7: The course facilitates student access to institutional support services essential to student success..
In the learner support standard, four different kinds of support services are addressed: technical support, accessibility support, academic services support, and student services support.

STANDARD 7.1 - (3 Points) Required
7.1 The course instructions articulate or link to a clear description of the technical support offered and how to access it.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 7.2 - (3 Points) Required
7.2 Course instructions articulate or link to the institution's accessibility policies and services.
Points Possible: 3 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
It is not possible to provide specific support for special accessibility requirements, and this is stated in the course. This course is being offered independent of a formal educational institution.

STANDARD 7.3 - (2 Points)
7.3 Course instructions articulate or link to an explanation of how the institution's academic support services and resources can help students succeed in the course and how students can access the services.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 7.4 - (1 Point)
7.4 Course instructions articulate or link to an explanation of how the institution's student support services can help students succeed and how students can access the services.

Points Possible: 1 **Points Awarded:** 1 **Result:** MET

General Standard 8: The course demonstrates a commitment to accessibility for all students..
The accessibility standard incorporates the principles of Universal Design for Learning (UDL) and is consistent with Web Content Accessibility Guidelines (WCAG).

STANDARD 8.1 - (3 Points) Required
8.1 The course employs accessible technologies and provides guidance on how to obtain accommodation.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 8.2 - (2 Points)
8.2 The course contains equivalent alternatives to auditory and visual content.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 8.3 - (2 Points)
8.3 The course design facilitates readability and minimizes distractions.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 8.4 - (2 Points)
8.4 The course design accommodates the use of assistive technologies.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

TOTAL POINTS AWARDED: 88
FINAL RESULT: DID NOT MEET STANDARDS

Results from peer reviewers 2 and 3.

Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning

General Standard 1: The overall design of the course is made clear to the student at the beginning of the course..
The course introduction sets the tone for the course, lets students know what to expect, and provides guidance to ensure they get off to a good start.

STANDARD 1.1 - (3 Points) Required
1.1 Instructions make clear how to get started and where to find various course components.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
The Getting Started section on the front page provides new users with directions on how to commence the course.

STANDARD 1.2 - (3 Points) Required
1.2 Students are introduced to the purpose and structure of the course.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
The course description section followed by the Information list below are evidence of this.

STANDARD 1.3 - (2 Points)
1.3 Etiquette expectations (sometimes called “netiquette”) for online discussions, email, and other forms of communication are stated clearly.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
The Netiquette section on this course could be expanded to provide more details and or examples of behavior. As well, consider placing a netiquette icon in a more prominent position on the course front page.

STANDARD 1.4 - (2 Points)
1.4 Course and/or institutional policies with which the student is expected to comply are clearly stated, or a link to current policies is provided.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
Course policies are clearly outlined for the students to read. It seems that this course is not affiliated with a specific institution and is a non credit offering. Therefore we feel that institutional polices do no apply to this course.

STANDARD 1.5 - (1 Point)
1.5 Prerequisite knowledge in the discipline and/or any required competencies are clearly stated.

Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
Yes, in the Course accessibility and Participation section.

STANDARD 1.6 - (1 Point)
1.6 Minimum technical skills expected of the student are clearly stated.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
Yes, in the Course accessibility and Participation section. The section is called, minimal technical skills.

STANDARD 1.7 - (1 Point)
1.7 The self-introduction by the instructor is appropriate and is available online.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
A full e-portfolio is with comprehensive descriptions is available for the students. We appreciated the links to his social media information as well.

STANDARD 1.8 - (1 Point)
1.8 Students are asked to introduce themselves to the class.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
In the Welcome Discussion Forum students are encouraged to introduce themselves.

General Standard 2: Learning objectives are measurable and are clearly stated..
The learning objectives establish a foundation upon which the rest of the course is based.

STANDARD 2.1 - (3 Points) Required
2.1 The course learning objectives describe outcomes that are measurable.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 2.2 - (3 Points) Required
2.2 The module/unit learning objectives describe outcomes that are measurable and consistent with the course-level objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 2.3 - (3 Points) Required
2.3 All learning objectives are stated clearly and written from the student's perspective.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 2.4 - (3 Points) Required
2.4 Instructions to students on how to meet the learning objectives are adequate and stated clearly.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 2.5 - (3 Points) Required
2.5 The learning objectives are appropriately designed for the level of the course.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

General Standard 3: Assessment strategies are designed to evaluate student progress by reference to stated learning objectives; to measure the effectiveness of student learning; and to be integral to the learning process..
Assessment is implemented in a manner that not only allows the instructor a broad perspective on the students' mastery of the content, but also allows students to measure their own learning throughout the course.

STANDARD 3.1 - (3 Points) Required
3.1 The types of assessments selected measure the stated learning objectives and are consistent with course activities and resources.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 3.2 - (3 Points) Required
3.2 The course grading policy is stated clearly.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
This is a non-graded, non-credit course so this is not a factor with this course.

STANDARD 3.3 - (3 Points) Required
3.3 Specific and descriptive criteria are provided for the evaluation of students' work and participation and are tied to the course grading policy.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
This is a non-graded, non-credit course so this is not a factor with this course.

STANDARD 3.4 - (2 Points)
3.4 The assessment instruments selected are sequenced, varied, and appropriate to the student work being assessed.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
This is a non-graded, non-credit course so this is not a factor with this course.

STANDARD 3.5 - (2 Points)
3.5 Students have multiple opportunities to measure their own learning progress.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
Students are encouraged to participate in discussions, post different aspects of the project, surveys and a reflective activity.

General Standard 4: Instructional materials are sufficiently comprehensive to achieve stated course objectives and learning outcomes..

The instructional materials form the core of the course, and these standards respect the instructor's prerogative in selecting them. The focus of this standard is on supporting the course objectives and competencies, rather than on qualitative judgments about the materials.

STANDARD 4.1 - (3 Points) Required
4.1 The instructional materials contribute to the achievement of the stated course and module/unit learning objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 4.2 - (3 Points) Required
4.2 The purpose of instructional materials and how the materials are to be used for learning activities are clearly explained.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Instructions are clear and concise.

STANDARD 4.3 - (2 Points)
4.3 All resources and materials used in the course are appropriately cited.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
Course references cite a multitude of resources.

STANDARD 4.4 - (2 Points)
4.4 The instructional materials are current.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
The primary example of this is *WinkSite*!

STANDARD 4.5 - (1 Point)
4.5 The instructional materials present a variety of perspectives on the course content.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
Planning, storyboarding, building and testing are all aspects of this course.

STANDARD 4.6 - (1 Point)
4.6 The distinction between required and optional materials is clearly explained.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET
Recommendations:
It does not seem that there are any optional events in this course.

General Standard 5: Forms of interaction incorporated in the course motivate students and promote learning..

Engaging students to become active learners contributes to the learning process and to student persistence.

STANDARD 5.1 - (3 Points) Required
5.1 The learning activities promote the achievement of the stated learning objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 5.2 - (3 Points) Required
5.2 Learning activities provide opportunities for interaction that support active learning.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
Story boarding, discussions, building an object and reviewing peer projects is evidence of this.

STANDARD 5.3 - (3 Points) Required
5.3 The instructor's plan for classroom response time and feedback on assignments is clearly stated.
Points Possible: 3 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
We could not locate any specific statement of this sort. The nature of this course may not require this as there are no real "for grades" assessments present.

STANDARD 5.4 - (2 Points)
5.4 The requirements for student interaction are clearly articulated.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

General Standard 6: Course navigation and technology support student engagement and ensure access to course components..
The technology enabling the various course components facilitates the student's learning experience and is easy to use, rather than impeding the student's progress.

STANDARD 6.1 - (3 Points) Required
6.1 The tools and media support the course learning objectives.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 6.2 - (3 Points) Required
6.2 Course tools and media support student engagement and guide the student to become an active learner.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 6.3 - (3 Points) Required
6.3 Navigation throughout the online components of the course is logical, consistent, and efficient.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET

STANDARD 6.4 - (2 Points)
6.4 Students can readily access the technologies required in the course.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET

STANDARD 6.5 - (1 Point)
6.5 The course technologies are current.
Points Possible: 1 **Points Awarded:** 1 **Result:** MET

General Standard 7: The course facilitates student access to institutional support services essential to student success..
In the learner support standard, four different kinds of support services are addressed: technical support, accessibility support, academic services support, and student services support.

STANDARD 7.1 - (3 Points) Required
7.1 The course instructions articulate or link to a clear description of the technical support offered and how to access it.
Points Possible: 3 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
As this course is not affiliated with an institution, it does not have a support service. We could not see any evidence during our review.

STANDARD 7.2 - (3 Points) Required
7.2 Course instructions articulate or link to the institution's accessibility policies and services.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
There is accessibility information.

STANDARD 7.3 - (2 Points)
7.3 Course instructions articulate or link to an explanation of how the institution's academic support services and resources can help students succeed in the course and how students can access the services.
Points Possible: 2 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
This course is not associated with a student success department.

STANDARD 7.4 - (1 Point)
7.4 Course instructions articulate or link to an explanation of how the institution's student support services can help students succeed and how students can access the services.
Points Possible: 1 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
This course is not associated with a student success department.

General Standard 8: The course demonstrates a commitment to accessibility for all students..
The accessibility standard incorporates the principles of Universal Design for Learning (UDL) and is consistent with Web Content Accessibility Guidelines (WCAG).

STANDARD 8.1 - (3 Points) Required
8.1 The course employs accessible technologies and provides guidance on how to obtain accommodation.
Points Possible: 3 **Points Awarded:** 3 **Result:** MET
Recommendations:
This course is not associated with an institution but students are directed to the canvas accessibility area.

STANDARD 8.2 - (2 Points)
8.2 The course contains equivalent alternatives to auditory and visual content.
Points Possible: 2 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
On images, viewed on a Mac, we could not see ALT tag content for text readers.

STANDARD 8.3 - (2 Points)
8.3 The course design facilitates readability and minimizes distractions.
Points Possible: 2 **Points Awarded:** 2 **Result:** MET
Recommendations:
Clean design and good choice of colour schemes and fonts for readability.

STANDARD 8.4 - (2 Points)
8.4 The course design accommodates the use of assistive technologies.
Points Possible: 2 **Points Awarded:** 0 **Result:** NOT MET
Recommendations:
We could not see evidence of this.

TOTAL POINTS AWARDED: 82
FINAL RESULT: DID NOT MEET STANDARDS

APPENDIX O: Detailed Summary of the Meta-Analysis of Mobile RLO Case Studies

Publication	Year	Art / Chap	# of RLO Cases	# Collab	# Sit	# Act	# Mob	Case Ratio	Collab Ratio	# of CSAM	100% CSAM	75% CSAM	50% CSAM	25% CSAM
Ally (2009)	2009	13	3	2	1	3	3	0.23	0.67	1	0.50	1.00	1.00	1.00
IJMBL v1	2009	19	7	7	5	7	7	0.37	1.00	5	0.71	1.00	1.00	1.00
IJMBL v2	2010	17	7	7	7	7	7	0.41	1.00	7	1.00	1.00	1.00	1.00
IJMBL v3	2011	20	9	6	7	9	9	0.45	0.67	6	1.00	0.77	1.00	1.00
mLearn 2011 (Beijing Normal University, 2011)	2011	84	17	14	15	17	17	0.20	0.82	14	1.00	0.88	1.00	1.00
Traxler & Wishart (2011)	2011	5	4	4	4	4	4	0.80	1.00	4	1.00	1.00	1.00	1.00
IJMBL v4	2012	18	6	4	5	6	6	0.33	0.67	4	1.00	0.83	1.00	1.00
mLearn 2012 (Specht et al., 2012)	2012	62	12	9	12	12	12	0.19	0.75	9	1.00	1.00	1.00	1.00
Berge & Muilenburge, 2013	2013	53	3	3	3	3	3	0.06	1.00	3	1.00	1.00	1.00	1.00
IJMBL v5	2013	19	19	16	17	19	19	1.00	0.84	16	1.00	0.89	1.00	1.00
mLearn 2013 (Power, 2013e)	2013	41	8	8	7	8	8	0.20	1.00	7	0.88	1.00	1.00	1.00
mLearn Gulf (Palfreyman, 2013a)	2013	21	5	5	5	5	5	0.24	1.00	5	1.00	1.00	1.00	1.00
Ally & Tsinakos (2014)	2014	16	4	4	4	4	4	0.25	1.00	4	1.00	1.00	1.00	1.00
McConatha et al., 2014	2014	15	3	3	3	3	3	0.20	1.00	3	1.00	1.00	1.00	1.00
TOTALS		**403**	**107**	**92**	**95**	**107**	**107**	**0.27**	**0.86**	**88**	**0.96**	**0.96**	**1.00**	**1.00**

APPENDIX P: List of Primary and Simultaneous Codes Used for the Qualitative Survey and Interview Transcript Analyses

Primary and Simultaneous Codes for the Qualitative Survey and Interview Transcript Analyses

Primary Codes		Simultaneous Codes	
Code	Description	Code	Description
100	FRAMEWORK STRENGTHS	100	FRAMEWORK STRENGTHS
200	FRAMEWORK WEAKNESSES	101	Simplicity / Clarity
300	COURSE STRENGTHS	102	Ease of use
400	COURSE WEAKNESSES	103	Comprehensive
500	SELF-EFFICACY	104	Balanced
600	INTEREST	105	Guidance
700	OTHER BARRIERS	106	Usefulness
800	OTHER SUPPORTS	200	FRAMEWORK WEAKNESSES
		201	Too advanced
		202	Too prescriptive
		203	Not generalized (to all situations)
		204	Personal Objectivity (during reflective practice)
		205	Further explanation of the different CSAM elements
		206	Too narrow in scope
		300	COURSE STRENGTHS
		301	Content and organization
		302	Length
		303	Multiple learning resources
		304	Practical learning activities
		305	Interaction / Feedback
		400	COURSE WEAKNESSES
		401	Acronyms
		402	Development tools (ie *Winksite*™)
		403	Length (more time needed)
		404	Lack of synchronous interaction
		405	No opportunity to test / redevelop RLO projects
		500	SELF-EFFICACY
		501	More confident
		502	Less confident
		600	INTEREST
		601	Will definitely use mRLOs

	602	Likely to use mRLOs
	603	May use mRLOs if appropriate opportunity arises
	604	Not sure how mRLOs could be used in personal context
	605	Not likely to use mRLOs
	700	OTHER BARRIERS
	701	Developmental Resources (time, money, etc…)
	702	Personal perceptions
	703	Lack of institutional interest
	704	Negative institutional perceptions
	705	Lack of technology (student / teacher devices)
	706	Lack of professional experience/background
	707	Lack of teacher interest
	800	OTHER SUPPORTS
	801	Opportunity to experience mRLOs as a student
	802	Formal or informal institutional support
	803	Face-to-Face training
	804	Practicum (opportunity to build and test)
	805	Informal community of practitioners

APPENDIX Q: Interview Transcripts

The following are the uncoded transcripts of the follow-up interview sessions conducted with five volunteer participants from the Creating Mobile Reusable Learning Objects Using Collaborative Situated Active Mobile (CSAM) Learning Strategies professional development course. All interview sessions began with a reading by the researcher of the script of the Participant Information Letter (APPENDIX B). The text of the Participant Information Letter has been omitted from the interview transcripts. All transcripts represent the actual words spoken by the researcher and the interviewee during the recorded interview session. The contents of the transcripts have been member-verified by actual participants. All interview participants have confirmed the accuracy of the transcript documents.

Follow-up interview transcript ID CSAM001.

Date of Interview: June 4, 2013
Date of Transcription: June 20, 2014

Researcher: Information Letter (Read to Participants at Beginning of Session)

Researcher: Before we begin, do you have any initial comments about your experience in the professional development course, of about the CSAM learning design framework?

Participant: Thanks for an interesting experience. In the course. Liked it.

Researcher: How has the CSAM learning design framework influenced your plans to use mobile RLOs in your teaching and learning practice?

Participant: Well, I've been thinking about this, because you did provide me with the questions in advance, so I sort of thought about this and . . . I don't think it's influenced my plans in a direct way. Like, I would like to use mobile learning objects, reusable learning objects, but, in practical terms, I'm limited what I can do in my current working environment. So it's not the, not the CSAM Framework that's influencing here. It's my context. So it has influenced the way I think about what I do, but not about what I am actually doing. Do you know what I mean? Does that make sense?

Researcher: What do you feel are the strong points of the CSAM learning design framework?

Participant: It's simple. It's clear. It's practical. It's useful. It's pedagogically sound. Like, not in any hierarchical order there, but, I like it. In some ways it's a good starting point when you're thinking about either developing a reusable learning object or in trying to evaluate one that you already know about. So I think it's got a lot of good things about it. I like it.

Researcher: What do you feel are the weak points of the CSAM learning design framework?

Participant: I don't think the framework itself has any weak points, but it lacks things that I would like to see that are beyond its scope, if you know what I mean. Like, I think, it doesn't include things like, what's the. . . institution that you work for, what's their capacity to support the use of mobile learning? What's the students' familiarity with that? What skills do the teachers already have? There are a lot of things that are beyond the scope that still have to be considered and that's not a problem with the framework. It's just that the framework has a limited scope, and there are many other things that have to be considered.

Researcher: What additional guidance (if any) would help you to become more interested in or comfortable with integrating mobile reusable learning objects (RLOs) into your lesson planning?

Participant: Oh, I think I would need more opportunities to create more learning objects that I could try and test and get a reaction from students and actually apply in a classroom, in a real context. So, my situation might be different from the other people in the course in that I'm not currently teaching a class in which I could use, immediately use and apply a learning object that I created. But I think that's how I would become more interested and more capable, is: do it, try it, find out how it worked, change it, . . . because the object that I created in the course is one that I haven't yet trialed with a real audience and that's the next step. Just creating it is sort of like writing something that nobody ever reads. I have to share it and see what the audience thinks of it and how it works in a real situation.

Researcher: Ok. I'm just going to go on to one follow-up question here. Earlier you replied that you felt that your current context at your current institution is imposing some barriers, I guess, to your interest in or your ability to integrate mobile learning strategies, mobile reusable learning objects, into your practice. Would you be able to elaborate on what some of those barriers might be?

Participant: Well, the biggest barrier here is WiFi capacity. So I might be able to use a reusable learning object with one class, with my class if I were a teacher in a class, but in my current job I have to promote the use of learning in all classes and I can't promote the use of WiFi-connected device in all our classes because that would create chaos here because we don't have the infrastructure to support that yet. I know it's coming, but we don't currently have it and so that's the biggest barrier.

I guess there are other barriers to the introduction of any technology in any situation and that would be teachers' familiarity with the technical aspects as well as the class management part so that's a barrier, an easily overcome barrier, but that's also a barrier. It takes time for people to be comfortable, 'cause I'm not the only user here. I'm kind of a coach rather than a classroom teacher and . . . I think those are the two biggest barriers. It's … infrastructure is important, and teacher buy-in and willingness to try stuff.

Researcher: Thank-you for your time. Before we conclude, do you have any additional comments about any aspects of the professional development course, the CSAM framework, or your experience with using mobile reusable learning objects?

Participant: Well I liked the whole idea of the course. I liked the way you set it up in that everybody chose their own little project that they thought would be suitable for their context and we used the framework when we were planning to help us guide our thinking about what we were doing. Then we created the thing, or sort of a sketch of a thing, even if you didn't get your thing finished in the time. And then afterwards we went back to the model and evaluated whether we had actually used a, or created a, I don't know, a model learning object, but according to the framework standard. So, I liked that. I thought it was really practical. It was kind of fun and it's something that I haven't done for a long time, so….

I looked at Winksite years ago and tried to promote it here on the campus but it was too early. People weren't ready for that yet. I think you're the only person on campus that I talked to that picked it up and did anything with it. I don't know anyone else who did, and I talked a lot about it for a few months and then I realized, well, people aren't that interested, plus, at that time, the infrastructure was even less . . . I don't know, high level in terms of WiFi than we have now.

So, there are a lot of things about the course I liked. I liked the interaction with the other people and seeing what they were developing. I liked seeing the range of the kind of stuff that people developed. I thought your comments in terms of responding to everybody were wonderful. You were always really specific to what they said and gave them really good advice and practical ideas about how they could expand on what they were doing or whatever their problem was. You offered some practical solutions. Because I've been in many online courses where the moderator is just kind of "hanging out" if you know what I mean, and not actually teaching, and I think you were an active and critical friend in most of the discussion, like you looked at whatever the people had created and you gave them some advice on specific areas. And, you were also very encouraging. I liked that. I thought that was really well done.

Well one thing that I found, and this is not related to you or anything you did, but one thing that I found about Canvas was, I found it really difficult to find specific other people's comments. Like there were a couple of people that I know working at my institution that I wanted to see their objects. I wanted to go to their discussion postings specifically so that I could see what they were doing. And I . . . Because of the way the discussions compile in a long, long string, I found it hard to find the people I was looking for. And, that's nothing you can do about that, but the format of the discussions weren't searchable, which is something that I would like to see because I'm often in a big course with hundreds and hundreds of people. This one wasn't so big, but even still, I was looking for somebody specifically, I won't say the name now because of the anonymity thing, but I was looking for one person's thing, because she sent me an email and asked me a question about it and I couldn't find her discussion posting to comment on it. And I cruised, but I still couldn't find it. So, that's something about any discussion, I guess, when it gets really long, when there are lots of people, it's hard to search. Maybe I missed the search feature in Canvas, but I couldn't find it. Is there one there?

Researcher: There may be. We can have a look after and see if we can find that.

Participant: Ok.

Follow-up interview transcript ID CSAM002.

Date of Interview: June 5, 2013
Date of Transcription: June 23, 2014

Researcher: Information Letter (Read to Participants at Beginning of Session)

Researcher: Before we begin, do you have any initial comments about your experience in the professional development course, of about the CSAM learning design framework?

Participant: Nope. Ready to go.

Researcher: How has the CSAM learning design framework influenced your plans to use mobile RLOs in your teaching and learning practice?

Participant: I'm always trying to be alert and aware of what's around with current technologies that could enhance my own tasks and jobs. I'm no longer, in my present position, a classroom teacher, but I look for ways that would augment what I do within the context of the Writing Centre, specifically. I'm not, completely, averse to using them. I look for them and ways that they might be useful and, when this opportunity came up, I saw it as an opportunity to get a little more insight of working with the RLOs, getting a sense of the pragmatics of creating a RLO and making practical use of it, hoping that that experience would give me a little better insight, a little more reliable insight, into very particular application in a concrete circumstance, which I don't have a lot of opportunity for. So it's mostly my scanning of reading, what literature, popular magazine articles, what professional literature I have exposure to and stuff, and the various discussions and debates, announcements, and so on, much of which has, in my readings, put me on guard every bit as much, if not more so, as being intrigued about the use of technology.

So this was a really interesting exercise for me and it was for largely that reason, getting those insights, that I took it. And since doing it, I think I have . . . In real terms . . . I've probably just decided that I can look even more closely. I can take a more active approach at looking closely at some of these technologies and how we can integrate them. I don't see it as specifically a trigger for me to make use of RLOs in my present context right now.

But they interested me. That whole process that you led us through with that exploration stuff interested me and so I think I'm a bit more open to it but in terms of actual application of it, it's not there yet. Did that address your question?

Researcher: What do you feel are the strong points of the CSAM learning design framework?

Participant: Strong points of it: Well, the framework struck me as quite a solid framework for actually approaching the design task that a person would undertake to make a viable RLO, and also for the user, the instructor or teacher, to, in the process of applying it, to assess where they're going with it, its viabilities in certain dimensions of that framework, and so on.

It seemed to me that it was . . . it's strongest aspect as a framework was more for the designer. That was my feeling. . . for the developer of . . . people using the technology and putting out RLOs, putting out tools for instructors, whether that's the instructor themselves or whoever it is. But it also offered me, as I was going through it, a measure to look to: was this being achieved? Or, was this being achieved?

In terms of what the framework looks for, and compelling me to say, if I felt that there wasn't, say, for instance, a collaborative element, that was weak there, or something, then saying, well is that something that, to which there is benefit that I beef up, I somehow integrate that or can I justify leaving it just as it is? Or some other aspect of the framework that perhaps is not there at all and, is that a problem, or does it matter? So I've got a framework to make my own measures both in terms of development and in terms of applications.

Researcher: What do you feel are the weak points of the CSAM learning design framework?

Participant: I think that's harder for me. Perhaps, I don't know that it's an inherent weakness at all of the framework as it stands. It wouldn't surprise me that it might develop further and have refinement, but I haven't given it any thought about what refinements they might be, but I suppose if I have anything that amounts to any kind of a concern or something. . . my predisposition is to be wary of formulaic ways of going at anything. So from that predisposition my worry would be that the framework would be taken as a hard and fast rule for the measures that you'll go by. And that's about it. Otherwise I don't see any, from where I sit, I don't see any really specific weakness in the framework, inherent in the framework, that disturbs me.

Researcher: What additional guidance (if any) would help you to become more interested in or comfortable with integrating mobile reusable learning objects (RLOs) into your lesson planning?

Participant: Well, I think for many instructors, particularly in my generation, I suppose, there's a certain exoticism about it all and how it melds or conflicts with more conventional and traditional teaching practices. And, to the extent that there's benefit from it, and I'm convinced that there's benefit from it all in how it was used.

But, I think there's a lot of instructors, myself specifically too, as well, would benefit by a more frequent kind of workplace orientation and training and workshopping from time to time, at least in terms of voluntary participation in those kinds of activities, and even just presentations about what is the latest thing.. For instance, if somebody on staff has developed some RLO so they're having some real positive outcomes as a result of it, you know, that those things are getting exposure within the faculty here.

I remember going back about four years now, and, I wish I could put the names to them. But anyway, there was a gentleman who was doing some interesting stuff with video and some technical measure of getting responses from the video, I think specifically in Math instruction, with their students. He just took it upon himself to see if he could employ these technologies in ways that stimulate the classroom and make it more interesting, but also produced more reliable outputs from the students, and he seemed to have nice success from it. And it was great to see that he had opportunity to actually present it to the faculty. It came up in a kind of general assembly kind of thing. It wasn't about his specific thing, but it was an opportunity to say, here's something interesting happening in the technology. Mr. So-and so, whatever, has got ten minutes. He's just going to spend some time talking about it.

That kind of exposure, workshop opportunities. . . I was glad to grab the research opportunity you presented. First thing I did was, I read your basic background paper on it and stuff, a couple of your papers, and I thought, this was interesting and fed into my curiosities about technology and how to apply it, and I think there will be benefit if somehow the leads could be provided from some source that perhaps was mandated or to have it within their job descriptions to say to get those things out there and exposed. But at the same time, without being heavy handed about it: these are options; here's where they work; here's the problem; here's how we're developing it, getting around it, and so on. . . but some exposure, and I think workshop and presentation, and anecdotes or reports of the successes and stuff within a real context, with our immediate context. We can go through lots of media to talk about what's happening in California, what's happening in South Africa and stuff. I want to see it on the ground here, you know? I think that's chiefly how I see it.

We have in this institution something what appears to me to be quite enviable, the technology support, many institutions would like it; and so, where in those other institutions you might find people getting ramped up or excited about the application of technology but not having the technical support anywhere around to help them engage it and to help them troubleshoot or to refine it over time. We seem to have that here. I don't have reason to be turning to it a whole lot but it appears to me it's here, so there's an opportunity, and I'll just fold into that answer that, I think, I would like to see, to the extent that there's. . . any of these things might unfold over time, these workshops or presentations or other things, that we retain the perspective that it has to serve honest to goodness pedagogical goals and not be some technology for technology's sake or that's where the money's being spent, or something like that. It has to be really about the students and how it's serving students in particular.

So that's . . . I can't think of anything else.

Researcher: Thank-you for your time. Before we conclude, do you have any additional comments about any aspects of the professional development course, the CSAM framework, or your experience with using mobile reusable learning objects?

Participant: Experience using the framework: I think, as I reflected on, I found myself referencing the framework as I was engaging others who were part of the course: reading the comments, talking about the framework, and of course, you guiding the topic to some extent: "please comment"; "how do you feel the RLO is applying or how well do you feel the framework is helping you shape it?" So I picked up those topics and I tried to participate in those and see my own project in those terms.

But except where that kind of prompting was there, and the specific objective was to look to the RLO in those terms, I was not thinking RLO as I went, or the framework, I wasn't thinking the framework as I went. My mode as I went at it, I think I had my RLO, for good or for bad at the end of it, well advanced towards what it became by the end of the course, without referencing this framework at all and when it came up again within the discussion groups and stuff, ok, reflect on this, I said "Oh, right. This was what it's about." And then I went in a minor panic back to my RLO and said, did I really. . . I wasn't paying attention to the framework, and so does mine comply to the framework? And I found that in large measure I was happy that it did, I thought. But I was approaching it in terms of: I've got a topic or subject; I've got a particular kind of audience or student in mind; I have these constraints and these potentialities within this piece of technology. How do I lever that? How does it become a conduit to achieve what I would otherwise achieve in my classroom, given the sacrifices, compromises, and conditions of? And I was just focused with that intent, I think, and only after the fact, prompted, I went to the framework and was ok with it. But. . .and with that started to pay a bit more attention to the framework and say, because, again, the discussion went on, how does it work? Is the framework working for you? Where are such things as the. . .how is it influencing your decisions in putting together RLOs, and so on. It think that's as far as the framework is concerned. What was the other things you brought up in that last . . .additional comments?

Researcher: Yes

Participant: I've done a number of online courses. Full-length degree program subjects, and so on. I'm fairly comfortable with them. This one seemed to me to go quite smoothly. I had not significant, or any kind of real issues with any of it. I would say that, perhaps more than most in my experience, you were responding to people promptly and regularly and, I thought, fully. Certainly, my questions and enquiries and statements are usually very brief and I want to go with substance, with substance at least as I perceive it. And you were very ready to come back and give me full replies and that was really appreciated, because I've been in situations where, maybe because of the load of students that have to be dealt with in a course, in a typical online course, the instructors just get worn out and don't deliver as much as you'd like. So I appreciated that. I generally felt that that component of the whole exercise, the online thing, was generally positive, quite positive actually.

Your choice of the online service, it slipped my mind.

Researcher: Canvas.

Participant: No, not Canvas. Canvas was fine.

Researcher: Winksite.

Participant: Yeah. Winksite, for the purposes, was quite good. It was quite a good simulation of what you would be visualizing and trying to achieve for mobile devices, and so that was also a nice component of it. It had its limitations, but, yeah.

And the opportunity there as it unfolded for the exchange that occurred, in part with my colleagues here at the College, but also with people who were participating from all over, with their approaches and having a sense of their teachers' prof--, their teachers' sensibilities, you know, with their concerns for that objective of serving the student and then applying this tool to serve the student. It was nice to see them engage in that.

So that the tool, the technology, wasn't erecting barriers, but rather was facilitating engagement. That was kind of nice to see them making the effort to whatever degree there was success... and whatever degree of successes they were having was another matter.

So that was. . . at the time I wasn't conscious of it so much, it's only on reflecting back but I think, on reflecting back, that was an important part of it for me. That was reinvigorating for my faith that people coming to the technology are not all coming with the bells and whistles all up front, you know, which is often my concern. So that was a nice component.

On the whole, as just a kind of simple word or phrase to describe the whole experience, it was positive, for me.

Follow-up interview transcript ID CSAM003.

Date of Interview: June 8, 2013
Date of Transcription: June 23, 2014

Researcher: Information Letter (Read to Participants at Beginning of Session)

Researcher: Before we begin, do you have any initial comments about your experience in the professional development course, of about the CSAM learning design framework?

Participant: Sure… I just want to say, because the four questions… with the email, you informed us what the topic they would be… or, what they would be about… But, I just wanted to give feedback about how organized your presentation was for your course. Just, currently, I'm taking two courses from another university, and I only wish my professors had their materials as organized as yours, Robert. I really felt it was easy to follow. The terminology was good. And it attracted all types of learners with your videos, with your audio, with your things you could read, your resources… and I just wanted to say you did a wonderful job in that area.

Researcher: How has the CSAM learning design framework influenced your plans to use mobile RLOs in your teaching and learning practice?

Participant: Ok. I think that I saw it as a fun thing to get students engaged... Not only for me to learn more about it, but for the students to learn more about it. It's fun… umm… you can be creative… there's so many ways you can add things to it, take it away, switch it mainstream.

I just think it's just, with today's technology, and, especially here, because of where we're living in this country, so many students love technology… and I just see it could serve not only the instructor, but… umm… serve the students, too.

Researcher: Ok. So, that seems to address your views on using mobile reusable learning objects in general. Do you have any specific thoughts about how the learning design framework—the CSAM framework—has influenced your perceptions on that, or your intentions or interest in using mobile RLOs?

Participant: Oh, well, it's definitely triggered my interest, for sure… umm… so, sorry, the first part of the question was, what, sorry?

Researcher: How has the CSAM learning design framework influenced your plans to use mobile RLOs in your teaching and learning practice?

Participant: Oh! I would love to try to put it right into class in Fall 2014, if it's possible. Umm… again… umm… time permitting, as far as course development… yeah… I would definitely be interested in implementing it.

Researcher: What do you feel are the strong points of the CSAM learning design framework?

Participant: So, again, the accessibility. Umm… the clearness. The, just, how can I say it… the opportunity to put, umm, extra things in there that might help the students. Just the availability to move around the content in many formats, or presentations… you could present your content in so many different ways.

Researcher: Ok. And, the framework itself… the CSAM learning design framework… in terms of its ability to help you plan your mobile RLOs… what do you feel are the strong points of that framework for helping you to plan, and to integrate RLOs?

Participant: I think it's because, with the course now, or the course that we just completed… everything was step-by-step-by-step, so I can go back and use that as a resource for me, when I go to try to implement it into my, umm, my work in the Fall. So, it'll be a huge resource for me. Am I answering what you wanted me to answer?

Researcher: And, what about the framework, itself? The four elements of the framework—C – S – A – M? The Collaborative, Situated, Active and Mobile?

Participant: Right.

Researcher: What do you feel are the strong points of that? Just, the framework, itself, in terms of helping you to, umm, to plan for using mobile reusable learning objects?

Participant: The strengths? Umm… hmm… I'm drawing a blank here. I'm sorry! [laughs] Umm… ok… do you know what? Can we go onto the next question? And I'll come back?

Researcher: Ok.

Researcher: What do you feel are the weak points of the CSAM learning design framework?

Participant: The weak points?

Researcher: Not of the course, itself, but of the actual framework… for helping you frame your instructional design.

Participant: Yeah… I didn't really see any, Robert. Like, when I, yeah… this is new to me, you know… so, maybe, if I use it more and more, then maybe something would appear. But, through this semester, there wasn't anything that really jumped out at me as anything negative, or a weakness. So, with regards to the previous question, then, the strengths of it… Did it help you with your planning for your RLOs? Yes. Yes. Yeah.

Researcher: And, is there anything in particular that you thought about that framework that helped you?

Participant: No. I can't think of one. I'm sorry. Yeah.

Researcher: What additional guidance (if any) would help you to become more interested in or comfortable with integrating mobile reusable learning objects (RLOs) into your lesson planning?

Participant: What could help me? I guess the support of knowing, ok, if I want to get more engaged in this in the Fall 2014, what support would I have. I know that this course was running, and if you had any questions, you could run down and ask you. But, would there be help, umm, here, within our college, umm, if we wanted to move forward on this more.

Researcher: Ok, so, you think that, if you were going to use reusable learning objects in your teaching and learning practice, you still would want some form of professional development support? Some form of training support?

Participant: Yeah! Yeah! Something like that. Something, like, as a follow-up, like, to make sure that we're all feeling comfortable with it, and… umm… you know… it's the same as anything whenever you start to use new techniques and, you know, ways of doing content… You like to know that you have a support group there, that… umm… if you run into troubles or difficulties, or you want to bounce an idea off someone. Now, of course, I will have the people that I know… just met in the hallways, who shared with me that they were doing the course, too… so I know those people are there, that I can run and bounce ideas off them.

Researcher: Thank-you for your time. Before we conclude, do you have any additional comments about any aspects of the professional development course, the CSAM framework, or your experience with using mobile reusable learning objects?

Participant: Again… like I said, I'd like to learn more about it, and get more and more engaged about it. No, I thought everything was pretty… like, time wise, you know, it was a nice plan all the way through for each one of the modules that were done. It didn't feel rushed.

The only frustrating thing that I found… and it has nothing to do with the course, was sometimes I tried to logon at home, to do the work, and then, of course, the area that I live in, and the Internet would drop. And then I'd be frustrated, and then, Ok, I'd wait and come in in the morning to do it. And then, students would come in through the office doorway, having questions for me. So, that was frustrating. But, that was just because, solely with the Internet services. It had nothing to do with the course. Thank-you for letting me participate in this. I know a lot of people have quite enjoyed the course.

Follow-up interview transcript ID CSAM004.

Date of Interview: June 10, 2013
Date of Transcription: June 18, 2014

Researcher: Information Letter (Read to Participants at Beginning of Session)

Researcher: Before we begin, do you have any initial comments about your experience in the professional development course, of about the CSAM learning design framework?

Participant: Umm… First I have a question. How…When do you anticipate the research study will be completed?

Researcher: I'm expecting to be completed by this time next year so I hope to convocate by June 2015 and at that point the dissertation report itself will be published and deposited into the Athabasca University Library Dissertation Database.

Participant: Yeah. So at that point all our contact info will be destroyed?

Researcher: Yes.

Participant: Now, is that an open database, so those of us who will be quite interested to read your dissertation could have access to it?

Researcher: Yes.

Participant: That's wonderful, thank so much Rob. Yeah I just want to say thanks for doing this for us.

Researcher: How has the CSAM learning design framework influenced your plans to use mobile RLOs in your teaching and learning practice?

Participant: It has put it now in my plans. That's the influence. So, for myself, because I've been out of the classroom at CNAQ, there… it's a little bit… we are planning to have some…actually, now this is confidential, right? You'll be able to cull out anything that's identifiable or sensitive?

Researcher: Yes. This will appear in the transcripts that I work from, however it will not appear in the dissertation research report and the transcripts will be kept confidential.

Participant: Yes, ok, then I can talk a little more generally, just because… so, some of us at this college are moving on and so I can say that in the plans in the centre where I've been working, the Independent Learning Centre, it is possible for us to have modules in our D2L site that help students test their own independent learning skills, so definitely any suggestions I leave for the next person to take my position will involve just exactly using mobile, these sorts of reusable learning objects. Otherwise, all of my First Nations work, bang on, because it's the youth who are gonna move forward. So I'm just quite excited and thank you, thank you, thank you.

Researcher: What do you feel are the strong points of the CSAM learning design framework?

Participant: First, could I ask, didn't we get asked similar questions to this in a follow-up questionnaire?

Researcher: There were questions that were similar in the end of course feedback survey, and, we're just looking for a little bit more of your opinion on things here.

Participant: Ok. No, because I didn't actually get to produce my RLO, I would say my answer is going to be quite similar, which is: the simplicity and accessibility of the Framework, I think is, is super strong, and in the course there were other examples given, but to me the simplicity of this, and the comprehensiveness, is so super and, that's what I would say, it's a workable framework.

Researcher: What do you feel are the weak points of the CSAM learning design framework?

Participant: I can't think of any weak points of the framework. It would be different after I've produced a few MRLOs

Researcher: What additional guidance (if any) would help you to become more interested in or comfortable with integrating mobile reusable learning objects (RLOs) into your lesson planning?

Participant: I can't think of any other guidance, except maybe a different context, which is, if there could be a community started, an online community, it probably already exists, it could be residuals, hopefully huge residuals, out of our course so that we could continue to work together and sound ideas off each other, throw prototypes at each other. Yeah. That's what I'd love. I know that you're available, but it would be fun to still be connected down the road. So it would be an online community with its life beyond the particular study.

Researcher: Thank-you for your time. Before we conclude, do you have any additional comments about any aspects of the professional development course, the

CSAM framework, or your experience with using mobile reusable learning objects?

Participant: I wasn't sure exactly about "situated". So maybe getting to… I don't know if it's a weak point. I don't think so. I think I'm…because I didn't actually do it and get your feedback on it, it wasn't clear to me at the time…oh, situated, how will I know whether this is situated or not, what I'm generating.

I found the course itself was wonderful and the speed with which we heard back from the instructor was amazing and it was great there was such a large enrollment because enough were able to keep up that there was an interaction going on. I think we all loved the fact that it was a package that lasted only so long and I think a lot of us are very indebted to the instructor to still be available. So, for example, when I get mine done, that I can actually send it to you and get, or someone could send it, and get your comments.

Follow-up interview transcript ID CSAM005.

Date of Interview: June 11, 2013
Date of Transcription: June 22, 2014

Researcher: Information Letter (Read to Participants at Beginning of Session)

Researcher: Before we begin, do you have any initial comments about your experience in the professional development course, of about the CSAM learning design framework?

Participant: No. I think I'm ready.

Researcher: How has the CSAM learning design framework influenced your plans to use mobile RLOs in your teaching and learning practice?

Participant: Well, to be honest, I'd never even heard of this until your course. So… everything was kind of new and exciting. And, the framework has been helpful just because I didn't know anything about it before… And, I've been thinking about some ways to incorporate it at work… Umm… I'm just still on maternity leave, so I haven't gone back yet. But, unfortunately, I find, where I work, they're not very receptive to new ideas. So, these ideas that I have for using it… I'm a little bit afraid that when I go back, they're going to be like 'Too complex. Too much time. Who's going to do it? Who's going to update it?' So… yeah…

Researcher: Ok, so, just to follow up on some comments that you made there… you seem to indicate that while you do find that the framework has been helpful to you in generating ideas about how you could use mobile reusable learning objects in your own practice, you do still perceive that there are some other barriers to your integration of such strategies at your workplace. Would you be able to elaborate on those just a little bit?

Participant: Well, I often find that if someone like myself brings forth and idea… like, I like this idea for preparing our students… umm… I teach in a dental assisting program, and I think this would be great for preparing people for the board exam… and there could be all these different pages of, like, the domains… It would just be a great tool for them to start preparing for the board exam as they go through the program, opposed to at the end.

And… so… recently, I was talking with my supervisor about coming back to work, and I said "we could do this, and we could do that," and, right away, it's like "Who's going to pay for this? Who's going to update it? Ahh… they've been doing alright on their board exams, so let's just leave it how it is." You know, I kind of feel like the ideas that come from technology, people are so quick to say "Who's going to pay for that? And who's going to maintain it? Who's going to support it?" And, it always seems to be a financial struggle. Let's just keep doing what we're doing, because it seems to be working, on paper, you know…

Researcher: What do you feel are the strong points of the CSAM learning design framework?

Participant: Well, umm… Did you design this framework? Or is it just one that you used?

Researcher: It's a framework that I designed. As I explained in the course, itself, it's not a new concept, so much as a summary of what I have deduced has been done by other practitioners and researchers, through a meta-analysis of the literature on mobile reusable learning objects in the past five years.

Participant: Oh, OK, because I wasn't sure if you had designed it, and it was kind of… anyways… if it was something new, or if it was something that existed previously, but… ummm…

Researcher: Yes. The framework , itself, is new. The conceptualization of it, the graphic, is new, but the concepts… the key pedagogical principles are kind of universal, and that's what I was trying to express with that.

Participant: OK. In terms of strengths… I had never heard of, or used, mobile RLOs. It was just a good starting point, a good working point, a good finishing point. Like, how am I going to develop this? And what points do I need to cover? And, then, as I'm developing it, thinking, am I hitting on all points of this framework? And, then, as I'm finished, something to evaluate it with. So, having no knowledge in it, I found that this framework was very helpful, as, like, checkpoints along the way. Umm… and then, saying that, I don't think that I know enough about the mobile RLOs to pick out the negative points of the framework, because I don't think I've done it enough. Or, maybe if I'd created like ten, I'd say "oh, this is maybe missing from this framework," or, umm, I wasn't able to find any weaknesses in it, simply from my lack of exposure to it.

Researcher: What do you feel are the weak points of the CSAM learning design framework?

Participant: Well, the only, umm, I wouldn't call it a problem, umm… The first part, the C, the collaborative, it's kind of a difficult one to use, and, as you expressed in the course, well, not all of them are going to be collaborative. There's only a certain percent. But I think I always felt like something must be missing if I didn't have it, because it is part of the framework. Like, it doesn't appear to be an optional part. And, especially because it comes first in the framework, you kind of feel like that's a really important part, and I have to find a way to incorporate it… umm… when that isn't necessarily the truth. That it may be present, or that it may not be present.

Researcher: What additional guidance (if any) would help you to become more interested in or comfortable with integrating mobile reusable learning objects (RLOs) into your lesson planning?

Participant: Hmm… well… I found the course great. You did a wonderful job, and, umm, I'm going to keep my logon and login information and stuff so that I can continue to refer back to it.

Umm… I didn't… I thought that, like, the Winksite… umm… like, maybe more support through the Winksite website, which has nothing to do with you, of course… umm… but I thought that they were maybe lacking a little bit in instruction and support… umm…

I find that, like, YouTube videos are great for, you know, providing some clarification, and just examples, and… but, I thought your course was fantastic, and it was really quite comprehensive. But that's what I'd probably refer to if I needed additional help. I'd go back to what you already have in there. And it's probably there, and I just didn't see it, and I didn't even know I was missing it at the time. But, as I got more experience, I think I'd like to refer back and say "Oh! This is what this meant!"

Researcher: Thank-you for your time. Before we conclude, do you have any additional comments about any aspects of the professional development course, the CSAM framework, or your experience with using mobile reusable learning objects?

Participant: Umm… I though the course was really wonderful. And it really, it demonstrated how much thought, and consideration, and work that you had poured into it. It was obvious. Like, when you went through it, like, how much work you put into it, and how you had troubleshooted things, and thought about it, and, umm, your connection with each person, and… There was a lot of people, you know!

Umm… I found that I often didn't think that I had enough time. Like, to start with, I was like, oh, this will be more than enough time. But when I got into the Module 3, I kind of felt like, "Oh, God, I've gotten behind! Should I continue? Or should I not continue?" I just found like I didn't have enough time, maybe, in the last two modules , umm, to stay on schedule. And, umm, I appreciated that you extended, kind of, some of those deadlines. Umm… But, saying that, I kind of didn't have enough time to do my own thing really well… that, I felt like I wasn't contributing to other people's as well, because I wasn't posting as much as was, kind of, requested.