ATHABASCA UNIVERSITY

ENCOURAGING DEEP LEARNING IN A BLENDED ENVIRONMENT: A STUDY OF INSTRUCTIONAL DESIGN APPROACHES

BY

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF EDUCATION IN DISTANCE EDUCATION

CENTRE FOR DISTANCE EDUCATION

ATHABASCA, ALBERTA
JUNE 2013

Athabasca University
FACULTY OF GRADUATE STUDIES

Approval of Thesis

The undersigned certify that they have read the thesis entitled

**"Encouraging deep learning in a blended environment:
A study of instructional design approaches"**

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In partial fulfillment of the requirements for the degree of

Master of Education

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Dedication

I dedicate this research study to Elizabeth van de Ligt, who encouraged me to pursue graduate studies, even when I had doubts about whether I'd be successful. Thank you Mom, I see how much difference a good education can make, and I hope this research contributes to better educational opportunities for those who come after me.

Acknowledgements

I am fortunate to have had many, many people encouraging me through this research process; I extend a heartfelt thank you to every one of you.

In particular, I would like to acknowledge:

- My sister Linda, for her willingness to listen patiently and ad infinitum while I talked about this work, tossed around ideas and analyzed out loud in a field of study outside of her own work

- My colleagues in the world of instructional design, who encouraged, supported and cheered me on throughout the research process and the work of writing up the results

- Dr. Marti Cleveland-Innes, my thesis advisor, who encouraged me when I needed it, let me struggle when I needed to and challenged me to reach higher, and then reach higher again

Abstract

Encouraging Deep Learning in a Blended Environment: A Study of Instructional Design Approaches

This qualitative research study seeks to answer the question: *Which instructional design approaches for blended learning encourage deep learning?* This grounded theory research captures the lived experiences of instructional designers and faculty members in converting courses at the post-secondary level from traditional, face-to-face delivery to blended delivery using educational technology. Study results provide insight into the complexities involved in the design and development of blended delivery courses and shed light on the complications that can arise with course conversion. The study also opens a window into design approaches to foster deep learning, clarifying the importance of targeting high levels of learning in the course syllabus / outline, and then aligning every part of the course to the specific learning outcomes identified. Study results culminate in a set of recommended instructional design approaches that foster deep learning in a blended learning environment.

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List of Nomenclature and Abbreviations

Best application of learning: Most suitably appropriate, advantageous or effective application of learning for the subject and the specific learning activity it supports

Best delivery method: Course delivery method that is most suitably appropriate, advantageous or effective for the subject matter

Best practices: Practice that is most suitably appropriate, advantageous or effective for the recommended context

Blended learning: A combination of face-to-face and online learning components used together in a single course, each integral to achieve the required learning outcomes (for the purposes of this research study)

Deep learning: Learning that focuses on the meaning of the learning material; processing at the highest cognitive levels

Educational leadership: Leadership focused on moving education forward in ways that support learning theory and best practices; may be visible in certain roles, but leadership in education can also be an institutional culture supported by management

Faculty: Instructional staff at a post-secondary educational institution, whether contract or permanent; may assume the instructional design role at times

Formative assessment: Measurement of student learning throughout a course to provide ongoing feedback to both students and faculty on the success of the learning to that point; often low point value against the overall course mark

Instructional Designer (ID): Educator whose work focuses on applying learning theory to the design and development of courses and programs

Learner centered: Learning that is structured to focus on the student's needs, abilities, interests and learning styles, placing the teacher in the role of facilitator and much of the responsibility for learning with the student

Learning domains:

Cognitive: Mental skills—knowledge—facts, procedural patterns, concepts

Affective: Growth in feelings or emotional areas—attitudes, feelings, values

Psychomotor: Manual or physical skills which require practice and are measured in terms of speed, precision, techniques, etc.

Post-secondary: Formal education after high school; for example, college, polytechnic, university

Subject Matter Expert (SME): An expert in a particular subject, often hired or off-loaded to create course material; may be faculty or an industry expert

Summative assessment: Measurement of student learning against a standard (such as learning outcomes) at the completion of a course module, course section or at the very end of the course; often carrying a high point value against the overall course mark

Surface learning: Study focused primarily on the text in the learning materials, not its relationship to other knowledge

Teacher-centered: Learning structured to focus on the teacher as the primary source of knowledge, with the learner in the role of gaining knowledge as it is delivered by the teacher; sometimes referred to as the "sage-on-the-stage"

Teaching faculty: Faculty members focused on teaching who are not carrying the instructional design role

Chapter I - Introduction

Scenario

A given program at the post-secondary level has been successfully taught face-to-face for several years. Although the content in the program has been frequently updated to reflect changes in subject matter, none of the courses currently employ a significant amount of educational technology. The institution offering this program is gradually changing programs from traditional delivery to a blend of face-to-face and online delivery; the program discussed here has been designated for change.

Instructors are asked to take on the role of subject matter experts for the purposes of reworking the courses, but are unsure of how to proceed and wary of the impending change. They are willing to have organizing material such as the course syllabus and schedule available online, but may be hesitant to load much in the way of course content online, preferring to keep as much of the teaching and learning in the classroom as possible. The instructors express concern that blended delivery courses will not be able to deliver the same depth and quality of education as would be delivered in the classroom. Approaching the instructional designer assigned to the project, they want to know how to blend the use of educational technology with face-to-face components. The instructors recognize the need to preserve the integrity of the course content, engage learners, encourage deep learning and assess student learning against course and program outcomes. In short, the instructors are asking for best practices in instructional design specific to blended learning.

Moving from Face-to-Face to Blended Delivery of Course Materials

Increasingly, post-secondary institutions are converting on-campus programs from traditional, face-to-face delivery to a blend of face-to-face and online delivery using educational technology. This change is often initiated by an institutional directive to put some course content online for each program, providing the beginnings of blended learning. Course modification resulting from such a directive may initially be limited to making resource materials such as a course syllabus, schedule and a list of supplementary course resources available online to the student, but courses that offer such limited online resource material do not offer true blended learning. The student has very little reason to go to the course site unless he is highly motivated to learn more than what is being presented in the classroom and wants to follow up with optional learning on his own. Building on the original institutional decision to change from face-to-face to a blended delivery model requires a fundamental shift from teacher-centered to learner-centered course design.

Research suggests that blended learning includes a wide continuum of possibilities and that the term has "no generally accepted definition" (Picciano, 2009). The goal of blended courses should be to combine the best of classroom teaching with the best features of e-learning (Gulbahar & Madran, 2009). "The overall goal of a blended learning experience is to provide a mix of online and face-to-face learning experiences which support each other in achieving desired learning outcomes" (Ginns & Ellis, 2009, p. 653). Courses delivered using a blended approach have been used to accomplish everything from providing access to electronic resources to actually reducing face-to-face class contact hours (Rovai & Jordan, 2004).

Converting from face-to-face to blended course delivery creates opportunities for the learner, the instructor and the institution. A reduction in class contact hours is often considered an inherent change when blended learning is adopted, but not all institutions choose this route. In many cases, blended learning utilizes online course material to prepare and engage students in advance of class time, includes the use of educational technology in the classroom, and then follows up with online activities that reinforce the learning. Online learning materials in a blended course can help the student develop a deeper understanding of the subject matter through more comprehensive study, and address differences in learning styles by providing variety in the activities that help learners build subject knowledge.

Asynchronous communication tools in a blended course offer the opportunity to increase student-to-instructor and student-to-student communication outside the classroom, continuing learning after hours and building a stronger learning community. Learner effort hours may increase as well. Students accustomed to attending class and doing minimal work outside of it may find that their success requires increased effort outside of class time, and that they can benefit from the increased attention to the subject matter.

Blended learning also offers the opportunity for online formative and summative assessment strategies. Formative assessments completed and marked online provide almost instant progress feedback for both learners and instructors. Summative assessments completed and marked online may relieve the pressure felt by a busy instructor, and in turn, help ensure institutional marking requirements are completed on time. Assignment instructions delivered online provide opportunity for

better clarity and consistency across classes. These assignments can be uploaded for marking; feedback to students can also be provided online, removing some of the urgency for last minute location of an instructor to turn in work.

Whether working on a single course or a whole program, course development teams need to know how to, for example, balance the blend of online and face-to-face components to create a variety of learning opportunities, how to use the online components to encourage deep learning, and how to effectively design assessment strategies to measure student success. Instructional design approaches specific to blended learning offer guidelines to effective course design.

Although there are a variety of online learning management systems and tools, educational institutions often rely on them more to assist with administrative issues such as enrollment, access to learning materials and reporting student progress instead of to facilitate engaging learning materials. Bonk (2004) identifies the enhanced pedagogy required for online learning as the "third storm." He argues that interactive courses are rare, even though learning experts believe that the online component of courses "should have activities that are relevant, interactive, project-based, collaborative and provide learners with some choice and control over their learning" (p. 4). Garrison and Vaughan (2008) assert that blended learning requires fundamental course redesign, and challenge educators to integrate approaches and media to "most effectively and efficiently achieve the intended learning processes and outcomes" (p. 48).

Blended learning must evolve beyond the initial reaction to an institutional directive to be effective. It's not enough to offer online course resources, post reams

of course content or offer simple online activities. Keengwe and Kidd (2010) suggest that the "pathway of course migration to online environments often begins with the assumption that instructional design, grading procedures, and other methods that typically work in the traditional classroom" (p. 535) would remain the same for blended or online courses. "Converting a traditional course to a successful online one requires more time, skills, and knowledge" (p. 535). Whether offered through educational technology or in a face-to-face environment, content, learning activities and assessments need to be aligned to the course learning outcomes, and accordingly, reflect the appropriate level of learning.

Research indicates that increased adoption of blended learning formats has compelled educators to focus on the instructional design for these courses, pointing out that the quality of the learning environments depends upon course design, and recognizing that poorly designed learning environments result in poor learning experiences (Akyol, Garrison & Ozden, 2009). Thoughtful instructional design offers an opportunity to approach blended learning in a different way: to create online course content, activities and assessments that are integral to the learning process, to meet the level of complexity required by the learning outcome and to add value to the learner. Campbell, Schwier and Kenny (2005) discuss agency of the instructional designer, arguing that instructional design is about more than application of the traditional rational, systematic, objective design processes. The modifications required when employing educational technology, combined with the shift from teacher-controlled to learner-centered instruction, are complex and transformative changes that require a closer look at constructing learning. Instructional design

approaches tailored to blended learning can help educators realize the inherent potential of this type of course delivery.

1.1 Statement of the Problem

Institutions converting courses from face-to-face to blended delivery need to design quality learning experiences using educational technology. Instructional design for blended learning requires a careful blend of face-to-face and online components that work together to deliver quality education—more than a simple upload of the course syllabus, schedule and some content. This research explores blended learning course design, and specifically relates elements of course design to deep learning. These key aspects are discussed below.

Blended learning. The blended approach to course delivery has been used to accomplish everything from providing access to electronic resources to actually reducing face-to-face class contact hours (Rovai & Jordan, 2004). The literature touts blended learning as having the potential to offer the best of both the traditional classroom and online learning, and it has that potential, through careful design.

Garrison and Vaughan (2008) portray blended learning as "a complex weaving of the face-to-face and online communities so that participants move between them in a seamless manner—each with its complementary strengths" (p. 27), but they are careful to note that creating effective blended learning is challenging. They define blended learning as "the thoughtful fusion of face-to-face and online learning experiences … optimally integrated such that the strengths of each are blended into a unique learning experience congruent with the context and intended educational purpose" (p. 5). Blended learning, they contend, is not an addition, but

rather requires "a fundamental redesign that transforms the structure of and approach to teaching and learning" (p. 5), and can be recognized by distinct design methodology that is "multiplicative, not additive" (p. 7).

The profusion of technological features available seems to be offset with a shortage of principles for e-learning. "There are no guidelines for analyzing, designing, developing, supplying, and managing e-learning materials pedagogically" and software designed for e-learning tools doesn't stretch to pedagogy" (Alonso, Lopez, Manrique & Vines, 2005, p. 218). In fact, online course elements are often added to a course after it is developed. Precel, Eshet-Alkalai and Alberton (2009) argue that when online elements are added to a course previously developed, those elements are not perceived as central in the learning process, and thus don't significantly affect learning.

There are aspects of online environments that do affect learning, and these must be integrated into blended designs. Research focused on the community of inquiry framework (Akyol et al, 2009; Garrison & Vaughan, 2008), communication and collaboration (Gulbahar & Madran, 2009), connectivism (Siemens, 2004), and pedagogy (Bonk, 2004; Precel, Eshet-Alkalai &Alberton, 2009) is equally applicable to both blended learning and single-mode online delivery.

Adding online components to traditional learning requires a cautious approach, particularly in cases where the underlying reason for blended learning is to resolve other organizational issues. For example, Fulkerth (2009) studied Golden Gate University's efforts to shorten the on-campus time for students with blended learning, approaching the issue through course redesign. While this may work, care

must be taken to ensure high quality learning, regardless of the initial motivation for the change in delivery methods. Golden Gate's redesign efforts highlighted that although they had continuously updated their course content, the learning objectives providing the framework for each course had remained static for many years. Objectives needed to be restructured, in this case using Bloom's taxonomy, to clarify the expected levels of learning for both in-class and online components. Directions for research assignments at Golden Gate also required restructuring; their online assignments did not include criteria for creating or evaluating the work (p. 49). Shortening the length of the course removed the face-to-face opportunity for the instructor to explain what was expected of the learner. Assignment requirements needed to be articulated to the student up front, written into the assignment instructions.

When designing for blended learning, instructional designers must draw from a mix of learning theories (rather than any single one), choosing theory based on the skills, behaviours and knowledge the learner must master (Carman 2005). Constructivism, a learning theory widely employed in blended or online course design, is noted for encouraging the construction or the processing of cognitive and memory structures (Boudourides, 2003). This theory assumes "… that knowledge is constructed by learners as they attempt to make sense of their experiences" (Driscoll, 2005). Connectivism is beginning to be apparent in course design as well. This theory focuses on connecting specialized information sets. It assumes that "learning is a process that occurs within nebulous environments of shifting core elements" (Siemens, 2004), an apt description of today's world. Behaviourism, while rejected as

out-of-date by many scholars, still commonly appears in the use of various taxonomies to identify levels of learning and cognitive processes. Regardless of the chosen theory, it's clear that learning theory must be applied in order to create effective course materials.

Alonso, Lopez, Manrique and Vines (2008) refer to Bloom's three levels of knowledge and their application in the context of educational technology; "… technology (developed around the e-learning paradigm) is beneficial for 'improving the quality of learning,' but is useless if not based on psycho-pedagogical prescriptions" (pp. 389-390). They further note that there is a "profusion of technological features" (p. 390) but that teaching principles for e-learning are not always applied. Designing for blended learning is more than deciding to put some of the content online because the technology is there to allow it. Online components must be based on pedagogical principles and support the learning required by the course.

A case study by Abrahmov and Ronen (2008) on the use of blended learning for the theoretical aspects of a practical course—photography in this instance—echoed the need for careful planning when introducing new teaching objectives to the program by incorporating online elements. Cooner (2010) studied a large cohort of BA Social Work students and their experiences using a technology-enhanced blended learning design. In this instance, the use of technology was successful; it was designed to "enhance student learning experiences through the constructivist principles of 'emergent learning" (p. 284).

Evaluation and assessment strategies often require more complex thinking when blending online and face-to-face learning (Laumakis, Graham & Dziuban, 2009). The wide variety and diversity that blended learning embraces is a challenge for instructional design, but is "highly advantageous for teaching and learning" (p. 75). In a blended learning environment, faculty can utilize both classroom observation and the tracking tools available through course management systems to evaluate student learning.

Precel et al (2009) concluded in their study of the pedagogical and design aspects of a blended learning course that there is "great importance of 'designing in advance,' [to] take into account the problems of online learning, contrary to 'designing in retrospect,' which characterizes the majority of present-day online academic courses" (p. 11).

Blended learning requires the fundamental redesign of existing approaches to teaching and learning. The single most important aspect of education lies in providing high quality, effective learning experiences. The experience of a learner can and should be enhanced when educational technology is carefully integrated with work in the classroom; however, effectiveness can be quickly lost if the online environment is viewed as a place to simply upload information in the hope a student will absorb some of it.

The five Sloan-C Pillars of learning effectiveness, cost effectiveness, access, faculty satisfaction and student satisfaction offer one approach that can be used to evaluate blended learning opportunities. Laumakis, Graham and Dziuban (2009) suggest that all of these pillars must be met for blended learning to be effective. A

review of the suggested metrics for each Sloan-C pillar implies that certain measures of effectiveness are designed to address institutional concerns, such as cost-effectiveness, access and to some extent, faculty satisfaction. The pillars of learning effectiveness and student satisfaction are more directly tied to course effectiveness from the point of student learning.

From an overall institutional perspective, the purposes of blended learning include increased efficiency, effectiveness and convenience, each of which presents different benefits to learners, instructors and administrators, as outlined in Table 1 (Garrison & Vaughan, 2008).

Table 1: Potential Benefits of Educational Technology

Purpose	Learners	Instructors	Administrators
Efficiency	• Reach the required learning outcomes faster or with less effort	• Accomplish activities more quickly or with less effort	• Reduce the cost of administration by the organization
Effectiveness	• Enhance and deepen the learning experience • Expose the student to learning that might not otherwise be available	• Deepen the learning experience for the learner • Provide tools which enhance learning that would be difficult to replicate in another way	• Change the way activities are carried out, helping meet administrative objectives better and at a reduced cost • Provide information that will lead to better decision making and control
Convenience	• Provide easier access to learning or make learning available at a time that is more convenient	• Facilitate learning at places or times that the instructor is not physically present	• Reach students that are not able to come to campus, or those who cannot be available at a time that works for the organization

Countless opportunities for research into the use of educational technology in blended delivery courses and programs are possible; however, without focus on a specific aspect, the research would be both unwieldy and never-ending. Therefore, this qualitative research study focuses on course design for effective online instruction in a blended learning environment. Effective use of educational technology benefits learners, instructors and administrators in a number of ways, as illustrated in Table 1, but a study of effectiveness could take many forms and would still be too broad for one research study. Therefore, the research focus is further narrowed to exploring instructional design approaches for blended learning that will foster deep learning. Research results are expected to benefit both learners and instructors. Focus on how online components combine with face-to-face instruction make this research applicable to the design of both blended and online learning.

For the purposes of this study, a blended learning course is defined quite broadly, as a mix of face-to-face and online learning components for which both elements are essential to student learning. In other words, participating in both the face-to-face and online components of the course will be necessary for the student to achieve the required learning outcomes.

Deep learning. Deep learning, the second key aspect of this research, was first identified by Marton and Saljo (1976) as deep-level processing by the student, an approach to learning that focuses on the meaning of the learning material. In contrast, surface-level processing was identified as study focused primarily on the text in the learning materials, not its relationship to other knowledge. Many scholars have built on this original work, most notably Entwistle (2000), who concluded that a deep,

strategic approach to studying "… is generally associated with successful academic performance" (p. 3). Biggs (1999) related the concept of deep learning to teaching practices, noting that certain students will adopt a deep approach to learning, regardless of teaching methods, but that others can be encouraged to adopt deep learning approaches given the appropriate teaching conditions. "Good teaching is getting most students to use the higher cognitive level processes that the more academic students use spontaneously" (p. 2). The structure of online and blended courses is often more prescribed than in face-to-face situations due to technology requirements. Careful design of these courses provides the opportunity to encourage deep learning for every student.

For this research study, deep learning is defined as processing at the highest cognitive levels, learning that compels a student to discover the meaning of the new knowledge, realize how it relates to existing knowledge, apply and synthesize information (Laird, Schwartz, Shoup & Kuh, 2005; Slack, Beer, Armitt & Green, 2003).

The study focuses specifically on the transformation of courses and programs in post-secondary education, ones that were previously delivered in a traditional, face-to-face classroom setting, to blended delivery. This applied study investigates the experiences of instructional designers and faculty members who have practical knowledge of converting face-to-face courses to blended delivery. The research is inductive; data from transcripts of the first stage of research was clustered into themes which, in turn, generated a second stage of research using questions concentrated around specific aspects of data already gathered. The study is practice-oriented in that

it provides insight into the practical application of instructional design for blended learning. Final analysis of all interview information has been used to propose a set of best practices to guide the design and development of blended course materials.

Educational institutions develop very few completely new programs. Instead, they rework existing programs and courses to reflect advances in subject matter and to meet evolving student and institutional requirements. Proposed best practices in blended learning that foster deep learning will benefit instructional designers and faculty members tasked with reworking existing, traditionally delivered courses to a blended delivery model. This research will also add knowledge to the field of Distance Education; some of the same design issues arise in the creation of both blended and fully online programs.

1.2 Purpose of the Study

This qualitative study focuses on the process of converting courses designed for traditional classroom delivery to a blended model, documenting instructional design approaches for blended learning that encourage deep learning. The study culminates in a set of best practices, based on the expertise of a purposeful sample of instructional designers and faculty involved with this type of course conversion in post-secondary education.

1.3 The Research Question

The central question of this research study is: *Which instructional design approaches for blended learning encourage deep learning?*

This research study interviewed a purposeful sample of educators experienced in designing and developing technology-enhanced courses and programs. Educators in two specific roles were interviewed: instructional designers, who generally do not teach, and faculty members, who are often expected to redevelop their courses for blended delivery, although they may not have any formal education in instructional design. These two distinct groups will highlight any differences in the points of view between those who design course materials and those who instruct it.

1.4 Delimitations and Limitations

Delimitations. This study explores instructional design approaches in blended learning using educational technology that can help promote deep learning, approaches that contribute to effective instruction for blended delivery courses and programs. This research is not intended to address other purposes or benefits of blended delivery, such as those associated with efficiency or administration. It will not address the initial choice of whether to blend delivery for a particular subject, course or program. These purposes would simply be too broad to include in a single study.

Limitations. Instructional design approaches that encourage deep learning when using educational technology are applicable at all levels of Alberta's educational system. This research was conducted in the adult education environment of Alberta post-secondary institutions however, and as such, some of the results may

not be directly applicable or automatically transferrable to programs in the K to 12 environment. Although the phenomenon of converting courses designed for traditional classroom delivery to a blended model is at work in both systems, teaching methods and the needs of learners in adult education differ somewhat from those in the lower levels of education.

Chapter II - Review of Related Literature

The central question of this research study is: *Which instructional design approaches for blended learning encourage deep learning?* This literature review discusses the current thinking on blended learning, its applications and the instructional design concerns that arise when developing a course or program for blended delivery. It examines the concepts of deep vs. surface learning, cognitive, affective and psychomotor domains of learning, student progression within the range of levels, and relates them to online and blended learning. Last, it considers teaching principles, their application to blended or online courses, and discusses the need to support good teaching principles through course design.

2.1 Defining Blended Learning

The term *blended learning* does not have a generally accepted definition or even an accepted taxonomy (Picciano, 2009). Terms such as *hybrid, mixed-mode, sandwich learning* and *laptop* learning are interchanged with *blended learning*, depending upon the locale (Picciano, 2009, Ausburn, 2004). The variety of terms makes it difficult to agree upon a definition, and even more important to clarify the parameters of *blended learning* in the context of each educational institution.

Scholars define blended learning in various ways, each attaching significance to different aspects. Rovai and Jordan (2004) describe blended learning as a "hybrid of classroom and online learning that includes some of the conveniences of online courses without the complete loss of face-to-face contact" (p. 1). Course design for blended learning is flexible; courses can be created with more face-to-face or more

online components, depending upon the subject matter. They further suggest that the sense of community among blended learners can be stronger than either traditional or fully online courses.

Blended learning refers to "course delivery which combines traditional classroom instruction with learning via the medium of the Internet" (Pratt, 2007, p. 705). The success of blended delivery depends on how effectively each element is used to achieve the intended purpose. Additionally, blended learning includes "combining multiple delivery media that are designed to complement each other and promote learning and application-learned behaviour" (Singh, 2003) p. 51), recognizing that blended learning programs may encompass a wide variety of dimensions. The eight dimensions of Khan's (2001) octagonal framework— institutional, pedagogical, technological, interface design, evaluation, management, resource support and ethics— assist in the design of meaningful learning environments.

Essentially, blended learning can be defined as delivery of learning materials using two or more delivery methods in the same course, a description so broad that it can be difficult to apply and even more difficult to execute effectively. Blended delivery requires forethought and planning to ensure that the elements work together to support the required learning, and to ensure that the online components will be executed in a way that provides effective learning opportunities. While a seasoned face-to-face instructor might be able to change the lesson plan for the day to suit a classroom situation at a given time, and then fill in missed learning in another class, this is not always the case with the online portion of a blended course. The online

components of the course often require preparation time, particularly if multimedia learning objects are planned. The design of a blended course requires early, careful decisions about how and when to use the available technology to help students achieve the learning outcomes.

For the purposes of this research study, blended learning is defined as a combination of face-to-face and online learning components used together in a single course, each integral to achieve the required learning outcomes. In other words, it must be necessary for the student to use the online portion of the course for some of the learning materials, assignment instructions, communication and so on, and the online materials need to provide significant opportunities for learning. This broad, but real world, definition for blended learning purposefully allows for as many different interpretations and applications as the creative use of educational technology can provide.

2.2 Benefits of Using Educational Technology

Institutions embrace educational technology for three key reasons: efficiency, effectiveness and convenience, all of which affect learners, instructors and administration in different ways. While educational technology may initially be employed to manage student information and course materials, capitalize on students' familiarity with technology or reduce class contact hours, changing the delivery of a course from face-to-face to either fully online or a blend of online and face-to-face requires fundamental redesign.

Online course delivery offers well-known benefits: rigorous courses and programs from institutions far and wide that can be accessed anytime, anywhere, in almost any field of study. Online programs offer educational opportunities that appeal particularly to working students and those who live far from campus, and in many cases, enable them to continue working to support themselves at the same time. The isolation experienced by students in the older distance education model of correspondence should no longer prevail in a well-designed online course; students in these courses can quickly and easily communicate with instructors and with other students in the course through synchronous and asynchronous communication tools, and build a community of inquiry. Online courses, which are commonly delivered using learning management system (LMS) software, have the potential to provide an array of learning opportunities appropriate to the subject matter, deliver interactive learning objects using multimedia software, facilitate nearly seamless collaboration among students, and support assessment strategies. Delivering a course online is significantly different from face-to-face; as a result, course design is often seen as different from the outset and approached as a new entity.

Blended learning offers the opportunity to create courses that borrow the best of traditional, classroom instruction and combine it with the best aspects of online course delivery. A well-designed blended course can enhance the student's experience through reflective skills, providing opportunities and encouragement to reframe and reinterpret knowledge. It can help build the strength of a learning community by continuing learning and connection outside of the classroom. It can increase or improve active learning strategies and assessment techniques, and

encourage personalization, self-direction and variety (Ausburn, 2004, Cooner, 2010, George-Palilonis & Filka, 2009, Gulbahar & Madran, 2009).

Changing the delivery of a course from face-to-face to blended delivery offers a myriad of educational opportunities. Rather than simply viewing blended learning as another way to deliver knowledge or replace some of the face-to-face contact hours, careful instructional design can help focus blended learning design on improving the learning experience, whether through opportunities for self-reflection, communication, flexibility, engaging learning materials or context-specific activities (Collopy & Arnold, 2009, Cooner, 2010). For example, discussion boards in a blended course provide the opportunity for communication and discourse about the subject matter to continue outside of class time—discussion that can be reviewed and reflected upon by every learner throughout the course—a method of communication that is potentially more effective and accessible to all students than a lively conversation over a cup of coffee might be. Instructors monitoring online communication have a bird's eye view to student discussion in a way that may not be possible in an otherwise busy day of face-to-face teaching, and may be able to identify the concepts learners are struggling with and where they are successfully building their knowledge. Providing some of the learning materials online, to be studied outside of class hours, may increase learner effort and provide flexibility during class time to work through more difficult concepts. Engaging learning materials and context-specific activities encourage learners to remain involved with materials throughout the course.

Blended delivery can successfully integrate theoretical and practical learning in subjects that require both. Online study of theoretical aspects prepares learners for on-campus, hands-on learning, taught in a traditional, face-to-face manner. One example of this type of blend is found in the instruction of photography, where learners study theory and background for visual art, new concepts, and methods for capturing an image during the online portion of the course (Abrahmov & Ronen, 2008). In this case, the learner benefits through studying how to read the artistic elements of an image before setting out to create his own photographs. Another example of this type of blend prepares apprenticeship students by teaching some of the required theory online, and then bringing the apprentices to campus to apply theory to the required practical learning elements. There are some key benefits to this type of blend. Learners studying theory online in advance of coming to campus have the opportunity to learn concepts and think them through before trying to apply them. Time away from work and family is shortened, and shorter on-campus time for each group of learners may result in access to a larger number of apprentices.

2.3 Considering Blended Learning for a Course

Preparing a course for blended delivery takes time and requires careful consideration. Determining which elements to deliver in the classroom and which to deliver online, along with decisions about the treatment of specific instructional components, should depend on the subject of the course, the learning outcomes that need to be achieved, how well and in what way the subject lends itself to teaching

with educational technology, and the technology available to the institution (Oh & Park, 2009).

Subject consideration. The subject of a given course is one of the first aspects to consider when designing a course for blended delivery. While some subjects lend themselves more easily to this type of delivery than others, the design of a blended course needs to provide a similar or greater level of learning to what could be achieved in a face-to-face situation. Online elements for subjects that require creativity, reflection and cooperation among learners may more easily blend with classroom work. Learners studying marketing or communications, for example, are likely to be engaged by discussion boards and the integration of online project work, but these elements may be less appealing to a class of engineering students focused on high-level mathematics.

Determining how well a subject will work online is not always obvious. Course materials that rely heavily on imagery might seem to be tailor-made for online learning, especially if the images can be gathered into appealing visual presentations; however, care must be taken to design presentations that go beyond multimedia to become good learning material. Consideration must be given to which outcome(s) a media piece would support, whether and how it will be used to enhance learning, and how learners will engage with the material. Further, visual materials may be less practical to develop than expected. Although currently in a state of flux, copyright law in Canada prohibits the republishing of materials without permission, even for educational purposes. The design of an architectural history survey course, for example, may rely on thousands of images from around the world which are shown in

the classroom; however, obtaining permission to re-publish the images on a learning management system is a lengthy and unpredictable process. The quality of visual materials is also a consideration; a low-quality image may be useful as part of the research material towards developing a new drawing, but providing those low quality images in digital form as part of the learning material does not serve the student.

Blended delivery can also be utilized in courses that develop psychomotor skills. For example, creating sophisticated simulations of instrumentation may help a learner practice outside of the lab before and after handling the actual equipment on campus, which could result in shorter lab time, less face-to-face instruction and, potentially, access to lab facilities for a greater number of students over the academic year. Sometimes though, the cost associated with the change of delivery outweighs the benefits to students, instructors and the institution as a whole. Detailed simulations are expensive and time consuming to create, and to be effective, simulations must be accurate and kept up-to-date. When proficiency with a given instrument in the field is a critical skill, and use of the instrument requires a great deal of practice, a simulation might be worthwhile. In other cases, this element of learning may need to be designed into the face-to-face portion of the blended course.

Key criteria in deciding how to design for blended delivery for a given subject include: which components of learning can be successfully delivered online, how those components will dovetail with classroom work, the advantages of blended delivery to the learners, instructor and the institution, and whether practical elements will make the design too awkward to execute.

Aligning to learning outcomes. Online instructional components need to be aligned with the learning outcomes of the course. The higher levels of the cognitive domain (analysis, synthesis, evaluation), affective domain (organization, internalization) and psychomotor domain (adaptation, origination) require different learning activities than lower levels, whether online or face-to-face. A simple multimedia piece that requires a learner to memorize terms will only support low-level learning, but creative design for learning can encourage higher levels of learning. Holon Institute of Technology began with a practical photography course that relied primarily on lower levels of learning. As they redesigned their program, they incorporated online elements to teach learners how to analyze photographs from many points of view and to use their reflections to evaluate their own skills. The level of learning increased, which would not have been possible during limited on-campus time (Abramov & Ronen, 2008).

In a similar manner, online interactive schematics provide learners with the opportunity to experiment with the effects of different routes for electricity or gas flow, building deeper understanding and higher level skills than would be possible in a lab setting due to the potential for danger. The same schematics drawn on a whiteboard or explained in class are unlikely to have the same impact on the learner.

Availability and features of educational technology. Educational technology varies from campus to campus, and so do the skills of those creating learning objects. Sophisticated learning management systems are available to help deliver many types of course content, but institutions do not always use their systems to full extent or equip them with every option. Variables in the ability of the delivery

system for the online components affect the design of the course and must be explored before preparing a course design. For example, while most systems have the ability to handle asynchronous discussion boards, not every system or campus provides easy access to standardized synchronous tools. In a blended delivery course, outcomes that would benefit from synchronous communication may need to be delivered in class.

Another consideration for the design lies in whether the ability to produce a variety of multimedia objects is available to the designer. This specialized skill is not universally available; without it, design possibilities shrink considerably. While an instructional designer may have the ability to create basic html text, more sophisticated skills in web authoring, programming, Flash and other tools for creating online content may require access to multimedia specialists.

Design concerns. "Blended learning is not conducive to a prescriptive instructional design" (Garrison & Vaughan, 2008, p. 105). The challenge in designing for blended learning is to integrate traditional and online approaches to effectively meet the intended learning outcomes. The course redesign process requires thoughtful discussion about what the learners need, the type of activities most appropriate to each modality, which activities can be designed to effectively integrate face-to-face and online components or bridge from one to another, the assessment strategies that will be used and how the available technology will support blended learning (Garrison & Vaughan, 2008).

The time required to redesign and redevelop a traditional course for blended learning is offset by the potential benefits of the new course: meeting the needs of

more students by providing greater variety in learning and assessment strategies, directing learning outside of the classroom, encouraging deeper levels of learning, increasing the presence of planned pedagogy, increasing learning cohesion among the students, and possibly (but not necessarily) reducing class contact hours (Akyol et al, 2009).

Blended learning sometimes functions as a replacement for or extension of face-to-face environments, often through course management systems that seem to manage learners rather than provide effective learning experiences. In such a case, design to maximize student learning has likely been overshadowed by technological and administrative concerns. A study by Bonk, Kim and Zeng (2004) notes that although 93 percent of higher education respondents were already using blended learning, such use was modest, in many cases for less than 20 percent of their courses. The same group of respondents indicated that "online collaboration, case learning, and problem-based learning were the preferred instructional methods" (p. 8) for online instruction. The study identified 10 future trends in blended learning for the following decade. Some predicted trends—such as mobile learning; increased connectedness, community and collaboration; and changed instructor roles—are already apparent, while other trends—such as self-determined learning and changed institutional calendaring resulting from decreased classroom time—are not yet in widespread use. Bonk et al (2004) also predicted the emergence of blended learning specialists, explaining that "… blended learning is typically more complicated and multifaceted than either fully online or face-to-face learning … instructors must know

when to shift gears or add new tasks or resources and when to let the learners wander off and explore their own interests" (p. 17).

2.4 Applying Instructional Design to Blended Learning

There are many ways to approach the design of a blended learning course. Educational technology will impact teaching methods; used effectively, it will also improve learning outcomes. Instructional design framework for blended learning courses must adapt to integrate student interaction with and because of the technology. Collaborative instructional strategies that will encourage students to achieve the appropriate learning outcomes should be considered. The mix of face-to-face and online components in the learning experience needs to support the planned learning identified in the course outcomes. Each learning component, whether delivered traditionally or online, must be applicable to the learner in order to sustain their interest.

Blended learning is typically more learner-centered than face-to-face instruction. Learners have increased responsibility and control over their own learning, thus individual differences need to be considered at both the macro (overall instructional strategies) and micro (learning activities, learner characteristics and motivation) levels (Beldarrain, 2006, Lim & Morris, 2009). "Instructional design frameworks must be adapted to purposefully integrate student interaction using technology tools … the added control and interaction provided to learners using technology tools may help tap into a student's expertise, and promote collaboration through peer-to-peer mentoring, teamwork, and other strategies" (Beldarrain, p. 143).

Carman (2005) argued that instructional design that draws from a number of competing theories is well suited to the design of blended learning courses, as "different theories apply to different situations" (p. 1). He went on to name five key ingredients for the design of effective blended learning courses, as shown in Table 2.

Table 2: Carman's Five Key Ingredients to Blended Learning Design

Live Events	Synchronous, instructor-led learning events, with student participation
Self-Paced Online Learning Materials	Learning experiences that the learner completes individually, preferably "based on effective implementation of instructional design principles" (p. 4).
Collaboration	Learning environments which foster communication among the learners, and between learners and instructors, whether synchronous or asynchronous; examples include e-mail, threaded discussions and online chat
Assessment	A meaningful measure of learners' knowledge, both before and after learning events, based on cognitive levels of learning
Performance Support Materials	References materials that enhance learning retention and transfer, in downloadable and/or printable formats

Research suggests that instructional designers and faculty consider using multiple approaches when they blend face-to-face and online delivery in a course. This technique will help meet the needs of a wide variety of learners with different learning styles, personality types, skill levels and generations. It will allow learners to study in ways that are comfortable to them, while still challenging them to experience new ways (Picciano, 2009).

Instructional design for e-learning "has evolved on a par with the development of the three basic learning theories: behaviourism, cognitivism and constructivism"

(Alonso et al, 2008, p. 390). Behaviourism focuses on overt behaviours that can be observed and measured, ignoring the possibility of thought processes occurring in the mind. Cognitivism focuses on the acquisition and reorganization of cognitive structures of the mind. Careful organization of course materials supports cognitive theory. Finally, constructivism builds on the other two theories by recognizing that learners will have multiple perspectives upon which they build individual learning (Alonso et al., 2008).

While there is no ultimate formula for blending online and face-to-face elements in a course, the components should be complementary, working together smoothly. Learners should be able to continue to build knowledge and understanding, regardless of the format in which they are currently working. Learning materials in each format must be tailored to support the achievement of course outcomes and objectives (Precel et al, 2009, Sethy, 2008).

The Community of Inquiry (CoI) framework, widely advocated by researchers as a strong basis for the design of blended and fully online courses, consists of three key interdependent elements: social presence, cognitive presence and teaching presence (Akyol et al, 2009, Garrison & Cleveland-Innes, 2005, Garrison & Vaughan, 2008 and Garrison & Ozden, 2009). The CoI "… supports connection and collaboration among learners and creates a learning environment that integrates [the elements] in a way that will sustain critical reflection and discourse" (Garrison & Vaughan, 2008, p. 8). It supports the development of effective learning communities in online and blended environments "that enhances and supports deeps approaches to learning" (Akyol et al, 2009, p. 78). Social presence encourages learners to engage in

open, purposeful discourse. Cognitive presence is a recursive process which follows learners through the stages of questioning, exchanging information, connecting ideas, creating concepts and testing the solutions. The third key element, teaching presence, is designed to bring the other elements together to ensure productivity within them. "Teaching presence provides the design, facilitation and direction for a worthwhile educational experience" (p. 24).

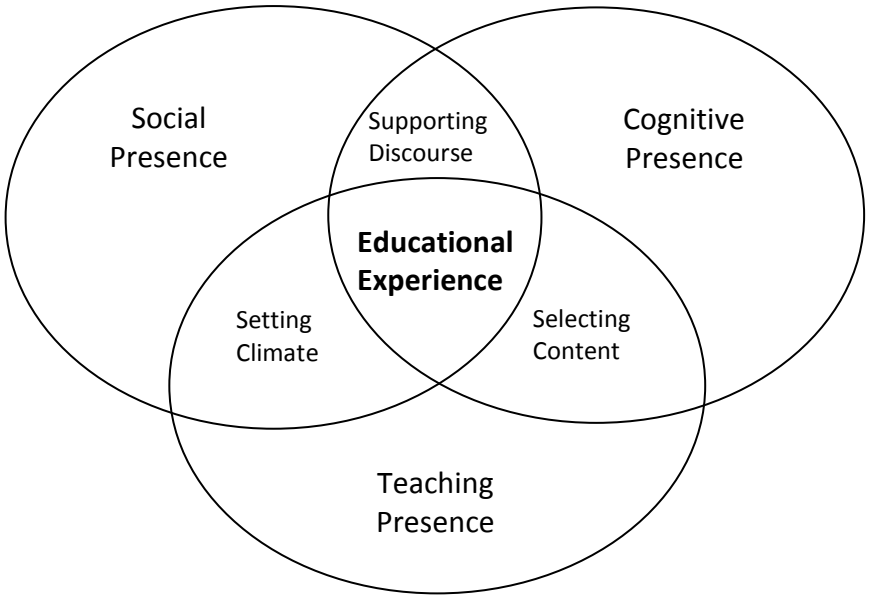

Figure 1: Community of Inquiry Framework, Garrison & Vaughan (2008)

2.5 Deep vs. Surface Learning

Learners process new information on many different levels. Some concentrate their studies toward achieving high test scores; this is surface-level processing, focused on substance, memorization and rote learning (Laird et al. 2005). "Surface learners are motivated to complete the task rather than assimilate the learning (Cleveland-Innes & Emes, 2005, p. 242). The primary goal of studying at a surface

level is to avoid failure on an exam. Others study at a deep level; this learning focuses on the underlying meaning of the substance, understanding the application of the knowledge, analyzing how each piece of information fits with what the learner already knows, and synthesizing the information (Laird et al, 2005; Slack et al, 2003). "In a deep approach to learning, students are intrinsically motivated to engage with learning for its own sake" (Cleveland-Innes & Emes, 2005, p. 242. The goal for learners studying at a deep level is to grasp key concepts, understand their relation to other information and how that information applies.

Most learners use a range of learning approaches as they work through their course materials. While many learners start out memorizing and reproducing knowledge; as they work their way through their studies, they often come to realize that learning can be more rewarding when they seek "… personal meaning by *transforming* information and ideas in terms of their own previous knowledge and understanding" (Entwistle, 2000, p. 2). As learners become more engaged in their learning, their learning tends to deepen. Deep learning is considered to result in higher levels of academic achievement, as long as assessment strategies are aligned (Entwistle, 2000). "In particular, students who use deep approaches to learning tend to perform better as well as retain, integrate, and transfer information at higher rates than students using surface approaches to learning" (Laird et al., 2005, p. 3).

Seminal research. Seminal research describing deep and surface learning was completed by Marton and Saljo (1976). Their study of university students distinguished two distinct levels of processing, "deep-level and surface-level processing, [which corresponded] to the different aspects of the learning material on

which the learner focuses" (p. 7). They found that learners who were processing at a surface level were focusing on the text in the materials, whereas those who were processing at a deep level were looking for the "intentional content of the learning material (i.e., what is signified)" (p. 7).

Biggs (1999) built on the work of Marton and Saljo by describing two learners, one who approached her studies "in an academic way" (p. 57), arriving for lectures prepared and interested. The other learner is described as listening for pieces of information he believes he can remember and use come exam time, putting in only enough effort to pass. Biggs compares the two approaches to learning, and then concludes that, "Good teaching is getting most students to use the higher cognitive level processes that the more academic students use spontaneously. Good teaching narrows the gap" (p. 58).

Biggs (2003) contends that learners construct meaning through learning activities, identifying the teacher's role as one of creating an environment in which the learner is most likely to achieve the appropriate level of learning. He advocates for a system of constructive alignment, where teaching is designed around learning outcomes that align to the levels of learning expected of the student, and assessments clearly measure whether learners have achieved the outcomes. Constructive alignment can be used effectively in blended course design, to plan appropriate learning activities for the desired level of learning. Biggs (2003) developed the Structure of the Observed Learning Outcome (SOLO) taxonomy to systematically describe how a learner's performance increases in complexity as knowledge grows. He describes five performance levels, outlined in Table 3, noting that as teachers and

students make their way through the levels, they often progress from surface to deeper levels of learning.

Table 3: Biggs' Structure of the Observed Learning Outcome (SOLO)

Pre-structural	The student is incompetent in the area of study; he doesn't really understand how to go about completing a task.
Uni-structural	The student understands only one relevant aspect of the task.
Multi-structural	The student understands several relevant aspects of the task.
Relational	The student can integrate several aspects into a coherent whole.
Extended Abstract	The student can conceptualize at a high level and generalize to a new area of study.

Instructors and instructional designers are encouraged to apply these performance levels to teaching, particularly in the area of assessment strategies, and to design course objectives that clarify the level of understanding that will be expected of students. Biggs (1996) cautions against the tradition of quantitative assessment strategies, arguing that it encourages the learning of more and more information that is expected to be reproduced accurately. Instead, he advocates qualitative assessments designed to measure "changes taking place in the nature of both what is learned and how it is structured," based on the "levels of understanding that are reasonable at the stage of learning in question" (p. 4). The SOLO structure can be used to help design learning activities increasing in complexity and depth, and assessments that measure the learner's performance in those areas.

Blooms' levels of learning. Bloom's six levels of learning in the cognitive domain—knowledge, comprehension, application, analysis, synthesis and evaluation—also illustrate the step-by-step progression students may work through as they study new knowledge (Kinnes, 2010); higher levels reflect deeper learning. The cognitive levels can be further grouped. At the syntactic level, the learner acquires knowledge and comprehension; at the semantic level, they are capable of analysis and synthesis; and at the pragmatic level, learners are capable of applying and evaluating in quantitative and qualitative manner (Alonso et al, 2005).

In addition to the cognitive domain, Bloom identified two other, overlapping domains: the affective and psychomotor domains. The affective domain concerns growth in feelings or emotional areas, while the psychomotor domain reflects manual or physical skills. Higher cognitive levels (i.e., deeper learning) are thought to influence both affective and psychomotor levels, and vice versa.

Table 4: Blooms' Domains of Learning

Cognitive	Mental skills – knowledge – facts, procedural patterns, concepts
Affective	Growth in feelings or emotional areas – attitudes, feelings, values
Psychomotor	Manual or physical skills which require practice and are measured in terms of speed, precision, techniques, etc.

Bloom's taxonomy is one of the most recognized and widely used frameworks in education, yet many course outlines seem to disconnect the level of learning described in the outcome from the learning objectives that support it. Learning

outcomes that suggest deep learning (higher levels) are frequently supported by course objectives that are either task oriented or reflect the lowest levels of learning. Courses with learning outcomes that describe low (surface) levels of learning are often paired with objectives that require a higher level of learning than the outcome does. In other cases, courses brought forward for blended learning may have had the content updated over time, while the original learning outcomes and objectives remain as they were written several years earlier (Fulkerth, 2009).

Alignment is an essential element of course redesign, regardless of the specific taxonomy in use. Learning materials and learning activities need to align to prepare learners to meet the course objectives, which are in turn, aligned to support the learning outcomes. Assessment strategies need to measure whether students have achieved the level of learning set forth in the learning outcomes. If the learning outcomes, objectives, learning activities and assessment strategies are not aligned with each other, learners are unlikely to recognize or be able to meet the required level of learning.

Entwistle's approach. Entwistle (1991) contends that while a learner's general approach to studying may remain relatively stable over time, the balance between deep and surface learning can be influenced by factors such as assessment processes. "It is the students' *perceptions* of the learning environment that influence how a student learns … " (p. 202). The course outline sets out the learning expected in the course; it is a key document in the development of a course. In situations where student-instructor communication may be decreased, the learner is more likely to rely on course outline information when determining how to approach learning. Course

design can be used to influence the amount of communication between the learner and instructor in a blended or online course.

Sims' view of deep learning. Sims (2006) explains that the intention of deep learning is "to understand ideas for yourself," while the intention of surface learning is "to cope with course requirements" (p. 3). She describes a deep approach to learning as:

- Relating ideas to previous knowledge and experience
- Looking for patterns and underlying principles
- Checking evidence and relating it to conclusions
- Examining logic and argument cautiously and critically
- Becoming actively interested in course content (p. 3)

Sims writes of three intersecting gateways to deep learning: student voice—the need for students to articulate their needs and become involved in the business of schooling; assessment for learning—to develop students by sharing lesson objectives, outcomes and assessment criteria; and learning to learn—to help the student develop learning skills. The three gateways build on each other when they are all employed, emphasizing that "learning is not something that is done to you. It is an active process in which you participate with your teachers" (p. 9).

Levels of processing vs. stored memory. Craik & Lockhart (1972) discuss levels of processing in relation to stored memory. The hierarchy of processing stages can be "referred to as depth of processing, where greater depth implies a greater degree of semantic or cognitive analysis" (p. 675). Short term store (STS) memory is limited in capacity, of short duration and easily replaced, they argue, whereas long term store (LTS) memory is largely semantic, unlimited and not easily forgotten.

Higher levels of semantic or cognitive analysis could be expected to translate into deeper learning for a student. “At deeper levels the subject can make greater use of learned rules and past knowledge; thus material can be more efficiently handled and more can be retained” (p. 676). Further, deeper analysis of the stimulus leads to improved memory performance over time.

Learning as a process. Learning can take many years; it is not a single activity (Rumelhart & Norman, 1987), and is outlined as a three-stage process of accretion, restructuring and tuning. Accretion is described as fact learning, the addition of items such as names and dates to a learner’s existing knowledge base. In the restructuring phase, the learner creates new memory structures in order to interpret material that is being acquired. This restructuring is sometimes “accompanied by a click of comprehension” (p. 2) that helps the learner fit information into place; this moment signifies a deeper level of learning. During the tuning phase, the learner continues to modify the knowledge in memory, making small changes to the categories developed in the restructuring phase to improve accuracy, and to generalize or specialize the applicability.

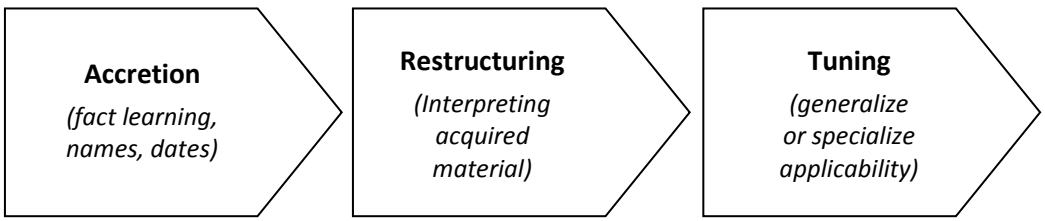

Figure 2: Learning Process, Rumelhart & Norman (1987)

Gagne (1972) also viewed learning as a process, suggesting that domains distinguish content that requires different instructional treatments, relate the

instruction of one subject to another, and clarify different techniques to assess learning outcomes. Gagne distinguished five domains in the process of learning: motor skills, verbal information, intellectual skills, cognitive strategies and attitudes. These domains intersect and interact with each other to support learners through the process. Recognition of the domains and their applicable instructional treatments provides one approach to the design of blended learning.

2.6 Tying Blended Learning to the Principles of Good Teaching

The design of a course or program for blended delivery must consider how to support the principles of good teaching as part of the creation process. Chickering and Gamson (1987) outlined Seven Principles for Good Practice for teaching and learning. Based on 50 years of research, the principles were formulated around good practice in undergraduate education in a face-to-face environment. Although they discussed these principles as guidelines to improve teaching and learning, they recognized that "… content and pedagogy interact in complex ways" (p. 4). They contended that frequent contact between learners and faculty is one of the most important factors in learner motivation, enhancing their intellectual commitment and providing encouragement to keep on working even through rough patches. Learners must talk and write about what they are learning, they argued, and relate it to their experiences as they learn. The diverse talents and learning styles learners bring to education need to be recognized and respected, they reasoned, to provide opportunities to learn in ways that work for them, before they are pushed to learn in new ways. Garrison and Vaughan (2008) echo this work in their discussion of the

Community of Inquiry framework, identifying the need to maintain social presence, cognitive presence and teaching presence in blended and online courses.

Implementation strategies for the original Seven Principles were revisited in view of advances in communications and technology in teaching and learning (Chickering & Ehrmann, 1996). They maintained that each of the principles can and should still be applied, even with the increasing use of educational technology, arguing that wisely used educational technologies can support these instructional strategies rather than detract from them. Each principle was discussed on the basis of the most effective ways educational technology can "advance the Seven Principles" (p. 3). They clarified, for example, that active learning techniques could be supported using simulations and interactive learning activities, and that educational technology would allow instructors to be much more prompt in responding to learner performance. High expectations of students could be managed through carefully planned assignments that sharpen each student's skills in analysis, synthesis application and evaluation, even online.

Graham, Cagiltay, Lim, Craner and Duffy (2001) developed a set of guidelines for online instruction that correspond to the seven principles. These guidelines speak to faculty from the point of view of online instruction, pointing out lessons learned that can be employed to assist in the course development process. Their work indicates that the principle of encouraging cooperation among learners can be honoured through discussion boards, but that such discussions need to be specific and focused in order to be meaningful. The principle of using active learning techniques can be honoured by having learners present their projects, motivating them

to perform at a higher level. The principle of respecting diverse talents and ways of learning can be supported by allowing learners to choose project topics, thus incorporating diverse viewpoints into a course.

Chickering and Ehrmann (1999) maintain that although principles for good practice can be supported when teaching with technology, technology alone is not enough. Bates (1999) agrees, declaring that using technology to build a course without any academic strategies can be an expensive lesson. The profusion of technological features that have arisen must be balanced with teaching principles for e-learning (Alonso et al, 2005).

2.7 Summary

The literature does not offer any hard and fast rules for the design of blended learning courses. There are a few guidelines for analyzing, designing and developing online materials for blended delivery, but considerable review and warnings about potential pitfalls. Although blended learning must be flexible in order to meet the needs of a variety of teaching and learning styles and to be relevant for a variety of subjects, it requires thoughtful, purposeful design to be successful. Careful choices must be made to balance learning delivered online with that delivered in the classroom, to ensure the learner moves smoothly between the two modalities and to encourage deep learning of course material regardless of delivery method. This research study, while only one step, contributes toward knowledge of instructional design for blended learning.

Chapter III – Research Methodology

3.1 Qualitative Research Strategy

Qualitative research is usually selected as a research methodology when searching for a complex, detailed understanding of an issue; it often reflects the researcher's desire to explore a problem in depth rather than relying on existing literature or attempting to prove a specific hypothesis. Qualitative approaches are divided into five main research styles: narrative, phenomenology, grounded theory, ethnography and case study. Successful qualitative studies rely on a single focus, rigorous data collection and analysis, reflection of the researcher's own position and sometimes lengthy and detailed reports (Creswell, 2007, Creswell, 2009, and Neuman, 2006).

This study uses the grounded theory approach to research. Creswell (2009) describes grounded theory research as a qualitative research strategy that "derives a general, abstract theory of a process, action, or interaction grounded in the view of the participants" (p. 13). This research study follows Creswell's outline, developing theory grounded in data gathered from educational professionals involved in the conversion of courses and programs delivered in the traditional face-to-face manner to a blended model using educational technology. The central question focuses the research and narrows the topic to a manageable scope. The study closely aligns to the qualitative, inductive, research process illustrated in Figure 3. Grounded theory procedures have been followed, focusing on how participants experience the process of course conversion in their work and how they design to promote deep learning in their blended courses. Understanding common or shared experiences of those using

educational technology to redesign and redevelop face-to-face courses for blended delivery helps shed light on the instructional design approaches that can provide opportunities for deep learning.

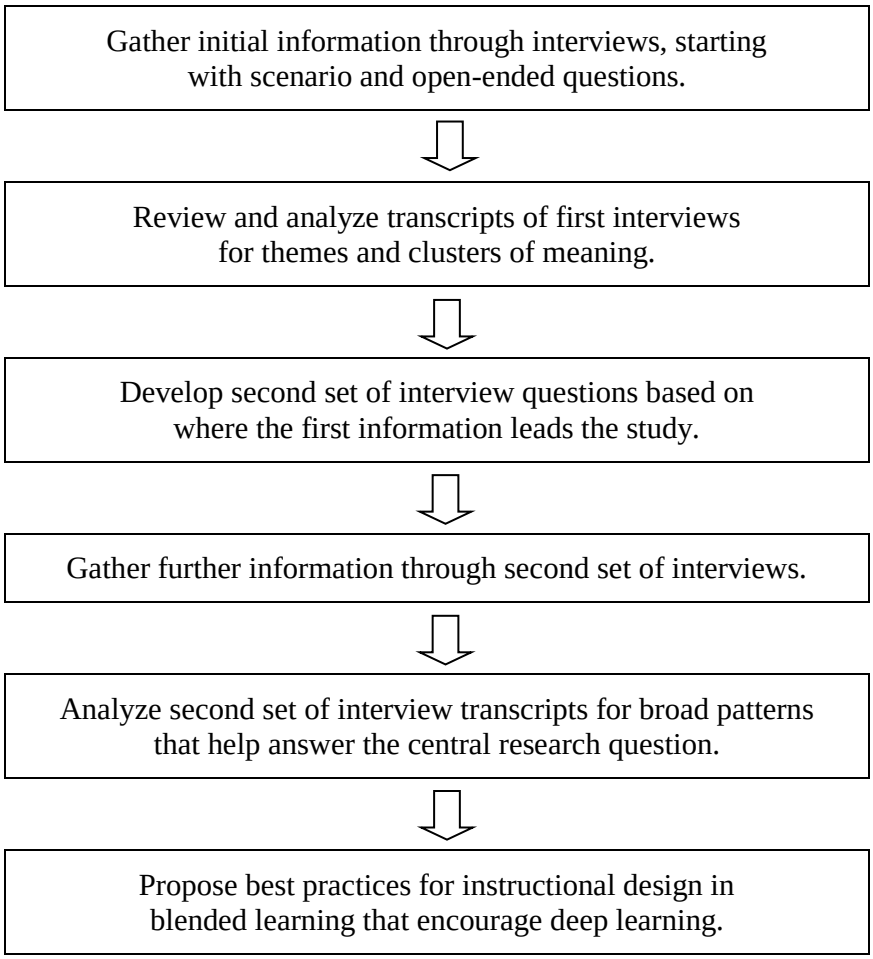

Figure 3: Qualitative, Inductive Research Process

Pilot study. The nature of the qualitative study did not lend itself to a pilot study; however, the scenario and first set of interview questions were reviewed by two educational professionals with both instructional design and teaching experience before research interviews began. Their valuable feedback helped clarify and fine tune the questions.

Data collection procedures and data treatment. Data for this research study was collected in two stages, through on-one interviews with research subjects. General background information of a non-identifying nature, such as the participant's discipline, level of education, teaching experience, general course design experience, and specific experience with designing blended learning was collected in the first interview. Each interview was digitally recorded (audio only) with the permission of the participant, and then transcribed by the researcher. For the first set of interviews, participants were given a simple scenario about converting face-to-face courses to blended delivery using educational technology, and asked to set aside administrative issues that may affect their role in course design and development to focus on creating learning opportunities. Each participant was asked five open-ended questions about their experiences with redesigning face-to-face courses for blended delivery. These questions were designed to draw out general approaches to redesigning a face-to-face course to blended delivery and included inquiries about determining the level of learning required, balancing face-to-face and online components in a course, ensuring the online components of the course are integral to student learning and promoting deep learning with the online components of the course (see Appendix B for detail). Once the first interviews were complete and transcribed, the data was analyzed using open coding, and grouped into emerging themes, according to the constant comparative method of data analysis. Software was not employed for this purpose; the researcher spent a significant amount of time completing the analysis and coding by hand.

Following the inductive style of grounded theory research, the results of the first analysis generated a second phase of inquiry. The researcher developed four interview questions based on themes that arose from the first interviews, to further explore the themes that arose in analyzing the first data. In the second set of questions, participants were asked to move beyond general approaches into redesign situations that were more specific. This phase of data collection asked participants how they would design learning activities and assessments for blended learning, for each of the domains of learning. Specific definitions of the domains were given, to provide context and align understanding (see Appendix D for detail). Because participants in the first stage of research indicated they were unable to separate institutional and administrative issues from course design, the last question of the second set of interviews attempted to shed some light on roadblocks they believed would interfere with their ability to design effective blended learning. The researcher also analyzed this data from this second stage of research by hand. The results of the two stages of research were, in turn, used to develop and recommend best practices in instructional design that promote deep learning for blended learning.

Data from these research interviews was transcribed and analyzed solely by the researcher; no other individual has access to the files. The digital audio files were loaded to the researcher's personal computer and then transcribed on the same computer. One set of coded and categorized transcripts was printed and used for the purposes of writing the thesis paper. All files will be destroyed one year from the date of successful thesis defense, in accordance with the requirements of Athabasca University's Research Ethics approval documents.

Strategies for validating findings. Creswell (2009) recommends seven strategies for validating findings and verifying for construct validity in qualitative research studies, and all seven were employed for this study. This study included prolonged time in the field, using two sets of interviews to collect data, and time in between interviews to review and analyze the data.

- Authenticating themes
- Member checking
- Rich, thick description of findings
- Clarifying researcher's bias
- Including negative or discrepant information
- Prolonged time in the field
- Employing peer debriefing

Authenticating themes. Seven themes arose from the initial data, which were authenticated by taking the principals back to each of the participants. Participants expressed interest primarily in what each theme meant and what was included within each theme. Participants were aware that the study included two groups with different job focus, and as a result, some instructional designers and some faculty members expressed interest in whether responses from the two groups showed distinct differences in approach to instructional design and in themes that surfaced. Themes were not affected by these discussions. Research participants were supportive of going forward to the next stage and asked to be scheduled for their second interview.

Member checking. Although research participants were offered opportunities to review transcripts of their own interviews as each batch of transcriptions were completed, none took the opportunity. Instead, partially polished research data was shared with the participants in four ways.

1. Before each of the second interviews, the researcher advised participants of the seven key themes that arose from the first data and discussed any queries regards differences between instructional design and faculty responses.
2. The script for the second interviews acknowledged that some first interview results had fallen outside of the expected pattern—institutional and administrative issues could not realistically be set aside during design activities—and the last question of the second interviews was created to specifically address this issue.
3. Throughout the second interviews, the researcher used the technique of mirroring and rephrasing participant responses together with quotations from that respondent's first interview to clarify meaning. This was particularly helpful in situations where the more focused questions of the second interview generated responses that either seemed to conflict with previous statement or statements that were simply not clear, and allowed some member checking to occur.
4. Partially polished research data was also discussed with participants at the end of the second interview. Participants were keen to learn what the research appeared to be indicating, providing an excellent opportunity to employ member checking strategies. As the analysis of the research data continued, these discussions continued with many, but not all, of the participants.

Clarify the researcher's bias. Researcher bias is clarified in this document in section *3.2: Role of the Researcher*. In addition, bias was clarified to participants at the beginning of each first interview, when participants were reminded of the working relationship that exists between the researcher and some of the participants, and the collegial atmosphere and attitudes among colleagues in education. Participants were

specifically asked to set these connections aside and focus instead on only the research questions; interview transcripts indicate that this strategy was successful.

Rich, thick description of findings; including negative or discrepant information. Research findings have been written up with a rich, thick description, and are provided in *Chapter IV: Results and Discussion*, of this document. A significant number of direct quotations are included to accurately explain the participant's stories. Unexpected data from the first interviews compelled the addition of a question to the second research stage that fell outside of the initial research intent. This anomaly was explained to participants at the beginning of the second interview. Data from the added question is included and discussed as part of the research results.

Employing peer debriefing. This study employed peer debriefing both prior to the research and throughout data collection and analysis. The researcher discussed the research plan and its possibilities with a number of faculty, instructional designers and others in academia who would not be in the pool of study candidates, to determine interest in the central question. The first set of questions was reviewed by two of this group, who provided valuable feedback. As data analysis began, the researcher discussed the codes and themes that were surfacing, along with the differences and similarities between instructional designers and faculty, with some of the same individuals, and with other educators who were not taking part in the study. Clarifying questions brought forward by peers were of significant help in determining the specific focus of the second set of interview questions, and again after the interviews concluded, during the time final analysis work occurred.

3.2 Role of the Researcher

In the case of qualitative research, the researcher must expect to be involved with the research subjects in order to understand their lived experiences and points of view. The researcher's role includes identifying, arranging to contact and then interviewing appropriate research subjects twice over a period of time.

Grounded theory research requires that the researcher bracket his or her interest and experience with the question to be studied. The researcher for this study works for an Alberta post-secondary educational institution and is working toward a permanent role in this field. She held the role of instructional designer for a 20-month secondment, assigned to design and develop both blended and fully online courses. The researcher's permanent role at the institution is as a curriculum writer; work she did for seven years and for one year since the secondment. In her curriculum writing work, she has been involved with, but not responsible for, instructional design activities. Prior to working in post-secondary education, the researcher designed and developed training programs and wrote course material in industry for ten years. The industry training work spurred her interest in the field of instructional design, including needs analysis work, program and course design, along with actually writing the course materials; however, the nature of industry training results in courses of short duration and none of the companies assessed their trainees, so this work could be considered to be a 'light version' of instructional design in comparison to design practices in higher education.

Like many others, the institution at which this researcher works issued a directive about a dozen years ago that an increasing number of programs were to be

changed to ‘laptop’ programs (using blended learning). Management facilitated access to blended learning through a controlled learning management system (LMS), and by providing students enrolled in laptop programs with the use of institutionally-owned laptop computers, loaded with appropriate software. Over time, it became apparent that very few ‘laptop’ programs used blended learning to its best advantages. Instead, academic schools posted course outlines and schedules online, provided some supplementary resource materials for students and in a few cases, used the LMS for formative assessments. Some might call these laptop programs the first step towards achieving blended learning.

The institution has consolidated most of its curriculum development funding. Access to this funding requires that each academic school work with an internal service department staffed with approximately 75 employees dedicated to various aspects of curriculum excellence. This department employs a group of instructional designers with various experiences and backgrounds to work directly with faculty and other subject matter experts to redesign and redevelop courses and programs for either blended learning or delivery fully online. Curriculum writers, multimedia developers and project managers work on development projects with members of the instructional design group to prepare the courses. In short, the institution set out to gather the required expertise to increase the quality and quantity of course development work.

This post-secondary institution is in an excellent position to move towards true blended delivery by creating courses that encourage deep learning, with components in both the online and face-to-face environment that are integral to

student learning. The knowledge gathered in this group of instructional designers combines well with the experiences of designers in other institutions around the province of Alberta to offer insight into best practices for the design of blended learning. Faculty members who were early adopters of the blended learning concept and have experience converting their courses from face-to-face to blended delivery offers a view that differs in some ways and yet dovetails with that of those focused on design.

This researcher has carefully bracketed the research by categorizing and defining the limits of the study. As a researcher closely involved with some, but not all, of her research subjects, she has cautioned every respondent at the beginning of each research interview to remember that they are participating in a study, carefully outlined the parameters of the study, and asked respondents to separate themselves from the collegial atmosphere of the day-to-day working environment.

3.3 Research Population

Sampling procedures. This research study used a combination of purposive and snowball sampling to select candidates. Purposive sampling, used by researchers to "… identify particular types of cases for in-depth investigation" (Neuman, 2006), allowed the search for candidates to focus on instructional designers and faculty members who most likely had worked on redesigning and redeveloping face-to-face courses to blended delivery using educational technology. Snowball sampling, which begins with a few people or cases and spreads out on the basis of links to the initial

cases (Neuman, 2006), helped to uncover additional potential research candidates with experience appropriate to the study.

This study was intended to employ an N of 10: six instructional designers and four faculty members. The initial request for research candidates, using purposive sampling, fell short of that goal. Five instructional designers accepted the research invitation, however one of these did not have experience creating blended learning, and could not be included in the study. Although four faculty members accepted the initial invitation to participate; two of these had experience teaching blended delivery courses, but no experience designing or developing blended delivery courses; these candidates were also excluded. Snowball sampling procedures brought additional qualified research candidates to the study; two instructional designers and three more faculty members were selected. The high quality of these research candidates resulted in a decision to include them all in the study, increasing the N to 11.

Sampling frame. Potential participants in this research study were drawn from post-secondary educational institutions, and contacted through an introductory letter sent by e-mail on behalf of the researcher by another graduate student. Participants were asked to contact this researcher if they were interested in becoming part of the research. Instructional designers who work for a number of Alberta post-secondary institutions were invited to participate. Six of those interested were selected; these participants met both the research criteria and were available for lengthy interviews. Faculty members were initially approached through their respective academic schools, and as word got around, some faculty members made inquiries about participating in the research study. Faculty who expressed interest and

fit the criteria became research participants; others did not, primarily due to availability for interviews. Five faculty members were included in the study.

Letters inviting candidates to participate in the study requested that each participant identify the amount of experience they had in redeveloping face-to-face courses for blended learning. This information was confirmed in the first set of interviews. Candidates who agreed to participate in the study received, filled out and returned informed consent notices for the study. Once the work began, there were no requests to withdraw from the research from any of the candidates.

3.4 Research Participants

This grounded theory research study was conducted with professional educators who work to design and develop courses and programs for blended delivery, using a combination of face-to-face and online components. Eleven participants were interviewed for this study: six instructional designers (55% of participants) and five faculty members (45% of participants). Choosing to include both instructional designers and faculty in the study is deliberate; each role has a different focus and brings a different perspective to the work.

Instructional designers focus primarily on the design and development of courses and programs. Often, they have graduate-level formal education in learning theory; they may or may not have a teaching background. Instructional designers are expected to apply their knowledge and creativity to a variety of subjects, to any required delivery mode, and to work with instructors, subject matter experts to develop effective learning experiences.

Faculty's key focus lies in teaching and research. In many cases, they are also expected to be involved in course design and development beyond the simple, annual updating of course materials, although they may not have any focused education in instructional design. Their instructional design work is often limited to courses they teach, but they may also extend their skills to other courses in their programs, where they have subject matter expertise. Faculty members sometimes have access to support in their development efforts through institutional curriculum development teams; however, such assistance is not always available.

Each participant in the study has been involved in the instructional design of courses—and sometimes programs—that were converted from traditional, face-to-face classroom or lab delivery to a blended delivery format of face-to-face and online components. Nine of the 11 participants in this research currently work in various post-secondary institutions within the province of Alberta.

All of the instructional designers who took part in this study have achieved a graduate-level education in their field; two of these are currently studying at the doctoral level and one already holds a doctorate. Four currently work in post-secondary education. Two designers currently work in industry; however, each of these has worked in the post-secondary environment in the recent past. Four of the six instructional designers in the group have teaching experience.

The five faculty members who participated in the study teach at a number of Alberta post-secondary institutions; one also teaches in industry. Each faculty member has been closely involved in course development for the post-secondary environment, in addition to carrying a teaching load. These faculty members have

held the role of subject matter expert (SME) for course development, and at times during their teaching careers, also been thrust into an informal instructional design role. All five faculty participants have also achieved a graduate-level education.

The participant background information that follows has been gathered from the interviews and/or is otherwise known by the researcher. The breadth of their work in the field of instructional design lends credence to the results of the study. Pseudonyms have been used to protect the privacy of the participants.

Instructional designers. Brief descriptions of the six instructional designers who took part in this research study follow.

Geoff is an instructional designer who has worked in education for 22 years. For the past nine years, Geoff has focused his work on instructional design, following a number of years teaching. He currently works as an instructional designer and supervises other instructional designers at an Alberta university, and has taught graduate-level courses in instructional design. Fourteen of his years in education have been in the post-secondary environment at a number of institutions; Geoff previously worked in the K-12 system. The combination of 14 years of face-to-face and blended delivery work, along with 12 years working in the online environment, make Geoff an ideal candidate for this study.

Jasmine is an instructional designer with 15 years of work in education at all levels. She has held the formal role of instructional designer in the post-secondary environment for five years, at two institutions. She also has 10 years of international teaching experience, at all levels of education. Instructional design, although less formally, was always considered part of her faculty responsibilities. Jasmine has

designed curriculum for face-to-face, blended and fully online courses on two continents.

Dratman has eight years of instructional design experience; for five of these years, he has been involved with converting face-to-face courses to blended delivery. His design work at three Alberta post-secondary institutions and one industry is coupled with experience teaching the principles of instructional design at an Alberta university. Prior to his work as an instructional designer, Dratman taught both post-secondary and K to 12, over the course of 10 years. His teaching roles required informal instructional design on courses where he was also the instructor.

Iris' work in education spans 16 years. Although she has formally worked as an instructional designer for post-secondary education for just three years, she designed instruction on an informal basis for high school courses in her teaching career, on two continents. Iris has worked on a number of instructional design projects that take traditional, face-to-face instruction and convert it to blended delivery, and has incorporated educational technology into her teaching for several years.

Keith's career in instructional design spans over 20 years and two continents. His work has been centered in adult education, and he has taught instructional design techniques at two universities. Keith has worked on converting traditional, face-to-face courses to blended delivery using educational technology for about 10 years. Although he has held the role of instructional designer in an Alberta post-secondary institution, he currently uses his skills primarily to design industry training.

Olivia has been an instructional designer for about 10 years, first becoming interested in the field when she was working as a media developer at an Alberta university. Her instructional design experience includes five years in post-secondary education and five years as a contract designer, dividing her time between academia and industry work. Olivia has experience designing course for fully online, and redesigning face-to-face courses for blended delivery.

Faculty. Brief descriptions of the five faculty members who took part in this research study follow.

Andrew is a faculty member at an Alberta polytechnic, teaching primarily English and Communications courses to students at two post-secondary institutions, for a total of 16 years' experience. His courses have used blended learning to some extent for about 12 years. For the past five years, Andrew's work has been divided equally between teaching and course development. His development work is focussed on converting courses from traditional, face-to-face delivery to blended delivery, and on developing courses for fully online delivery.

Danielle has been teaching and developing business courses for a number of Alberta post-secondary institutions and for several industry clients for 25 years. She developed and taught her first distance delivery course 10 years ago. Over the past five years, Danielle has worked on many courses that were changing from a traditional delivery style to blended delivery, acting both as faculty and as subject matter expert.

Erica has been teaching business courses at the post-secondary level for 18 years. She has developed a number of courses for distance delivery over about 12

years. For the past five or six years, Erica has been gradually blending the delivery of her face-to-face classes through the careful addition of online components.

Fred has been teaching information technology at the post-secondary level for more than 35 years, using educational technology in his courses for over 15 years. He has been teaching and developing courses for blended delivery for about 10 years. Over the past few years, Fred took the opportunity to be part of a team of instructors who redesigned and redeveloped an information technology program at an Alberta polytechnic, to better meet the needs of graduates and the industries that will employ them. He considers the use of online learning components to be a critical part of his courses.

Boris has been teaching computer courses for about 20 years, at four different post-secondary institutions. Although he has always incorporated online elements in his teaching, most of his intentional involvement in creating blended learning courses has been over the past five years. He began by making simple resources available online and has moved toward simulations, support reading, websites, links to websites and online quizzes, and is now looking for greater integration of the face-to-face and online components. Boris aims for deep learning in his courses, stating that graduating a student who has information but no transferable knowledge does not serve that student well.

Summary. The backgrounds of the research participants are summarized in Table 5.

Table 5: Research Participant's Backgrounds

Research Participant*	Years in Education	Current Role in Education	Other Roles
Geoff	22	Instructional designer, post-secondary	Faculty, K-12 and post-secondary
Jasmine	15	Instructional designer, post-secondary	Faculty, K-12 and post-secondary
Dratman	18	Instructional designer, post-secondary	Faculty, K-12 and post-secondary
Olivia	14	Instructional designer, post-secondary and industry	Media developer, post-secondary
Keith	20	Instructional designer, post-secondary and industry	Faculty, post-secondary
Iris	16	Instructional designer, post-secondary	Faculty, K-12 and post-secondary
Danielle	25	Faculty, post-secondary and industry	Subject matter expert
Andrew	16	Faculty, post-secondary	Subject matter expert
Boris	20	Faculty, post-secondary	Subject matter expert
Fred	37	Faculty, post-secondary	Subject matter expert
Erica	18	Faculty, post-secondary	Subject matter expert

** Pseudonyms have been used, to protect the privacy of the research participants.*

3.5 Significance of the Study

This research study has provided the opportunity to capture a purposeful sample of experience in the conversion of traditionally delivered courses and programs to blended learning using educational technology. It has opened a window into instructional design approaches that can be and are in use to foster deep learning for the student, increasing and enhancing learning opportunities, and further, provided data about approaches to the design and development of blended learning. Many post-secondary institutions are in the process of converting programs in this manner. The expertise and experience mined for this study provides significant value to institutions that are considering blended learning for their courses and to those already working with some blended learning, but are looking to increase learning opportunities within it. Instructional design approaches that foster deep learning are also applicable, in many cases, to post-secondary education delivered wholly face-to-face or online; hence the study results will be significant to these educators as well. The in-depth, rich narrative about the experiences of redesigning courses from face-to-face to blended delivery in a way that fosters deep learning adds to knowledge of instructional design best practices.

Chapter IV – Results and Discussion

4.1 Introduction

This chapter describes the data resulting from the qualitative interviews and discusses the results. Direct quotes from participants are used throughout this section, to clarify and illustrate themes and specifics. To avoid over-generalization, a rich, thick description of each participant's account is provided.

This qualitative research study was carried out through two sets of interviews. For the first stage of research, participants were given the scenario of a redesign/ redevelopment project involving a traditional, face-to-face course that was to be converted to blended delivery, using a mix of face-to-face and online components. The redeveloped course would need to support required student learning in both delivery systems. Five open-ended questions were asked, designed to focus on initial, more general approaches to this type of project. Participants were asked to set aside administrative issues and constraints, focusing their responses on creating learning opportunities. See Appendix B for scenario and question detail.

Responses to the first set of research questions showed some general differences in approach between the groups of instructional designers and faculty, particularly at the beginning of a project to redesign and redevelop a face-to-face course to blended delivery. Instructional designers appear to begin the process with a macro view, focusing on the course syllabus/outline to determine what learning is required, aligning outcomes, objectives and assessments strategies, and then moving directly to determining where the best application of learning will be for the subject. The instructional designers in this study work on many different

subjects, sometimes at the same time, and adopt a somewhat systematized approach to their work.

Faculty who took part in the study spoke of beginning a redesign project with a review of existing course materials, rather than at the syllabus. The more micro approach is not surprising, as faculty could reasonably be expected to have familiarity with the detail of most courses they would redesign. They spoke of aligning content and assessments with the course outcomes and objectives however, once they had reviewed existing content. In determining how to create a blended delivery course, faculty also identified the need to find the best application of learning in all cases, whether that would be face-to-face, online, or a combination of both deliveries to create learning opportunities.

The second stage of research was designed around the results of the first interviews. The responses from the first interviews indicated that design details of a course for blended delivery seemed to align with the dominant learning domain of the subject, and as a result, on activities and assessments that would support that domain. Three of the four questions in the second set of interviews focused on the use of blended learning to support the cognitive, affective and psychomotor domains, particularly exploring learning activities and summative assessment strategies.

First interview results also indicated that institutional and administrative decisions, issues and constraints play such a large role in determining the design of a course that they cannot be easily set aside, particularly when blended learning is on the table. Thus, the last question of the research interviews sought to uncover

roadblocks that may affect the development of creative and effective blended learning courses. See Appendix D for question detail of the second set of interviews.

4.2 Stage One of the Research

Analysis of transcripts from the first set of interviews revealed seven overall themes.

Table 6: Data Themes Derived from First Interviews

1. Program considerations
2. Course syllabus / outline
3. Review of existing course materials
4. Best application of learning
5. Online methods to promote deep learning
6. Collaborative work among course design team members
7. Institutional / administrative issues

The seven themes were further analyzed and subsequently coded. Some of the codes appear in more than one theme (e.g., outcome / objectives, learner profile / learner focus / learner preference / learning style. See Appendix C for detail.

Program considerations. The program of study in which a course resides is indicated as one of the critical pieces of information by both instructional designers and faculty when beginning a course redesign project, regardless of the delivery method chosen—the discipline naturally informs every course within that program. The potential balance of face-to-face and online components for blended delivery is also influenced by the specific program. Five codes surfaced in this category, as shown in Table 7.

Table 7: Program Considerations

Codes (*Frequency: IDs 16 / Faculty 25)*
Program requirements / constraints
External requirements – accreditation / industry / other
Program outcomes
Course fit within program
Learner profile / learner focus / learner preference / learning style

Program requirements / constraints. Program detail provides general information about the field of study—the type of work the program is intended to prepare students to enter. This is particularly important information from the point of view of an instructional designer, who does not have familiarity with every discipline. The field of study also provides some initial clues about learner profile and learner preference. An academic field will draw a different type of student than a technical field for example, and in turn, is likely to require a different approach to a blended course design. The balance of face-to-face and online components for a blended delivery course will need to be tailored to the field of study. While blended delivery can be successful for most subjects, programs that require more hands-on work on the part of the student may require a more creative approach to successfully blend delivery methods.

Program outcomes. Program outcomes—high-level skills the student is expected to acquire by graduation to be successful—are also key to the design. Danielle explains, "I would look at what are the outcomes for the program that the course is part of, so that I'm aware of not only the course, but the bigger picture of where it fits." Knowing what outcomes the industry in that field expects, or if there are no industry standards, outcomes set by the institution, frames the

program in which the new course must fit. Iris echoes this point of view, "If the endpoint [of a program] is to actually be doing tasks or working in a workplace or solving problems, then the level of learning has to be a lot deeper."

External requirements – accreditation / industry / other. External accreditation requirements, whether academic or industry-related, may significantly affect both a program of study and each course within it. The requirements and constraints of the accrediting body must be considered at the beginning of a course redesign. For example, an external body accrediting a pipefitting program may require that students complete a specific type of exam at the end of their program; the design of courses in that program needs to support students in preparing for that exam. Some types of business programs have specific accounting accreditations to which they are bound. Programs accredited by Transport Canada require that students have a certain number of hours in the lab and classroom, which will influence delivery methods for components in each course. Research participants agreed that course design needs to align with the requirements of external accreditation bodies associated with that program, in order to support student success.

"In my time and understanding now in how a course outline is put together, they are an extremely critical piece," Danielle clarifies. " … at one time when I started to get into this game, I thought that course outlines were something that somebody sat in a dark room and came up with. Now I understand that a lot of thought and input, industry dialogue has gone into what it is that people in that field need to know how to do, and then connected to the courses."

Course fit within program. All of the research participants cited fit of the course within the overall program as key information to gather before beginning the course design. Knowing the placement of the course within a program (or programs, as some courses serve more than one program) helps determine what content is needed and the level of learning the course needs to provide. "What comes before this and what comes after this? That determines the rigor and the amount of learning that the course would require," explains Dratman, an instructional designer. Danielle, a faculty participant, asked, "Where does it fit into the puzzle of the program? What is the continuum of learning from start to finish of this student, and what is the recommended learning journey?" Prerequisites and co-requisites are also determined from a close look at the overall program. Which courses provide learning upon which the new course will rely? Which courses will rely on the learning about to be developed? As important as it is to know what learning came before (prerequisites), it is equally important to consider which courses will rely on the learning in the course to be redesigned as their prerequisite, to ensure that redesigning one course doesn't inadvertently impair another.

Learner profile / learner focus / learner preference / learning style. The overall program of study provides the first clues to the learner profile and focus, along with what might be expected in the way of learner preferences and learning styles that need to be considered in the design. Research participants agree that deep learning depends on learner engagement in any course, regardless of the delivery method. Knowing who the learners in a program are lays some of the groundwork for design and development activity that will engage learners in their studies.

Course syllabus / course outline. This research indicates that the course syllabus/course outline is a key document in the design, and subsequently, the development, of any course. Research participants highlighted the importance of the syllabus, indicating that this document should form the deciding framework for the entire course—essentially the bones of the course. Instructional designers in particular identified the syllabus as the place to begin a new course design, citing the need to review what the syllabus already identifies in the way of required learning and assessment strategies before any decisions or recommendations can be made for potential change in either course content or delivery method. Both faculty and instructional designers stated that design and development decisions need to be aligned with and support learning identified by learning outcomes and objectives within the syllabus. As such, an initial review of the document, close examination of whether the learning identified in the current version is appropriate for the course, and careful thought about whether the assessment strategies will measure the identified learning, is essential.

Four codes surfaced with the analysis of the research data in this category, as shown in Table 8.

Table 8: Course Syllabus / Outline

Codes (*Frequency: IDs 53 / Faculty 49)*
Subject requirements / constraints
Outcomes / objectives - taxonomy and alignment
Assessment strategies - aligned to outcomes
Learner profile / learner focus / learner preference / learning style

Subject requirements / constraints. The subject of any specific course comes with requirements and constraints that may differ somewhat from those of the entire program of study. Within an engineering technology program for example, students have a variety of subjects to study—from math, science and technology for their specific field—through to report writing and communication skills. The type and level of learning for each subject needs to be reflected in the syllabus.

Olivia begins conversations about redesigning a course by asking, "What do students need to be able to do?" She illustrates her point by explaining that in a course about installing solar panels, the subject demands that some of the learning needs to be hands-on. Reading about and discussing how to install the panels without ever applying that knowledge will not serve the student when he is out on a roof trying to get the job done. "The ultimate goal," Olivia explains, "is to look at this and see how we're getting [these] students to the applied level, because that's going to be where they actually do get the deep learning, to be able to do it in some way." A natural requirement for this subject would be to create learning opportunities that allow the student to practice installation skills. The syllabus should reflect the application level of learning through some of the outcomes and objectives.

Subject constraints also need to be considered at the syllabus level. Boris, who teaches computer courses, explains that although his students need to be able to apply their troubleshooting skills after they graduate, some of their learning needs to happen in a controlled environment, to ensure they don't accidentally shut down commercial networks or unleash viruses on an unsuspecting public. The syllabus for this

particular subject should identify the critical thinking skills necessary to do the job safely and effectively, in addition to the actual troubleshooting work.

Outcomes / objectives - taxonomy and alignment. Learning outcomes need to accurately describe key, measurable skills and the level of learning within the skill that a student can be expected to achieve in the course, according to this research. Learning objectives for each outcome should be a collection of somewhat lower-level skills that when achieved, lead the student to achieving the skill described in the learning outcome. Both faculty and instructional design research participants expressed frustration with course learning outcomes that do not accurately reflect what the students are expected to learn, may not be measureable, and with situations when learning objectives are not aligned to the outcomes.

Taxonomies such as Bloom's are one tool that can assist in writing outcomes and objectives to accurately describe required learning. Andrew explains, "We'd start with determining the level of the verbs that we're using, measuring that against Bloom's taxonomy, and making sure that was the appropriate level at the appropriate time." He continues, "If an outcome is merely to be able to answer questions about something, it's going to be different than [one that requires] actually creating a document from scratch."

Erica uses taxonomy to align outcomes and objectives. "I tend to use Bloom's and say that the first section of the course tends to be on the lower level of Bloom's, but even within a particular section, the gears of objectives, I start with the lower levels and move up within it. I go through one part to the next, keeping that idea, moving up to application and then synthesis at the end of each section."

Instructional designers spoke of careful conversations with subject matter experts and other stakeholders in their efforts to uncover what the key skills for a course are and to identify the level required. Olivia explained, "I think it's a bit of a dance in terms of whether or not you're working with existing, grandfathered-in politics and issues that you don't know about and are connected to that course, so you have to tread lightly." The research also showed that there is value in reviewing other courses that may require similar levels of learning to the one being redesigned. This effort helps ensure that similar courses align with each other to create more consistent opportunities for learning.

Determining what students need to be able to do at the end of a course helps set the stage for opportunities that promote deep learning. Research participants point out the need to challenge students to stretch to higher levels of learning, rather than preparing a syllabus that aligns too closely to the skills students can be expected to already have when they begin a program. Fred uses course redesign as an opportunity to target higher skills. "If I'm redesigning a course from scratch, I love to get up higher on the level of Bloom's than is normally required in a technical [field]. We talk about comprehension and analysis, but I like to get into the synthesis and evaluation as well. So that means asking our students to do a little bit higher work."

Assessment strategies - aligned to outcomes. Assessment strategies are often sketched out in the syllabus. When beginning a course redesign, Danielle says, "The first thing I would do is make myself familiar with the course outline, the assessments within the course." Assessment information provides a window into what level of learning is actually being measured. Comparing the targeted learning to the

assessment strategies in the syllabus identifies gaps, whether those gaps exist in outcomes that are not measurable the way they are written, or gaps that need to be closed by revising assessments strategies. Outcomes that suggest learning at the analysis or synthesis levels, for example, cannot be accurately measured with assessments requiring simple, single answers. “I wouldn't use single answer exams if I wanted to approach deep learning,” Jasmine explained. “To approach deep learning, I'd ask them to do a research paper or create a presentation with a bunch of people that showed synthesis from one idea or one task [to show] how you would apply that to another.” Similarly, an outcome that requires application needs to be measured in a way that shows the student’s ability to apply the skill. Multiple choice exams generally target only basic knowledge, Olivia stated, “If it’s 100 percent multiple choice, obviously it's not too applied.”

Aligning assessment strategies to appropriate learning outcomes at the syllabus stage helps lay the necessary foundation for work with the actual course content.

Learner profile / learner focus / learner preference / learning style. Students come to post-secondary education expecting to learn skills that will, directly or indirectly, help them make a living. As discussed, different fields of study will attract learners with different profiles and focus. Learning preferences and styles will also vary. Although these issues may have already been considered in the design of the overall program of study, they also need to be considered on a course-by-course basis.

Geoff explains, “I've worked with engineers where I've tried to bring in a bunch of education and arts stuff into engineering. That does not work!” Those same engineers may need to learn communications skills however, and they may need to approach those skills in an entirely different manner than an English student might. Geoff continues, “There [are] some disciplines that do things a certain way, and the last thing I want to do is bring in a whole bunch of stuff from another discipline and really rock their world that way.”

A well-written syllabus takes the learner profile and focus, along with the anticipated learner preferences and learning styles into account, through careful wording. Students need to understand the direction of the course, Jasmine says, and the syllabus not only sets the course direction, it addresses the student’s need to know, “Is there a path I’m following? What do all these hoops symbolize? What’s at the end? What have I achieved?”

Review of existing course materials. In this category, instructional designers and faculty diverged in their responses. Although both groups indicated that they would spend considerable time reviewing the materials, faculty generally identified reviewing existing course materials as part of the initial approach to redesign. Andrew said, “The first thing I would do is look at the material that exists.” Danielle, who teaches and acts as a subject matter expert for courses that she does not teach, would also approach a redesign by reviewing existing material first, to ensure that she had a knowledgeable foundation of what the course is, what it's trying to cover and the status of the course materials.

Instructional designers did not discuss reviewing existing course material as a first step. Instead, they would determine the fit of the overall course into the program, and then spend time reviewing the course syllabus for potential issues. Review of existing course material would come later, when they were ready to appraise the material against agreed upon outcomes, objectives and assessments strategies in the syllabus, to see what would work and what might not.

The difference in approach can most likely be attributed to the differing roles each group carries. Faculty would generally have some familiarity with existing course material, whether through their own teaching or as a subject matter expert in the field of study. Instructional designers appear to default to a more systematic approach, which may increase their ability to design for any course in any subject, regardless of the subject matter.

Although the timing for this category differs between the two roles, both faculty and instructional designers spoke of the necessity for a detailed review of existing course materials. Four codes surfaced in this category, as shown in Table 9.

Table 9: Review of Existing Course Material

Codes (*Frequency: IDs 30 / Faculty 54)*
Currency and accuracy of content
Content alignment with outcomes and objectives
Appropriateness for online
Learning activities and assessments

Currency and accuracy of content. Learning material for a course comes in many forms. A course that is currently taught in a face-to-face manner may have reading materials such as textbooks, module style information written at the institution, handouts prepared by instructors and other printed content, along with

slide presentations and lists of resources that are made available to the students. Depending on the course, there may also be a lecture component of significant size. Redesign efforts to convert a course from face-to-face to blended delivery should include careful review of the materials in use. One concern that research participants raised is the currency of the content. “So basically, every year we have to throw away about 80% of the content and start over, because IT changes so quickly,” Fred explained. “What was leading edge a year ago is now obsolete.” While that statement cannot be generalized to all subjects, textbooks and other printed materials do become dated. Lecture notes and slide presentations prepared for a face-to-face environment may have been in use for some time, and be out of date. Accuracy of the content is also a concern. Geoff rationalizes, “The content matters, because I know when you do stuff like health courses, if we screw something up, people die! Which is very different than if you're doing a penmanship course and people mess up their paper,” Although corrections and updates can be quickly identified in a face-to-face setting, that is not the case for materials that may end up online. A course redesign provides an opportunity to consider the currency of all course materials, instead of simply re-using dated content in a different format.

Content alignment with outcomes and objectives. Preparing a course for blended learning does not necessarily require that a large amount of content be made available online; however, instructional designers and faculty in this study indicated that there must be sufficient content available in one form or another to support the learning outcomes. “We're not as key and integral, part of the journey as we used to

be in straight face-to-face learning, where we were actually feeding information. Now we're facilitating [students] finding and utilizing the information," Danielle said.

Specific course content must also be considered in the case that learning outcomes or objectives have been adjusted in the syllabus. Changes to outcomes or objectives may trigger significant change to the course content that have to be addressed. If the outcome specifies an analysis skill for example, the content needs to support the student in achieving that skill, as opposed to a simple knowledge transfer. Danielle explains, "I would take this as the opportunity that if there was something that was off track or not in full alignment with the course outline, this is the time to bring it back in alignment."

Appropriateness for online. Reviewing the existing course content can also be a step towards determining which components of the course might work online and which should remain face-to-face. When reviewing existing content, Jasmine says, "I'd look for perhaps obvious divisions, what I would see as obvious places where you could say, 'this really is a great lecture component or a classroom discussion component … this piece is a little more intricate. Students are going to need more time. They're going to have to understand the model. Is there a learning object that we could design that would facilitate this?'" Instructional designers sometimes need to do a little detective work, Olivia says. "There's all these little clues that are shown to you, and that's in the curriculum, and so it's a matter of making sure to ask the right questions, dig deep enough into some of the materials to sort of make some valid recommendations to the instructor to say, 'Hmmm, I notice here in your content it's an engineering drawing course and it's all lectures, and you're showing

them lots of drawings, but where are they drawing? What are they doing? Where are the components that they're drawing?"

Learning activities and assessments. Existing learning activities and assessments also need to be reviewed. Is the intent of each learning activity clear? Is it an integral part of the course? Does it support the required level of learning? If not, could it be adjusted to work? Do the current assessments measure the level of learning specified in the learning outcomes? If not, can they be adjusted to measure appropriately, or will they need to be replaced? Which of the existing activities and assessments need to remain in the face-to-face environment, which would be effective in the online environment and which could possibly work in either environment?

This research shows that a review of existing course materials helps to provide clarity about which content can be reused, what must be tossed, replaced or reworked, and what might need to be created to fill gaps in content.

Best application of learning. Every research participant singled out the best application of learning, regardless of the delivery method, as the most important factor in any course design. Although creative blended learning design provides opportunities to deliver course components face-to-face, online or with a combination of both delivery methods, determine where learning needs to happen to most effectively meet each learning outcome of the course, and where assessment will best be able to measure that learning. Although all participants were willing to be creative in their designs for blended learning, their opinions were strong and universal: *build best application of learning into the course design*, so that course elements are delivered in the way that provides the best learning opportunities for students.

Frequencies were very high in this category, with six codes emerging, as shown in Table 10.

Table 10: Best Application of Learning

Codes (*Frequency: IDs 136 / Faculty 140)*
Content / subject requirements / constraints
Learner profile / learner focus / learner preference / learning style
Natural fit of f2f and online learning
Build learner engagement
Activities that align with outcomes, regardless of delivery mode
Assessments that align with outcomes, regardless of delivery mode

Content / subject requirements / constraints. The subject of a course often suggests the best delivery method for at least part of the content. Iris explains, "It's dependent on what kind of program it is, what kind of course it is, and then I'm just always looking to see what information needs to be delivered or transferred, and where does actual learning have to happen. Where does application have to happen? What's best done online and what's best done face-to-face." Fred agrees, "It sounds like 50:50 [face-to-face and online] would be a nice place to start, but certainly technical courses sometimes will need a little more face-to-face, depending on the content, and we supplement the learning with the online activities."

In the business courses Erica teaches, she considers whether the subject will lend itself easily to a lot of online, self-exploration. Dratman considers, "What can the student be responsible for? What doesn't the instructor need to be there for?" Subjects which can be taught using "… any sort of collaborative learning, where you have the students in charge of what they need to learn, with the teacher merely acting as a facilitator," can be more easily designed for blended learning, he says, because, "you

can put that over into the online portion, have discussions boards and work with synchronous values as well."

Subject constraints sometimes play a significant role in delivery method as well; which delivery method will best support the required learning? Courses with a large component of learning in the psychomotor domain are often taught primarily in a lab or shop, for example, and may pose challenges to convert to blended delivery. Dratman explains, "Things like labs and competency-based learning, where you have to see an observable skill, obviously that has to be in a classroom." Those subjects requiring control for safety or security purposes—certain types of science labs, electronic circuitry, gas appliance troubleshooting, for example—might need to be taught in the controlled environment of a campus. In his computer courses, Boris finds that it's "fairly easy to distinguish what's available for online: the [competencies] that don't require direct supervision." Subjects that require access to large or expensive equipment (e.g., manufacturing, aircraft maintenance or sheet metal work) might seem to be obvious choices for face-to-face courses; however, students studying these subjects also need the cognitive learning that supports their psychomotor skills, and this part of the learning is not constrained to a classroom.

Learner profile / learner focus / learner preference / learning style.

Knowing who your learner is likely to be helps determine where the best application of learning is likely to be. Courses that attract learners who are directly out of high school, which is often the case with first year undergraduate students, have very different learner profiles from courses with learners in graduate programs, and from those in trades programs. The design of blended delivery courses needs to take into

account whether the students are likely to have online experience and be likely to utilize the online portion of the course. In some programs, the learner profile may indicate that not all students have continuous access to computers. Designing the online portion of the course may trigger institutional arrangements for computer access, through specific computer labs, the library or even an institutional laptop program.

Boris recognizes that although students in his computer courses are comfortable online, he needs to consider learner focus and learning style. “I find that there are certain things that generate ‘Aha!’ moments in almost any course I teach … steering the student towards that ‘Aha!’ moment I think really requires a hands-on approach, because every student is steered slightly differently, and through slightly different analogies. At the best of times, I can maybe get a quarter of the class to get that ‘Aha!’ in any given instant. And sometimes it takes three or four shots at it, and three or four different methodologies, before all of them get that flat-headed, 'Oh my God! This is what that means!'” To address the differences when designing courses for blended delivery, he explains, “Probably what I would do, if I actually have free reign in separating those [face-to-face and online components], is I find that there are certain things that generate ‘Aha!’ moments in almost any course I teach. And there's a lot of supplementary material that helps you build up to that ‘Aha!’ moment. So the supplementary material, the acquisition of information at this point, is easy enough to slip into an online component.”

Erica recognizes learner preference and learning style in her design efforts. In some courses, she says, students bring strong preferences that can be addressed by

choosing whether to use face-to-face or online components for the material. In Economics, for example, "… they come into it with, 'It's Math, yuck, I have to graph.' So there's like a barrier there initially, so I would see probably [design] a lot more face-to-face."

Geoff takes time to consider what the students are used to when he begins designing a course. "[There are] some disciplines that do things a certain way, and the last thing I want to do is bring in a whole bunch of stuff from another discipline and really rock their world that way … sometimes it just doesn't work." The discipline can be a critical design factor that is best recognized at the outset, he says. "I've worked with nursing students, and it has to be this way because it has to be this way."

At the beginning of a project, whether the best application of learning will occur online or in a face-to-face setting may seem obvious to an instructional designer; however, careful evaluation of learner profile, focus, preference and learning styles sometimes shows assumptions to be incorrect, and may significantly change decisions about which components to deliver online and which to keep in a classroom.

Natural fit of f2f and online learning. The most natural fit of face-to-face and online learning is one way to determine where the best application of learning will be for each part of a course, whether that's online or face-to-face. Dratman explains his approach, "I would look at [the course components] and see which of these would have to still be done face-to-face, and which could be done as an independent learner, or in a guided, facilitated role, online or independently of the instructor. I'd sort of create two columns at that point and write down each of the assessments and

assignments, which ones are straight to instructor, which ones are straight to an online type of material that I would use, and then possibly a third column in which I would put materials that could be converted either/or."

Looking at the natural fit begins the decision process, but should not be the only consideration. "You look for the pieces that lend themselves to one or the other, and sometimes it's the expected patterns and sometimes it's not," Jasmine says. "Instructional design is very fluid. There's no one answer or one way of doing anything." A good example of when expectations might need to be set aside might be in Boris' computer courses, where assumption that computer students would be comfortable learning higher-level concepts online proved to be incorrect.

Olivia looks at instructional issues in the existing course to determine the best fit of face-to-face and online components in her design work. "I think the instructional issues should drive the truck, and that you can have options [about] how you facilitate that learning, and customize it to the delivery mode. Okay, this component would work online, but start with instructional issues first, and then deconstruct it to say which component will work online and which are better face-to-face, with a mentor component." Attending to instructional issues helps provide the best application of learning for each component to support the student, given the circumstances of the course. "You can usually take those instructional issues and break them down to convenience factors for marking, or collaboration issues to get students talking or sharing assignments or information. You can always divide and conquer in terms of the delivery mode, after you've identified what the achievable instructional issues to solve in this development are."

Build learner engagement. Learner engagement is one of the keys to promoting deep learning. Courses that encourage active interest in learning materials, integrating the new information and relating it to previously learned content help students conceptualize at a high level. Without engagement, surface learning is most likely to result. Instructional design for blended learning provides opportunities to build learner engagement.

Danielle believes that blended learning is different from traditional face-to-face for more reasons than the components. "Instead of it being lecture, handholding, that kind of stuff, it's more facilitated, facilitating the journey. We [instructors] are not as key and integral, part of the journey as we used to be in straight face-to-face learning, where we were actually feeding information. Now we're facilitating them finding and utilizing the information."

Online components in some courses can help build student confidence as they work through the materials, Erica believes. For challenging content, students have the opportunity to learn the content in their own way, without feeling that they are behind because they didn't get an answer as quickly as their classmates, and subsequently disengaging from their learning in frustration. "I think online can be very powerful like that … you don't have to feel intimidated."

Building learner engagement needs to be inherent in the design, Jasmine explains. "Realistically, if you're able to support and encourage the learner to see the progress of, 'Okay, at the beginning here I learned the basics. I learned the basics and I understand how the fundamentals work.' And then if you move onto the next part, it's like, 'Oh, I can see how this builds on that. I can see the inter-connectivity. I can

see the relationship here. I can understand how we've moved from this to this.' It [building learner engagement] doesn't necessarily have to be complicated," she clarifies. "I think that's something that is often misunderstood, or misinterpreted. It can be a simple progression. It can sometimes even be a question - the same question. If you're talking about this, the students are learning different depths of information based on the same fundamentals. We all do this in life."

Building learner engagement does not necessarily mean separating a course into exclusively face-to-face and online components. "I was the one teaching it and presenting it to the students," Geoff explained, "there wouldn't be a separation, like 'Oh, this is face-to-face, oh, this is online.' [Instead I'd say] 'We had a conversation last week and now we're going to build on that.' The fact that the conversation was online is no different than the conversation could have been face-to-face. So I don't treat it as two separate modalities. It's all their learning, and their engagement with the learning."

Activities that align with outcomes, regardless of delivery mode. Participants agreed that learning activities for a course need to align with learning outcomes and objectives for that course. While some activities are more effective in face-to-face scenarios, Keith explains, others may work better in a virtual environment; however, if the learning outcome describes a higher-level skill, in the analysis range, for example, students require learning activities that support more than just the acquisition of knowledge to support their learning efforts.

Jasmine recommends creating learning activities that help scaffold the learning. "Build on previous experience. Make it relatable. Make it obvious why

they're doing what they're doing. What is the outcome of a particular activity? Why are they doing this? Students, like everyone else, like to know that there's a reason, that they're not just jumping through hoops." She continues, "If you're driving a car, you learn with the basics. The gas makes it go and the brake makes it stop; but what happens when you're driving on ice? How does that work? So you can't necessarily understand that unless you logically move through the progression of different experiences on how these things work. The fundamentals are great, but somehow you have to build in the extra pieces."

Danielle suggests creating balance between the face-to-face and online activities that will not only support learning outcomes, but also facilitate the student's inquiries. "Send the student out to go and find and use and explore the resources that are available to them, and support the student back in the classroom as they have questions, need clarification. If they get lost, give them some support and handholding, almost a parallel to what a supervisor would do at work," she says. "The online pieces would be exploring resources, tools, strategies, templates, websites, videos, you name it, the whole beautiful menu/array of learning options."

In the case of online learning activities, Geoff looks for activities that are relevant and relatable, citing an activity for those operating picker trucks. "You have the picker trucks and you just extend the crane out and the crane goes and picks things up, but if it tries to pick something up that's too heavy, the crane falls over or the arm doesn't go out far enough. It's those types of things where there's a lot of variables and it's authentic … I think it's better for [picker truck operators] to crash on the computer than to go out and wreck somebody's $200,000 truck. And get killed.

I need the multimedia piece to be interactive. I need them to be authentic, because it's going through the process of figuring out whatever they need to figure out, that's where the deep learning starts."

Assessments that align with outcomes, regardless of delivery mode.

Assessments also need to align with learning outcomes. Higher-level skills generally cannot be measured with simple assessment strategies such as online multiple choice exams, according to participants in the study. Instead, assessments must target the skill level indicated in the outcome. For example, an outcome that indicates application of a psychomotor skill cannot be realistically assessed through a written exam, but assessing the application of math formulae would be possible. If a course exam requires that students match definitions to terms in their field, but the outcome indicates an analysis skill, the assessment does not measure the appropriate skill. Alignment issues tend to surface during the review of existing course materials, according to the research participants. It may be that the assessments simply haven't been kept current with changes to course outline detail. It may also be a matter of clarifying exactly which skills are required, and then making the adjustments. Regardless, assessments need to measure whether the student has achieved the identified learning.

Dratman determines what to assess face-to-face and what can be assessed online by looking at, "the competencies that need to be assessed specifically by the instructor, in front of the instructor, and what can be done by the student away from the instructor," and then moves on to designing the actual assessments. Students can be assessed on multiple points through one assessment that will allow them to build

from fundamentals, through to something more complicated, if the assessment piece is designed well.

Geoff prefers to build projects that are used both as learning activities and as assessments into a course wherever possible, and include both online and face-to-face components. “They have to build something, I like constructionism. So the whole semester, they're building towards this bigger project, whatever the big piece happens to be. It could be a presentation; it could be a cabin, for goodness sake … if you can set the online activity so that it matters to the big project, whatever it is, that is where the planning happens for the group; All your planning is going to be online, because I need to see a record of it. You can't go to the coffee shop and exclude one person and then say this is what we're going to do. It's almost like saying here's your research plan. You give us the research plan and then you go do your research. I follow a kind of similar model that way.” When the project is completed and turned in for marking at the end of the semester, students will have gone through a number of steps in their learning that contribute directly to the project, and in turn, directly to the learning outcomes.

Online methods to promote deep learning. Creating blended delivery courses with online components that are both integral to student learning and promote deep learning seems to lie in the design of the learning activities and assessments. Although each participant could provide examples of stand-alone online learning activities, they all favoured a careful, intentional combination of online and face-to-face components in a blended delivery course that could be woven together with teaching presence to promote deep learning. In this category, the research indicates

that determining whether deep learning has occurred can be measured using assessments that can be accessed, completed and/or submitted online, by assessments that are aligned directly to the course learning outcomes. Although only two codes became evident in this category, the frequencies were high, as shown in Table 11.

Table 11: Online Methods to Promote Deep Learning

Codes	(*Frequency: IDs 89 / Faculty 92)*
Activities to target deep learning	
Assessments to target deep learning	

When designing a blended learning course, Jasmine maintains, it's important to ask what the students need to know and how you can get it to them in the most effective way possible. These answers help determine the best delivery methods for components within the course. The next question is how to prepare the course content to make it relatable for the student—in essence, how to provide the best opportunities for deep learning indicated in the outcomes.

Activities that target deep learning. Study participants spoke about using online and blended learning activities to target deep learning, explaining that learning has to be meaningful in order for students to achieve deep learning, and so the activities or resources that are put online need to be meaningful for the student. "You find that balance between inspiring learning and making it meaningful," Olivia says. "I think sometimes where we go wrong with some of the development, is that we think 'more is better,'" and that is often not the case.

Reflection. Keith encourages deep learning by designing activities that combine applying the recently acquired knowledge with personal and group reflections on what has been learned. Erica and Dratman promote deep learning by

giving students more responsibility for their own learning. “There are some things that are more complex, and if you really want them to dig down, they're going to have to figure out, ‘What does this have to do with that theory I've learned?’ If they really want to get that deep learning, they'll have to do it through some process of discovery, … getting past the theory and [asking] what really does this mean?” explained Dratman.

Guided discovery. Dratman chooses activities that reflect the synthesis, evaluation and creation levels, aligning the activity according to the level indicated by the learning outcome. “I'm a big fan of guided discovery, and so I say that the learner is responsible for their own learning … so I pose a question. I really believe in the task being an inquiry base of some sort … deep learning comes from the student not only just providing the answer, but doing the necessary steps in order to show that they discovered something, that they brought something out. That'll create the deepest learning as far as I'm concerned.” Being in charge of what they have to learn and how they have to learn it, the student will likely retain their learning for a lot longer than simply answering some questions.

One activity, delivered both online and f2f. Fred recommends preparing one learning activity with two deliveries that support each other. He sets up group debates in his course and then sends his students online to research what they need to address the debate questions. Although the debate itself is done face-to-face, the online learning component is finding the best information possible to answer the question and to understand both sides of the issue. “It's getting down into much better websites. It's doing a little bit deeper research. In the process of the research, they

have to ask themselves other questions. And I think that's where the deep learning happens, when they start asking themselves questions and not just what we ask them," he explained.

Learning activities delivered with dual methods, tied together through teaching presence, offer opportunities for deeper learning. Students feel, "connected to their professor … they've been given respect, someone's caring about the fact they're working or reading," Iris said. Collaborative work, along with the chance for students to debrief online with their colleagues about whatever they have done will also promote deeper learning. "I don't treat it as two separate modalities. It's all their learning, and their engagement with the learning," Geoff stated.

One example of a dual delivery activity would be when the online portion can be used for either preparation for face-to-face or reinforcement of learning. A skill that requires practice, such as using a particular hand tool or tying a type of knot, might be made available on video to be watched several times, anytime, anywhere. The student might learn the skill in class and then practice with the video, or learn the skill through the video and then demonstrate proficiency in class.

The online portion of a course can be a good place for students to read content, articles, watch videos and do some research—anything that requires transfer of information—but these activities need to be connected with follow-up, whether face-to-face or online, Iris explains. "We could have students read an article and then have a group discussion around it, or you could have some kind of forum postings going around some discussion, which means you're linking the online components … I think if it's just a bunch of information, then they'll take it or leave it, or just skim

over it." The connections help make the activity integral to the learning experience. "These days students know they can go to Google and get anything they want, so online shouldn't … just be like someone else did the Google search for you and put the information up," she explained. "It's about designing specific tasks for [students] to do that connect to something else," leading students to bring together everything they know.

Thoughtful instructional design is key to keeping the students' attention. Iris points out that, "Students can see right away if you've just thrown a random collection of stuff [online], as opposed to a really well designed course that makes sense … [use] progression, they can see this links to this, this links to this, it links to this. I think it's far more going to foster deeper learning than if there's just a bunch of resources online."

"We can't always plan the 'Aha!' moments," Jasmine explains. "They're not all the same for every student [or for] every class, but being able to bridge that by making the activities, the assessments, something that [students] can relate to, that they can say 'okay, this is how it works; I can understand that in relation to what I learned previously over here, and I can take that to the next level, the next point, the next important pieces,'" will promote deep learning.

Design to facilitate. Danielle designs a blended course so that, "the instructor is actually the learning facilitator and engages the student in all kinds of discussion and dialogue, challenging their thinking." She uses online activities such as, "exploring resources, tools, strategies, templates, websites, videos, you name it, the whole beautiful menu/array of learning options," along with online discussions to

encourage interaction with other students. Danielle says, “The more introverted students may become extroverted in an online environment, so by there being a combination of dialogue in the classroom in a face-to-face environment and dialog and interaction in the electronic world, we can meet all the learners, whatever the style is.”

Using online discussions. Some of the research participants designed online discussions into blended courses; others did not. Olivia explains, “The work is trying to figure out a really interesting, meaningful discussion that the students are either going to be inspired by or interested in, in what other people think or feel that there's value to that discussion.” Danielle tries to incorporate discussions on all the critical, relevant topics, the foundational information. “I would build in the opportunity to throw new ideas and challenges and media coverage and 'did you knows' into [the course], almost like a blogging within the course, to keep the discussion going, to keep the students’ interest,” she explains. Instructional designers who did not use discussions in their blended learning designs gave reasons such as a low level of institutional support and lack of faculty buy-in. Faculty participants indicated a preference to keep the discussions in the face-to-face portion of the course for the sake of teaching agility, and expressed concern over possible additional workload.

Media objects. Opinions on the value and type of complex media objects to develop for the online portion of a blended course were widespread among research participants. Although both instructional designers and faculty saw some potential value using media objects, they expressed concern about whether the learning value would be significant enough to justify their use. High costs, in both time and money,

would need to be weighed against educational reasons when deciding whether to design a media object. Questions were raised as to whether a media object would:

- Support required student learning, with the complexity required to encourage deep learning
- Be interactive, and at a high enough level to keep students engaged
- Offer learning that could not easily be achieved in another way
- Result in locking a course into an expensive media object at the risk of losing flexibility as technology changes
- Be constrained by availability of time and resources for development

"We can do all sorts of pretty stuff," Andrew says, but expresses concern that it may be "passive and pointless," instead of engaging students in their learning. "I think things will be changing," he admits, "we're so tempted by the [learning] objects we can make, because that's fun, but I think more and more we will be questioning the value of those." Flash cards, drag and drop activities and online crossword puzzles are media objects that have their place in providing the basics for students, but support only surface learning. Participants indicated that animations, simulations, interactive learning games and video are more likely to support deeper levels of learning.

Iris has had some positive experiences with more complex media objects. "I've seen … where people build really complex designs like tear-aways where you take layers back and you can see underneath it. That can be pretty helpful if you don't have the equipment to actually get your hands in, or are not allowed or something." This type of media object can be designed to be interactive according to student choice, scenarios "where you otherwise get to see a whole bunch of scenarios and

what would happen," in a safe environment. This type of media object can also be designed with specific controls built into it, such as an exploding diagram of equipment that has been animated. "I think we're talking big budget when you're talking objects that have breakaway, and maybe we don't have those constraints. But creating breakaway images and being able to look inside engines and things like is pretty effective," she explained.

Boris has incorporated complex simulations into his courses, to mixed reviews. "I've tried to use simulations in the past and I've seen two outcomes from it. Either it accelerates that 'Aha!' moment, or the students just glaze over and treat it like a YouTube video. I had a simulation designed … to show encryption methodology … I thought it was great … and it failed. It was just not well accepted by the students, because they are used to such a high level of simulation in games, that poorer simulations focussing on just a simple technical aspect, they just dismissed it, out and out. I was discouraged," he explains. He does see value in simulations when they provide learning that cannot easily be achieved in another way though, "A good example is a simulation I was using one time for how processors work inside. You can't peel the top off an integrated circuit and stick probes in it, so this worked really well. They could actually see things flowing through … fairly well" online, Boris continues, "… then I was able to incorporate it with a project … I had my students design a CPU from scratch by using discrete components and build it into about a five foot by five foot case, with LEDs showing the flow of data, and then they could compare it with the software simulation and actually see things happening."

In his instructional design work, Geoff prefers to use media objects that are authentic, interactive and relatable, but not necessarily 100% realistic. Referring to the picker truck operation activity discussed earlier, he explains, “It's those type of things where there's a lot of variables and it’s authentic … I need the multimedia pieces to be interactive. I need them to be authentic. When it comes to realistic, I don't know how important that is.” The operational skills the student needs in this case will prevent injuries that could result should the picker truck tip over, do the focus is on that skill, not on whether the animated truck is 100% realistic.

By themselves, media objects do not promote deep learning, but they can either begin or reinforce the learning, according to this research. The scaffolding around the media object that initiates the process of solving something is where deep learning happens, according to the participants. “When I was teaching per-calculus, some of the tools for looking at functions and changing the variables and you've got a sliding scale and you see how that changes the graph, those kinds of tools, very visual tools, can be really helpful,” Iris explains, but without the theory to go with the media object, the learning is incomplete. In this case, the media object reinforces the learning. “I would say media engagement should be for reinforcing, and then if you've got massive budgets, really good case study scenario situations are really effective. You can build a complex case study, where you choose this and it leads to that,” she rationalizes.

“We don't have many simulations, and I'd say that type of component could make a big difference in some courses,” Erica states. Media objects like this need to be tied directly to required learning to be justified. The cost in both time and

resources for this type of media object can be very high, which could be difficult to defend without evidence of need and educational value, possibly for years to come. Instructional designers in the study caution that media objects can be considered a waste of time and money, entertaining instead of educating, and sometimes only make it seem like people are learning. Instead of focusing first on showy media objects, they recommend, study the learning outcomes first; then design the course to support student learning.

Assessments that target deep learning. Research participants agree that learning within a course should progress to higher levels of skills and deeper learning, as the course itself and the overall program of study progresses. Learning progression should be visible in the learning outcomes of the course and assessment strategies aligned accordingly. Earlier courses within a program and earlier outcomes within a course may be at different levels than those that come later, and as a result, not all assessments would be designed to target deep learning. In discussing online assessment strategies, participants indicated that in a blended delivery course, assessments and assignments might be provided online or face-to-face, completed in either mode or as take-home work, and then submitted in a variety of ways as well. In most cases, the online piece of a blended delivery would become a communication tool between faculty and students for the assessment, rather than the assessment itself.

To approach deep learning, Dratman might ask students to, "… do a research paper or create a presentation with a bunch of people that showed synthesis from one idea or one task, [to explain] how would you apply that to another?" The assignment is not bound by any one delivery method. Instructions for the paper, communication

among the student group, submission of the research paper and even a presentation could be handled either online or face-to-face. The subject matter of business courses often requires online research; many of the assessments are submitted online as well. Danielle prefers to, "incorporate the assessments to be very, very exploratory and where [students] have to translate and utilize information to come to a conclusion that's in alignment with the course outcomes and objectives," to approach deep learning. Instructions for these assignments may also be provided online, but could also be given as part of the face-to-face time.

Fred described an assessment he uses for a group project that requires both online and face-to-face work on the part of the student. "The assessment comes in many forms. It comes in how the group is performing together, how the group is working individually, are they meeting their goals and their set targets? And then there is an online component, because we're on D2L, where I can ask them weekly questions where they have to answer on an individual basis on their research. So even though the group is answering the same questions, they shouldn't have the same answers, because they are all doing separate research. And that gives me an idea of who's doing what, and how deeply."

One of Boris's assignments relies, in part, on technology to create the basis of an assignment. He presents each student with a standard operating system with source code, and then asks the student, "For this component, I would like you to rewrite this section with the following characteristics. Those characteristics can change from student to student, fairly easily," he explains, and finds that the challenge has a higher tendency to trigger deep learning. The result of the assignment can be submitted

electronically or on paper, depending on whether Boris is marking the work by review, or testing the code in the lab. His experience with blended learning courses has made him realize that for both the overall course and for the assessments, "it would probably take three to four times longer for me to try and design the equivalent online version of what I run doing face-to-face. Because when I'm doing it face-to-face, I can change it instantaneously. But when you're doing it online, you have to anticipate those changes ahead of time. It's a lot more structured, and there has to be plans for contingencies."

Learning activities and assessment strategies are a significant part of promoting deep learning in a blended delivery course, according to the research participants. These key components were further explored in the second stage of the research.

Collaborative work among course design team members. Study participants generally work on course design and development with other team members. Some have access to a team of development specialists comprising instructional designers, faculty, subject matter experts, multimedia developers, curriculum writers and so forth, while others may only work with one or two other faculty members. Regardless of the size and structure of the design or development team, all of the participants look for open communication and a collaborative working style with their team during the project, explaining that discussions about the course, including the subject itself, learner profile, level of learning, and any existing limits that may affect the success of the new course help to clarify opportunities for blended delivery. Instructional issues that surface need to be examined by the team, and

hopefully, resolved. Once key elements for the new course have been agreed upon, they explained, development can begin with all of the team headed the same direction. Participants recalled frustration when team communication and collaboration has been absent, and concern that courses developed under these conditions may not meet the needs of students. Two codes surfaced in this category, as shown in Table 12.

Table 12: Collaborative Work among Course Design Team Members

Codes (*Frequency: IDs 23 / Faculty 28)*
Determine instructional issues
Clarity and respect for roles and expertise

Determine instructional issues. Each course has its own instructional issues, which can be either positively or negatively affected by redesigning a face-to-face course to blended delivery. One place to begin is to determine how successful the current course is, and which key elements impact that success, Keith asserts. The initial discussions with the subject matter expert or the instructor are critical; they help define a focus of the blended development. “What are we blending here? Are we going to divide up the theory and practice components … maybe some of the theory or reading material …what is the goal of the blended design going to be?” Olivia asks. "What are some of the existing instructional issues that we can actually solve?"

Faculty and subject matter experts who bring subject expertise and face-to-face teaching skills to the project may not have much experience working with blended delivery. One starting point is to talk about what is working in the face-to-face class and why. A good instructor can quickly identify the components that engage students well; as long as these activities support the course outcomes, they

may be better left in the classroom. It is also important to discuss what isn't working well, and then try to solve some of the issues using blended design. For example, a course without an assigned textbook may use a lot of printed content that may have to be prepared by the instructor before every class. As part of the blended development, these resources can be aligned with course outcomes and made available in digital format for quick student access. Instead of spending time preparing and distributing content for every class Olivia explains, the instructor is in a better position to benefit to the students, focusing on learning activities and mentoring in the classroom, giving better assignment feedback and so on.

Clarity and respect for roles and expertise. Respect for each team member on a redesign for blended learning project may seem automatic; that is not always the case however, and can stifle the collaborative spirit of teamwork. This research indicates that educators in different roles don't necessarily understand each other's area of expertise, which can make collaboration difficult. Dratman recommends that as instructional design begins, conversation with instructors in the subject also begins. "They understand what they're doing in the classroom, what the assessments are," he clarifies, and they know their subjects; instructional designers don't usually have subject expertise.

For some, the role of an instructional designer is not clear, and it can be resented because "they don't know our subject," Erica states. She has found, however, that access to an instructional design team in her redesign efforts has been beneficial. "When I've come to a problem when I was developing courses, I was very lucky and I had some wonderful instructional designers," she explains. "I needed

help, and there was always a designer that could tell me, ‘okay, what is it you are trying to achieve and how can we get you there, and how can we get students there?’ And that really made a big difference.” She also recommends that faculty spend some time online to become familiar with what other educators are doing. “Sometimes that helps spur my interest on and widen my horizons so I can get past my own ways of doing, own ways of thinking,” she says. It also helps her recognize the possibilities that may come up in a discussion with a design team. “People who often take on the responsibility of doing some development work don't have necessarily the background and don't know maybe in themselves, they don't know how to do something. That’s not our primary role.”

Olivia suggests that professional instructional designers should not feel the need to educate subject matter experts on the knowledge and tools used for design, respecting each team member for the type of expertise they bring. “We’re better off guiding them within their realm,” she says. “If their expertise is installing solar panels … talk to them in their language in terms of ‘okay, this course is about installing solar panels. How much experience do they get in installing them? Do they actually get to try it themselves? How can we set this up so that 30 students are going to get some component of hands-on at some point during the installation process?’” Asking questions and leaving room for instructors and subject matter experts to explain encourages a collaborative effort in redesigning a course.

Institutional / administrative issues. Institutional and administrative issues, decisions and constraints play a much more prominent role in course development than anticipated by this researcher. Although participants were asked to set aside

these types of issues for the first set of interview questions, it quickly became apparent that course design cannot be separated from the institution. “Instructional design is very fluid. There's no one answer or one way of doing anything,” Jasmine explains, but decisions made at the institutional level provide parameters that affect design and development decisions. Geoff wants to know whether there is a common understanding he needs to be aware of. “When it comes to deep learning,” for example, “do people … know what that means? The chairs of the departments, do they know what deep learning means?” Four codes became apparent in this category.

Table 13: Institutional / Administrative Issues

Codes (*Frequency: IDs 14 / Faculty 13)*
Institutional reasoning for and definition of blended learning
Project scope (institutional)
Time availability and constraints
Technology availability, reliability, constraints

Institutional reasoning for and definition of blended learning. Research participants spoke of the need to understand what the institutional reasoning is behind changing a course from face-to-face to blended delivery. For example, will classroom time be reduced for a blended learning course, perhaps to increase access to additional students by freeing up campus bricks and mortar? Or is blended delivery to be used in a different way, such as increasing or enhancing overall student effort hours? Has blended learning been selected for particular reasons, such as a good match for the subject? Does the change to blended delivery result from an institutional change, or have decisions been made at the school-level that need to be understood? Danielle asks, “What is the expected ratio of classroom to non-classroom time?” “Obviously blended … is going to be some kind of continuum of online and

face-to-face," Iris reasons, and wonders whether a decision has been made on the percentage of each that must be recognized in the new design. "How much time are the students going to be online and how much time are the students going to be face-to-face? Do I have one class face-to-face? And 20 hours of online to support that?" she asks.

It is also important to know the definition of blended learning that the institution, or school within the institution, is using, in order to align design activities. "I would want to know what the rules are as far as the school at whatever institution it is," Danielle explains. Knowing how (and whether) blended learning is defined by the institution informs most decisions for the design of a blended learning course. If the change to blended delivery is new, design and development make be working against entrenched styles of instruction and entrenched course material, Olivia rationalizes, "I think it's a bit of a dance in terms of whether or not you're working with existing, grandfathered-in politics and issues that you don't know about that are connected to that course, so you have to tread lightly," while you gather information. If, on the other hand, the redesign to blended delivery is given free rein, brainstorming can result in some creative design ideas. "Those are totally different in what kind of issues you can solve and where you're going with [a course]," she says.

Administrative issues within an institution also affect course redesign. Rules around when a syllabus/outline can be changed, and the extent of change, may hamper redesign efforts, Olivia points out, even when the, "outlines don't fully or completely articulate what is going on in the course."

Project scope (institutional). The scope of a course redesign / redevelopment project provides some clarity on the parameters of a project. Hours allocated for a redesign project, the time-frame those hours lie within, and availability of project team members determines what is possible during the development cycle. Expectations of what is possible are often much higher than what's possible within the project scope.

Scope also determines whether the online portion of a course can be interactive and media-rich. Regardless of how creative a design is, or how engaging and effective it could be for students, time is wasted designing what will not be executed during development. As indicated in another part of the research results, participants have found high-level interactive media objects to be expensive to develop, in both time and money. Knowing whether the scope of the project will allow for a media-rich design informs design decisions.

Time availability and constraints. Faculty identified focused development time and time to research information for assigned course redesign work as critical institutional issues. "My experience with this made me realize that it would probably take three to four times longer for me to try and design the equivalent version of what I [teach] face-to-face," Boris said. "I'd probably contact our advisory committee and ask them the level of detail, whether the particular jobs that students are shooting for or are being tailored for requires just information or requires knowledge, hands-on skills." He also recognized the need to prepare fresh assignments for a redesigned course. If the "assignments haven't changed in forever, there's plenty of examples of all of the questions in the assignments on the Net. So [students] are not getting out of

it what they need to get out of it. They're not making that material their own. They're not understanding it; they're just going through the hoops to get the piece of paper, to get the marks on the assignment," and in doing so, missing deep learning.

Technology availability, reliability, constraints. What technology is available, how reliable it is, and what constraints may have been imposed by the institution affects design decisions. For example, one institution may be utilizing a learning management system differently than another. The two institutions may use the same platform, but have enabled different components of it. A third institution may have a learning management system, but be willing to allow social media to be used for some of the online components, while a more conservative institution may reject social media due to student privacy concerns. Reliability of the system, whatever it may be, also affects design. A reliable system encourages confidence in faculty; they may be more willing to create a blended course design and more willing to teach a blended course than if the institution's systems have a history of failing when students need them most.

Participants had been asked to set institutional and administrative issues aside ion their responses to the first stage of this research; however, they indicated that their designs for blended learning were greatly affected by these issues. As a result, this category was further explored in the second stage of the research.

4.3 Stage Two of the Research

The central question of the research—*which instructional design approaches for blended learning encourage deep learning*—required more detailed exploration

than what had been gathered in the first stage of the research. Analysis of data from the first interviews led this researcher to consider whether blended learning would lend itself better to one learning domain over another, and how course design would be affected by each of the domains. What approaches, particularly for learning activities and assessments, would best encourage deep learning in the cognitive, affective and psychomotor domains? Would some approaches work for all domains while others only overlapped to some extent? Participants were given specific definitions of the three domains of learning to reference when answering questions:

- **Cognitive:** Mental skills—knowledge—facts, procedural patterns, concepts
- **Affective:** Growth in feelings or emotional areas—attitudes, feelings, values
- **Psychomotor:** Manual or physical skills which require practice and are measured in terms of speed, precision, techniques, etc.

The first stage of research also underscored the role that institutional and administrative decisions, issues and constraints play in determining the design of a course, particularly when blended learning is on the table. Thus, the last question of the research was designed to highlight roadblocks that can get in the way of developing creative and effective blended learning courses that promote deep learning.

Results for the second stage of this research questions naturally fall into themes tied directly to each question, and are presented accordingly.

Learning domain best suited for blended or online learning. All of the research participants identified cognitive learning as the domain that best lends itself

to online or blended delivery courses. Four people, (two instructional designers and two faculty members) indicated that the affective domain could also be taught either online or using blended delivery. Four instructional designers (but none of the faculty participants) indicated that psychomotor could be taught online or blended, if technology were available to support visual communication between the student and the teacher. They pointed out though, that part of learning a psychomotor skill requires an understanding of why that skill needs to be done a certain way, and that although it is possible to teach psychomotor skills online, the majority of online learning toward a psychomotor skill would most likely actually fall into the cognitive domain, but would inform the psychomotor skill or prepare the student to do the physical part of the work on campus.

Cognitive. Cognitive learning "lends itself beautifully to both blended and online" design according to Danielle; the other research participants agreed. Iris said, "I think the cognitive [domain] is the most easily designed for online, because it's largely presentation materials and planning of thinking activities around that." Boris pointed out that, "In cognitive, you can generally present material, give it to them in a variety of different ways, and then, by the very nature of it, [students are] supposed to mull it over. So that can be done just as easily, and is quite often done, outside of the classroom anyway." Keith believes there are many tools available to use for the online environment to support cognitive learning, and that cognitive learning can be, "more personal maybe, something I can do by myself. After I've done the activities or reading or doing any research or writing … I can reach the objective by myself." Andrew designs online activities for his courses to support the cognitive domain,

commonly research to "put some sort of a document or presentation together." In his view, online activity in the cognitive domain allows for more precise and objective marking. "When you don't have the student face-to-face, you have clearer criteria to mark with, to use for your own purposes."

Affective. Designing blended learning for the affective domain may be more challenging than for cognitive, according to this research, but with some creativity, it can be successful. "I don't know if it can be at the same level of success if I compare blended to instructor-led or traditional learning. I think now with … social media, with all these new approaches, they can be used to support learning at the affective level, Keith said, but the "way we communicate, the way we interpret other people's faces, etc.," suggests that a portion of affective learning be taught in the classroom.

Fred likes to teach the affective domain best, reasoning that it's the activity design, not the delivery method that matters. He provided an example of a blended activity he took part in that targets the affective domain. "We had an online group where we had a task … to do something together, but unbeknownst to us, each of us had a role to play. It was just something that we had to present. We had to put together an assignment, do research, all of that, but each person, each member of the team had a different role to play. Mine was the tough role because I was the one who didn't want to engage with the group. I didn't want to do the work. [The team members] were getting frustrated with me and yet I had to play my role. That was certainly going toward the affective domain, working in groups; the assignment was to see how the group functioned in an online environment, not necessarily to have the deliverable. It was the end product, which we didn't know at the time. That

assignment and project was set up very well for an online activity, to work in the affective domain."

Psychomotor. This research indicated that the psychomotor domain is more difficult to teach online. "The nature of [psychomotor] is to 'Do!' It's kind of hard to see, to test, to give feedback," Jasmine said. "You'd really be dependent on a number of different things, perhaps technologies and software. It's possible—with video, with Skype, with Adobe Connect—there are lots of different ways you can do that …," but it might be more limited, she explained. As a student, "I need the practical activities, I need to develop my skills based on exercises, practical exercises," Keith said, "and that might happen better in a face-to-face scenario. Any skill requiring physical feedback is more difficult to do online, according to Boris, "whereas in a one-on-one lab-type environment, something where you're supervising them directly, [they] get immediate feedback and they don't tend to create any bad habits."

Certain aspects related to the psychomotor domain can be taught in a blended or online environment. Complex simulations attend to skills in the psychomotor domain, Dratman said. "Psychomotor, when you read the descriptor of mental or physical skills which require practice and are measured in terms of speed, precision and technique, I automatically think of trades," explained Danielle. While they may be taught online to an extent, they are, "not so easy to evaluate" online.

Olivia reasoned that the theory and the knowledge components of a course in the psychomotor domain are best suited to the online environment. The practice components need to happen face-to-face, after the knowledge components are in place, or in an assignment that encourages students to go away, do something and

then come back to that platform. “I don't really think that in the fully online there is opportunity for mentorship in say, operating machinery or doing those kind of hard skills that sometimes are in courses.” Iris agreed, stating, “You can provide materials that are required to support practice, and then have them practice and come back and report on practice. Obviously the practice part, depending on what it is, probably can't be done online, although … you could get creative and videotape practice and get reflection and get assessment back, if you can post that with digital technology.”

Designing learning activities for each domain. Research participants were asked to explain the types of learning activities they would design to promote deep learning for blended delivery courses, in each of the learning domains. Faculty spoke about the domains in which they had blended learning design experience and/or were part of their teaching practices. Instructional designers, with a more focused role in course design, had sufficient experience to address each of the domains. Some of the participants pointed out that learning often includes components from two or more of the domains, and cautioned that categorizing learning as belonging to one domain over another may limit student learning and the practice of instructional design.

All learning starts with a component in the cognitive domain, Olivia, an instructional designer, believes. “You have to understand what you're doing and why you're doing it and really relate to either the information or the skill that you're trying to obtain, so I think it all starts there.” Clear separation of the cognitive, affective and psychomotor domains does not reflect reality, because, “Depending on the skill, they could all have components of each. I don't think it's an either/or situation for the most part. I think it's just the theory and practice components.” Theory components may

require an affective response, such as in an ethics course, she explains, but they may also be just required knowledge. “You either learn it or you don't. It doesn't matter how you feel about it.”

Cognitive. Participants spoke of a wide variety of learning activities that could be used to foster deep learning in the cognitive domain. Dratman and Danielle find that detailed case studies are one type of learning activity that supports the cognitive domain, as they challenge students to use their skills to make an interpretation. In a blended delivery course, the components of this activity could include student interaction outside of the classroom through online discussion or work on various parts of the case study, and then further group work in a face-to-face environment. “A case study can be applied to many different processes, different skills,” Dratman explained. For example, learning derived from a case study about accounting processes or procedures at one company is applicable at another company. Deep learning will be evident in the student’s ability to synthesize the learning from the case study and then transfer the skills.

Speaking to the cognitive domain, Geoff said, “the concept of deep learning is how are we making it work … not just write notes, but [encouraging students] to actually engage with the concepts and actually come up with a result somehow.” Once students have worked through the lower levels of learning, such as knowledge and comprehension, he plans activities that help students, synthesize the information to come up with something, “completely different, an artefact of some kind … I'm big into constuctionism, so it's always an artefact; there's always something that has to be built.”

When Keith approaches development of a course at the cognitive level, he uses a variety of learning activities, from asking students to complete readings, do research and write about it, to solving problems. “I have many tools in the online environment to do that,” he said. Learning activities such as preparatory or follow-up reading material and research supports the cognitive domain, laying the groundwork for students to reflect on their learning and determine where each new piece of knowledge fits. Several of the participants focused on designing activities such as discussions, thoughtful questions and quizzes that would engage students, to encourage them to move past basic knowledge to deeper levels in the cognitive domain.

Danielle’s business students work with financial information, processing invoices, purchase orders and other paperwork. In one activity she uses to encourage deep learning, she has students examine the process as it is defined in the course material, and then explain what their process would be if they were responsible for implementing that strategy in a workplace. “When I'm designing, I try to take the learning and the concepts and move it to what [they] will do with this if [they’re] working with this information. In particular because [I teach] business, everything that they're learning in a course has to be implemented sometime, somehow, some way in the world of work when they graduate and they have a job.” After working through the basic process set out in the course content, students would be expected to extrapolate it into a real-world scenario. Most components within this type of activity could be delivered online; the choice of which to deliver face-to-face and which to deliver online would be made according to institutional and faculty preferences.

Bruce challenges his students by having them build tests that they're going to take in his course. “They'll design a question, or five questions,” in teams, he said, “And then they'll have to post it to a discussion board for validation, and people will be able to make comments on that. Then they retrieve those comments and remake the questions … once they've been validated and rechecked, [those answers] can be loaded back online for study purposes.” The discussions among students as they compose questions result in deeper understanding of the material, and student-designed questions often compose the majority of a test. “They'll do that either through deconstructing a sample, or going online, finding rules, finding examples and then summarizing them, posting them back online for other people to study with.” Most of this activity happens in online discussions; when test questions are posed that are out of the scope of the course, Andrew can step in and reset the direction of the discussion.

Affective. Designing for the affective domain often overlaps with designing for other domains. Iris uses case study work, already identified in this research as an activity that supports the cognitive domain, to influence the affective domain. Keith uses group interaction in his designs for affective domain, sometimes taking an activity that is primarily cognitive and adding a social element to it. “I will invite them to interact among themselves around those affective objectives, so they can learn from each other, test their knowledge and apply it,” he explained. To extract the interpersonal aspect of it, “I will also use discussion forums, chat and Facebook updates, so there could be several ways to do that using the new tools. I can do the research by myself, I can do the reading, but if I have to defend or combat an idea, I

have to react an idea or knowledge, I think it can be more effective if I do it with other people instead of just as an individual exercise."

Danielle fosters growth in feelings or emotional attitudes with an activity that has the students going out to, "interview and engage with somebody who's actually doing what we're trying to help demonstrate to the students or help them learn, and have them dig into the life and daily work of someone." She uses questions such as, 'What does this mean? What would you do with it? How do you feel about it?' to keep students engaged and deepen their learning. This activity would work for either a fully online or blended delivery course. Instructions could be detailed online, and students could report back on their experiences in online discussions or submit written results.

Dratman finds that the use of poetry works well when he is designing for the affective domain. "Poetry is usually one of the most basic forms of emotion. You can find a lot of emotion in poetry in a very short time. So interpret the poetry, what does it mean, what does it say to you, what are your feelings on that?" he explains. "It doesn't have to be a poem. You could do that very easily to a story, to other types of documents. Journal writing - how would you apply reading this poem into writing one of your own. That sort of thing. Deep learning synthesizing into a different realm like that," and any written activity transfers easily to the online environment.

Designing for the affective domain is all about trying to trigger an emotional response, Geoff explains, but "too much emotion turns people's brains off. It scares some people, so to be honest, if I was going to design something, I'd really just dip my toe in there until I knew the group. I'd probably end up using something that has

some sort of emotional trigger and say, okay, here's what going on here. Where are they coming from? What's going on? How is it going on? What do you think of this, why do you think of that? I've actually done this with little guys, grade fivers, and it's all about what's the message here? What are these people trying to do?" Deconstructing messages in a gentle way opens the door to discussion, which would work well online, he reasons, "because online you can filter it, you can have somebody actually monitoring the posts," to provide teacher presence. The asynchronous nature of discussion boards, "gives people a chance to think. Sometimes in the affective domain, people are reacting. They're coming from the gut; they're not actually thinking about what they're saying. And that could potentially lead to … trying to balance the logical academic, cognitive stuff with the affective, emotional stuff and it'd be a fine line there, whatever the lesson happened to be."

Psychomotor. Participants agreed that skills in the psychomotor domain need to be informed by learning in the cognitive domain. "I think you have to know what you're doing - if you're operating equipment, if you're operating software - the context that drives that psychomotor skill. So, the knowledge and the context is the foundation component for the psychomotor skill, no matter what. If you don't know why you're doing, what you're doing it for and what you're trying to achieve, then you're just pressing buttons," Olivia clarifies.

The best implementation of learning activities for the psychomotor domain, "would be one where you could have [cognitive and psychomotor learning] related, interrelated, not as separate activities, but you do a pre-activity and you understand why you are doing it before you proceed with the practical application, and then after,

you conclude the practice or the psychomotor activity, then you link it back so that it makes sense to you as a whole, not as separate entities." Keith explained. "If I'm going to promote deep learning, I can use the online component of the blended solution to make the students reflect, extrapolate the practical knowledge that they have learned. So, they not only gather the skills about how to do something, but also understanding the why and going to the root of those skills."

Dratman sees possibilities in augmented and virtual realities lending themselves to psychomotor learning. "In Second Life they have these things called pose balls, and if you click your avatar to a pose ball, your avatar goes onto the pose ball, the pose ball becomes part of the avatar and then the avatar goes through the motions of doing something. In one of the cases that I've got on my learning area in Second Life, I have tai chi, so you can watch your avatar doing tai chi, and you can be sitting at your computer and doing the same motions as your avatar at the same time. So psychomotor, you're actually emulating the motions that you see on the screen in the 3D environment," he explained. Using creativity in the design of online learning activities can support the development of skills in the psychomotor domain, Dratman said. "Let's say we were using golf as an example. The swing motion of golf, if you correct it, can be the swing motion for baseball. So once you've mastered the swing motion of golf, you can apply that to a different skill, say baseball, or something like that. So in a psychomotor domain [for] instruments or anything like that [in a] competency-based institution … using an instrument panel you're going to have dials, you're going have gauges, you're going have things that correct them, you're going to have switches and readouts, so you can take those readouts, you can

take those dials, you can take the switches that change the variables and you could apply that to boards in the real world, in the work world, or into other aspects of the same process," he continues. "I am constantly asking my instructors when they say 'You will use the Atlas 5 instrument panel for this,' [whether] all the work environments in the world use the Atlas 5? Is there a different one? Can we say that they're going to apply the principles of the Atlas 5 or whatever have you into the Atlas 4 or the Omega 3 or whatever have you? Right? So I try to be least specific as possible, and that encourages the deeper learning because you're able to synthesize and apply over many different areas."

"When I'm thinking of psychomotor, I'm thinking of actual tasks, like manual tasks that you have to do, whether it's like cooking class or PhysEd or something like that," Iris said. "I think you could certainly take the stuff that doesn't require practice, but more thinking around it, and put that online." Videotaping the correct way to perform a psychomotor task and developing a checklist of steps or goals to post online, Iris reasoned, would also allow students to learn and practice the skill, whether they're in a lab supervised or away from campus on their own. "Let's say you're working on knife skills for example, and a student can practice something and then report back," whether by videotape or posting online. "They can report at which point they're having difficulty and then the professor can adapt practice exercises around that individual's needs," she explains. As students reflect on their abilities, they move into the deeper levels of learning.

For Geoff, designing learning activities to teach psychomotor skills online has to be more individual. In the early stages of activity, the student is online, by himself,

trying to create something. “For deep learning, there has to be an artefact at the end,” he said. “With psychomotor, I think it will be a two stage process. It’s getting through the stages of the hands-on and actually doing it, and then expanding on it to say, ‘There's a plant hanger. Congratulations, you're done,’ but then getting into the nitty-gritty of okay, how can I experiment now that I have the basics? How can I make it bigger, how can I make it a different colour, how can I put pattern into it, how can I, how can I, how can I?” The cycle of introduction, producing something, getting feedback from faculty and other students in the course may be posted online, before the student starts to expand upon what he’s already done. “That's where the deep learning is, not at the beginning, learning the basic skills. Once you're more comfortable with whatever the basic skills are to use your hands or to create something,” then learning moves to using that skill to do something far more detailed that shows progression. To demonstrate deep learning, students need to be able to present not only what they did, but explain why they made the choices they did.

Summary. Study participants indicated that regardless of the domain, learning activities in a blended delivery course are most likely to foster deep learning if they are part of seamless, continuous learning rather than set out as discrete components in a course. They agreed that online learning activities could be designed for each of the domains, but that the activity itself and how it supports the learning outcome is more important than the delivery method.

Designing summative assessments for each domain. Research participants were asked how they would design summative assessments that would measure deep learning for each of the learning domains. Faculty spoke primarily about assessments for the domains in which they had blended learning design experience or were part of their teaching practices, while instructional designers spoke to assessment design for each domain. There was some discussion with participants in regard to the definition of summative vs. formative assessments. “It's never a good idea, as every instructional designer knows, to have a 100% final exam,” Olivia reasoned, pointing out that an assessment that is summative to a section or module of the course could be formative to the entire course, and yet still measure how much knowledge transfer has happened up to that point. For the purposes of this research, a summative assessment could be summative to either an entire course, or a section within the course.

Jasmine recommends that assessments be aligned to the learning outcomes of the course, regardless of the learning domain. “What are your expected outcomes, and what are your constraints on how you plan on getting there?” Sometimes the choice of assessment for the learning outcome is very clear, on the surface, but other times the choice is more complex, in part due to accreditation requirements for the subject and what stakeholders want to see in the course. When designing assessments, Olivia investigates the type of skills that need to be addressed and whether the course material supports the student to get to that level. If the outcome indicates that the student is going to get to the apply level, but the content is set at the knowledge level, it would be unfair to assess at the higher level. “So that's a flaw with the course, and that becomes a bigger problem, where you have to go back to the drawing board and

say, okay, this content is weak. It promises them that they're going to get to the apply level, but it only gives them definitions or whatnot."

To create assessments that measure deep learning, regardless of the domain, Danielle also returns to the learning outcomes and objectives to determine what to measure and at what level. She finds that assessments often benefit from the use of a well-defined marking rubric that pulls out everything that is critical. "A year ago, I wouldn't have developed a course with a rubric that asked for business or academic writing skills throughout it, but I do now," she explained, "I realize that how we present information, or how the students present written information or verbal information is as important as the information itself." She would use the taxonomies that students are expected to demonstrate as the foundation, and then try to design an assessment that "they may not have been totally exposed to in the past. So something a little out of the norm, because I'm finding that too many courses that I look at sort of have the same footprint or the same strategies or the same assessment styles over and over again, and the students are getting bored and they're not stretching their learning skills." Thought and effort into marking rubric details help her align assessment measures back to the original learning outcome.

Cognitive. Research participants all recalled experiences designing assessments for the cognitive domain, and maintained that assessments in this domain are the easiest to design for blended delivery because they could work equally well in both online and face-to-face scenarios. Several indicated that they would ask students to explain, interpret or demonstrate course information and how they have processed it, in order to assess the depth of learning that had taken place. Andrew creates

assessments for his writing courses that are completed outside of the classroom and then uploaded online for marking. He avoids multiple choice exams as they have limited ability to measure deep learning, preferring product-driven assessments such as reports that entail research. “They'll have to demonstrate some kind of critical thinking skill, organizational abilities, research skills, things like that. So, to be able to put together a three or four page report requires a lot of deep learning in that sense.”

Dratman provided an assessment example that could be presented either online or in a face-to-face environment. “One of the easiest ways is if you have a final exam or an exam of some sort, where you're saying for instance, ‘We’ve done this accounting question three or four times in class. Now you are the accountant at Smith Barney, and you have this type of a problem.’” He would provide students with the same type of problem, but with different variables, to determine the extent to which students are able to synthesize learning from the case study to a new problem.

Jasmine also uses case studies for some of the cognitive assessments she designs. She believes that to measure deep learning, “You'd have to present them with an intricate and involved case study. It wouldn't be something superficial where you read through, and at the end, yes or no. It's not going to be something easy to evaluate. It would have to be something almost simulated in its approach. If a customer comes into your [automotive] shop and they bring in their car and they say, ‘Hey, I've got a problem with my car. When I drive it makes a clicking sound.’ I'm sure mechanics get all kinds of great descriptions from people coming in and saying, ‘My car is making a strange sound.’ But is the sound indicative of anything? Maybe.

Maybe not. Mechanics are often put on the spot and they have to make a judgement call. Well it would be this or it could be that or it could be the other thing. So what would be the first thing you do to eliminate possible contenders or pretenders as to the because of the issue?" In the field, an automotive technician needs to use critical thinking skills to evaluate the problem, she continued. "They probably would start the car and listen for the sound. Well, if the car was running and not moving, the sound isn't made. So, what does that mean? It's an evolved evaluation of what one small piece of information is, and what does that mean? Is it that the engine needs to be replaced, or is it just the carburetor, or the air filter, or there's a rock in the tire? So they're going to have to use their skills. They're going to have to investigate the issue. They're going to have to explore the options and they're going to have to build on the information that they've already received, and they're going to have to hypothesize what it could be, to evaluate their options and come to a clear conclusions." The case study needs to be designed result in an answer, she said, but the answer may be, "More information is needed. You can't diagnose it without a computer." The assessment would need to consider the process the student used to arrive at the answer, to determine whether the critical thinking skills necessary to resolve a similar real-world experience have been developed.

Erica measures deep learning in the cognitive domain for her economics course through an assessment that requires her students to take two concepts, compare their differences and similarities and then determine the economic impact of each. She found that student research on the concepts was good, but that some, "just wanted to regurgitate. They couldn't move away from the research. They could not

make that leap. They couldn't synthesize." She finds that those papers padded with tables and graphs often do not include any interpretive text, "which means if they did that, they didn't understand it well enough to offer that to someone who was reading it," she said. Instructions for this type of assessment could be presented online for a blended delivery course; the resulting research papers could be uploaded for marking as well.

Geoff cautions that cognitive assessments should be designed to go beyond basic facts in order to measure deep learning. He recalled a course where the instructor used an exam that allowed someone with no knowledge of the subject to pass the exam with a very high mark. "What is this exam measuring? Because I know what it's not measuring," he said. "So for developing the cognitive [assessments], I'd go back to Blooms taxonomy and make sure my questions are centered around the higher-level thinking, cognitive skills. And I'd ask them questions that would [expect] them to actually show that they've engaged with it. So that means I'd go back to some of the previous projects that we've done, and it'd be 'Explain why this happened,' or 'Explain how that could have been changed,' and have them look at stuff that we've already all engaged with, and use that as a basis for what the assessment piece could be."

Affective. Dratman sees the use of journals as one way to assess deep learning in the affective domain. "Affectively, you could have [students] turn in a journal at the end of the year that would be worth so much percentage, and the journal would be based on their emotions, their feelings about various things you've presented like poetry or stories or ethics, that sort of thing." Progression of the student's feelings and

attitudes over the term would act as a summative assessment and be marked as a final assignment.

A research paper, teamwork and team presentations are easy ways to design a summative assessment for the affective domain, Jasmine said. Asking "How does an engine work?' can be followed up with other questions targeted to the affective domain such as "Why is this important to people?" The detail in the paper or presentation should indicate attitude, feelings and values. "If I personally was assigning students the research paper, what I might do is give them overarching topics, but not specific topics, and the reason I'd do that is because I'd want them to have a choice. Everybody's got a focus, everybody's got an interest. Why not encourage that by letting people choose their own focus, their own topic? Give them a little bit of additional buy in into something. There's always the opportunity to investigate something you don't know very much about, because you feel it's a weakness. For students that can sometimes be a real learning experience." Choosing a topic for a research paper within guidelines will sometimes encourage a student to investigate something they are particularly interested in, but taken time to explore. "Anytime people are presented with options, it allows them to choose the option that appeals to them," she said, explaining that having the choice may lead to assignments that show more depth due to student engagement.

Danielle designs assessments for the affective domain that ask students to answer questions such as, 'What are the implications in a team environment or a work environment or a business environment?' requiring students to dig deeper into the

back of their minds about their emotional interpretation of how a process or information might be used in a world of work.

Designing online assessments for the affective domain can be tricky, Keith said. “For example, if I want them to learn how to control themselves in a chaotic scenario, or [when there is] injustice in the workplace, and I want to know in the online environment, how do I do that?” One online way to measure whether the student has learned anger management skills, and to what depth, he explained, would be to challenge them with a scenario, using synchronous visual activity, using Skype or any video conferencing tool. “What would you do? Why?” Using a rubric to mark the responses would remove some of the subjectivity that is a natural part of the affective domain.

True summative assessments that measure deep learning in the affective domain are difficult to design, Iris believes. She has designed some online self-assessment rubrics that measure the affective domain, to provide space for students to be more reflective; she also uses online journaling. “I think probably in terms of affective, the most measurable thing is, in terms of being able to quantify things like responsibility and attitude towards learning, is by actually looking at your learning analytics in terms of the learning management system, that tells you how often did they check in,” she says. “I know on my learning management system, I often can go in and I can see which students haven't checked into the website for like a week and a half, and I'm thinking something's off, or they're not learning.” Knowing whether a student has been on the course website though, may only indicate whether that student is engaged enough in the learning to open the site.

Psychomotor. Measuring psychomotor skills online can present challenges, research participants agreed, but can be done with some creativity and access to technology. "For psychomotor, it's do. They got to do it. And the reality is, psychomotor, showing that you're able to do … or able to create, whatever the final end product is," forms only part of the learning, Jasmine explained. While it may be necessary to measure the physical skill face-to-face, the variables within the skills that students are measured on are equally important. "If you're an electrician and you're able to wire a house, that's well and good, but when you turn on the switch, does the light light up? If everything is connected properly yes, but does that mean it's safe?" Students need to be able to troubleshoot psychomotor skills and articulate why something does or does not work in the physical world. Reasoning and critical thinking, cognitive skills that inform psychomotor skills, can be measured online.

Dratman believes that measuring deep learning online in this domain with simulations is possible. Using simulated environments, the student could be presented with a scenario such as, "I have to turn this switch and I have to do this and I have to record this to have this work in the work field," he said, and then asked to articulate how they would apply that knowledge to another work process or use it to operate another piece of equipment. "They've learned on this one," he said, "Now for the test you give them this one and say, 'Okay, they're the same type of equipment, but how would you operate this?'" and evaluate their answers to grade the depth of their psychomotor learning.

Keith suggests that online measurement of psychomotor skills could be approached with the use of technology. "How can I verify, check if learning

happened or not using an online tool for psychomotor? I can show them videos or people doing or applying the skills in the correct way or in an incorrect way, and have students select which are correct implementations of the procedures or which are correct displays of the behaviours or the skills that they are trying to learn and which are not, and if I may find any errors or mistakes to those procedures, through video. I could even ask them to tape themselves applying the skill." The recording can be used as a summative element for the evaluation, he said. Students can tape themselves and submit it as evidence that they are applying what they have learned, he said, "which could tell you a bit more than just identifying which of the videos is doing it right or wrong."

Psychomotor skills are the basis of what Fred teaches. He finds that the design of formative and summative assessments can be quite similar. "We start with some theoretical problem, and we work through to a solution and then we actually physically do it and see how close we matched to that." Most of his assessments are formative first. "We want to develop the critical thinking skills that we don't expect our students to have right away. So really, it's only the last few examinations that are summative. But they all work very similar. In the first formative ones, we are with the students as they do the measurement, as they build the circuit. If they've built it incorrectly, we are there to correct it. When you get to the final end and the summative, basically, that's when we have to let them go and say, 'You're on your own, from beginning to end. You have to build it, measure it and determine the problem.' If any of that part breaks down, it shows that they're not ready to be

troubleshooting [yet] or problem solvers." Although some of the learning activities in this course are online, these assessments are given face-to-face.

Boris uses long answer questions to measure deep learning for the cognitive skills that support the psychomotor domain. "I'm not a big fan of multiple guess evaluations … especially considering the type of courses that'd teach, which are generally, in my mind, more the synthesis side of things. So it's not like you can just pick up the facts and regurgitate the facts and be considered to be competent." A sample question might be, "Given the following piece of code, explain to me how you would compromise it using a buffer overflow?" he said, and although the question is cognitive, it would be coupled with psychomotor, lab-related activity. Explaining the solution for this question is pretty straight forward, he said, but to actually solve it can be quite detailed. The assessment determines whether the student has developed the critical thinking skills to solve the question.

Summary. Both instructional designers and faculty in this study stated that with thoughtful and creative design, assessments for each learning domain can be created for a blended environment that will measure deep learning. They recommend clarifying exactly what needs to be measured first (e.g., physical vs. cognitive part of the psychomotor skill, the exact skill within the affective domain, the level of cognitive ability) and then aligning the measurement and the type of assessment to the skill identified in the learning outcome. Assessments that measure cognitive and affective skills work both online and face-to-face. Psychomotor skills could also be measured online, if the technology (primarily visual) is available for the course.

Roadblocks to creative and effective blended learning design. Research interviews for this study began with a request that participants to set aside institutional and administrative tasks and constraints in their answers, focusing instead on creating learning opportunities. As the first stage of the research progressed however, it became apparent that design possibilities for blended learning are directly and indirectly informed by factors outside of the control of the instructional designer or faculty member designing blended learning courses, regardless of the level of skill they may have. Participants felt strongly that institutional and administrative choices could not be easily set aside in favour of design choices, and were asked to identify issues that can become roadblocks to creating blended learning courses that promote deep learning.

Research results for this question varied considerably, depending on the individual participant, the institutions and industries they have designed for, and their personal experiences. Respondents identified seven areas in which instructional design for blended learning that fosters deep learning would either be supported or constrained, depending on decisions outside of their control.

- Institutional and administrative management
- Educational leadership
- Resources
- Project management approach
- Faculty development
- Attitude towards teaching in a blended learning environment
- Online tools and delivery system

Institutional and administrative management. This study separates issues of institutional and administrative management from educational leadership. Research participants indicated that management of an educational institution plays a significant role in the adoption and evolution of blended learning. Management structure influences institutional culture and politics, and controls decision making at every level. Participants recognized that competing priorities between good education, available budget and requirements to maintain the physical structure of a university or college are constant, that these issues can be difficult to resolve, and that they often require hard choices that may position one priority against another. Entrenched management can choke innovation, participants said, and directly affect the design and development of blended learning. Other management decisions raised as concerns by respondents follow.

Mix of permanent vs. sessional faculty. Participants stated that a high percentage of sessional faculty at some institutions affects the ability to deliver a course through blended delivery due to lack of training and/or experience with technology and with the course material. This situation can discourage decisions to redesign courses from face-to-face to blended, and hamper instructional design efforts.

Faculty scheduling and teaching loads. Faculty schedules and teaching loads affect whether or not faculty will choose to (or even be able to) invest the necessary time and focus on redesigning and redeveloping courses, regardless of whether they are supported by a team or working on their own.

Prep time to deliver the blended course. Faculty participants indicated that some of their blended delivery courses require more preparation time to deliver, particularly where online resources change rapidly but are critical to the course content. They indicated that without flexibility to support the course, they would be reluctant to move to a blended delivery model.

Allocation and management of available resources. Both instructional designers and faculty respondents cited the importance of allocating and managing institutional resources in a way that would encourage the development of better courses for blended learning, not necessarily more courses.

Access to the right information about the course, program or overall project. Respondents spoke of their need to be able to access correct and complete information when they are designing a course, expressing their frustration that management decisions sometimes delay or prevent their access.

Educational leadership. Study results indicate that educational leadership is one of the most critical areas in either supporting or constraining instructional design for blended learning. The backgrounds of institutional decision-makers can sometimes be a roadblock to effective course design. “People in charge of making decisions are not necessarily the people who have been in the field, or who have been in the pedagogical realm … recently,” Dratman explains. “Educational institutions are often five or six years behind the times technologically of working institutes,” he acknowledges, but finds it frustrating when older methods or technology are touted as valuable additions to course design. Lecture capture is one example, he said. “People don't like it, unless they have to, unless they're somewhere in a remote area where

they have to listen to the lecture capture type of thing; it's not as exciting to the student as being able to go through a simulation or even read on their own and do some multitasking."

Participants reasoned that priority on innovative teaching and learning, supported at the highest levels, fosters changes in education, encouraging new uses for technology, adoption of new learning theories, and setting the tone for creative course design and development throughout the institution. Educational leadership may also affect financial allocation at the institution, which could lead to better access to innovative technology for teaching. Participants identified a number of areas that could be positively influenced by educational leadership, as follows.

Definition and vision of blended learning. Blended learning does not have a clear, agreed upon definition in the literature; every institution interprets and applies blended learning in a different way. Participants argued that without an institutional vision of the goal, parameters and definition, efforts to redesign courses to blended delivery may not be supported either financially or by faculty who would teach them. Communication of institutional decisions falls into the realm of educational leadership; instructional designers and faculty participants indicated that beginning a course redesign without this knowledge, or with competing visions among stakeholders, makes design efforts much more difficult.

Institutional reason for converting programs from face-to-face to blended delivery. All of the research participants indicated how important knowing the institutional reason to move to blended learning can be to the design of a blended learning course. If the reason, for example, is to reduce the need for bricks and

mortar, Geoff said, the decision can be expected to correspond with a reduction in face-to-face hours, which has to be accounted for in the redesign.

Defining terms on behalf of the institution. Educational leadership has the opportunity to clearly define and socialize terms such as *learner-centered* and *deep learning* on behalf of the institution. Research participants believe that clarity would help to align all of the stakeholders on a course redesign project and target the work toward the same end point. Designing to foster deep learning requires that the difference between surface learning and deep learning be understood. The term *learner-centered* is used with a variety of meanings, depending on the user's point of view. Participants have come across situations where learner-centered was interpreted to simply mean that the learner does all of the work in the course.

Using an LMS does not necessarily equate to blended learning. Sometimes, an assumption is made that using a learning management system automatically equates to blended learning, Boris said. Educational leadership has the opportunity to clear up that misconception, he said, clarifying that an LMS is simply a file delivery system. Clarity in this area would support better design for blended delivery.

Collaborative vs. combative atmosphere. Participants looked to leadership to foster a collaborative working environment for instructional design. Stakeholders who come into a course design project with a combative attitude make redesign to blended learning decisions more difficult and may affect the quality of a course.

Support differing requirements. Participants noted a lack of recognition of the differences between individual courses and what is required to develop some subjects for blended delivery. Institutions that take a cookie cutter approach to creating

blended delivery courses may only be supporting mediocrity, not creative design, one participant explained. Educational leadership is in a position to recognize and support instructional design requirements for blended learning in each subject.

Use instructional design skills to full advantage. A significant amount of instructional design skill for blended learning is available to institutions. Designers are also skilled in creating education that fosters deep learning, yet participants argue these skills are often not used to full advantage. When fresh design ideas are challenged in favour of creating courses in the same way they have been designed in the past, or when creative blended learning courses are set aside and still taught in the same old way, participants find themselves discouraged. Educational leadership is in a position to encourage full use of design skills for blended learning. Instructional design and faculty participants would embrace opportunities to review what worked and what didn't in a course they designed, and access resources to change what didn't work. One participant would like to have a palette of blended learning activities that promote deep learning that can be selected from, adapted and incorporated in new designs. Another sees advantages in designing a variety of learning activities and assessments to give teaching faculty to work with for some courses. Many of the ideas require support in the form of time and other resources. Educational leadership has the opportunity to position the work of instructional design as one key to good education, and to utilize the skills to the fullest extent.

Focused design and development time. Designing and developing an effective blended learning course that fosters deep learning takes time and a thoughtful approach. Participants stated that the focused time required often goes unrecognized

in the rush to create more courses. Recognition of what it takes to do the work for a blended delivery course at the educational leadership level would potentially have a trickle-down effect on planning and resourcing decisions.

Resources. Study results indicate that resources for redesigning and redeveloping face-to-face course to blended delivery are sometimes scarce, although expectations of course development teams may be high, which directly affects the quality of the course that will be delivered to the student. Although an institution may decide "they don't want a Rolls Royce, they just want a car," as one participant said, resources in four key areas are necessary for design and development activities: qualified people, budget allocation, sufficient time and access to appropriate technology.

People. Participants cited the need to have the right people on a course redesign project. Selecting a subject matter expert for a course with the appropriate experience in the subject, the willingness to work on a blended learning project and availability to actually do the work is a critical step. Blended learning experience on the part of the instructional designer is also an asset. Project teams need time to work together as professionals to do the research necessary, make decisions about course elements and then develop effective assessments and learning activities such as scenarios, case studies and media objects for the blended course. Participants have all experienced course design and development situations where instructional designers and faculty working on the course are over-extended; in these cases, development efforts suffer and course quality decreases.

Budget. Funding for course design and development influences the end result of a blended delivery course. Research participants indicated that insufficient budget allocation makes it difficult to create a high quality course with a good mix of online and face-to-face components that will foster deep learning. Limited financial resources particularly affect courses that require a lot of redevelopment work, and those that would be enhanced by a media-rich design. Redirecting additional financial resources to course design and development would help to increase the quality of blended delivery courses.

Time. Participants universally indicated that it takes time to develop a high-quality course, regardless of the delivery method. In situations where a face-to-face course is being redesigned to blended delivery, that time is even more important—thinking time, research time, development time—and it needs to be focused time, so that the appropriate level of learning for the course can be discussed and agreed upon, outcomes and objectives written to reflect those levels, and effective activities and assessments can be designed and developed that target the deeper levels of learning the student is expected to achieve. Instructional design participants stated that time allocation for their work rarely follows instructional design models, and that trying to design blended delivery courses over too short a time often results in lower quality courses. Other roadblocks to creative blended learning identified by participants are:

- Unrealistic project start and finish dates for course redesign and development
- Low estimates of the hours it will take for each of the team members to accomplish their work, and lack of flexibility in the number of hours allocated

- Insufficient time for subject matter experts to complete their work to a high standard, particularly for developing content for activities and assessments that were previously delivered face-to-face and now need to be prepared for online delivery

Technology. Research participants identified the lack of appropriate digital tools for development of blended learning as a roadblock at some institutions. Knowing whether access to innovative technology will be available affects instructional design decisions early in the process. Media developers and applicable software must be in place before interactive media pieces can be considered in course design, whether those media objects would enhance learning or not.

Project management approach. Course design and development resources are sometimes managed through a business-style project management approach designed to track and control time, budget and the allocation of human resources. While participants acknowledged the need for fiscal responsibility and project structure, they argued that of the three tenets of project management—time, cost and quality—they find that time and cost take the lead in most cases, and that even these two resources are often set very low, while the expectation of a high-quality course design remains high. Redesigning any course requires an investment of time and resources. Designing and developing activities to target deep learning and assessments that can measure whether a student has achieved the required learning is a thoughtful, creative process for which faculty and instructional designers need focused time. Participants recommended that the focus of course design and development projects be placed on quality issues rather than on measures such as time used and percentage complete.

Project scoping. Project scoping feeds directly into the project management approach. Often, scoping is done well in advance of a redesign projects, and is based on assumptions such as extensive re-use of existing materials, according to research participants. Unfortunately, when the project begins, it commonly becomes apparent that the scope is inaccurate. Redesign and redevelopment to blended learning requires more than changing the delivery of a few course components; it is a fundamental change that must consider all aspects of the course. Participants recommended that initial project scoping be done with the assistance of instructional designers, to more accurately determine what the course will require. They also recommended that an opportunity to re-scope the project once it's underway be made available, with the information from re-scoping efforts fed back into the project. Project scope limits the hours each person on a course design team can work on the project. Olivia points out that if one option for a course would be to, "do some sort of video demonstration component, but there's no money for video," there are two options—change the direction of the design or re-scope the project if video is a course components that is critical to student learning. If there is no opportunity to re-scope, the design of the blended delivery course may suffer.

Attitude. Redesigning face-to-face courses to a blended delivery requires significant change, both for teaching faculty and students. Although there will always be those who easily adopt new methods for teaching and learning, there will also be those who would rather keep the status quo. Participants find that resistance to change shows up in attitudes that affect whether a blended delivery course will be supported, and sometimes even whether the completed course will be used at all. The following

situations place roadblocks in the design, development and delivery of blended learning courses.

- Strict attachment to a course 'the way it's always been'
- Lack of faculty buy-in, which surfaces in a refusal to 'get on board' with blended learning
- Past experience with course design efforts, particularly if those involved were not given a choice in participating or feel their efforts were not valued
- Apathy on the part of either faculty or students towards a blended course

Training and development opportunities for faculty. Faculty participants indicated that whether training and development opportunities are available or not impacts their level of interest in redesigning a course and may limit whether they are prepared to stretch their creative abilities for course design. "Guidance on what tools are appropriate where," is a critical factor for Boris in his computer courses. "If you don't know what you can do, then you don't even think about doing it," he said, suggesting that an institution "supply support training until you get a critical mass of people who are comfortable with that technology." Danielle identified faculty's lack of experience with teaching a blended delivery course and "resistance to go from a 'talking head' to a learning facilitator," as a roadblock, noting that some of the courses she has redesigned to blended delivery have been soundly rejected by the faculty assigned to teach them. She recommended more intensive training for faculty who will teach in the blended environment, to help them be comfortable with technology and with their changing role.

Online tools and delivery system. Faculty participants identified that stability of the course delivery system is essential, whether a learning management system or

other technology. Regardless of whether stability issues were short-term or ongoing, they found themselves and their students discouraged at the disruption, and indicated they would be less likely to embrace blended learning, or consider redesigning a face-to-face course for it until well after the issues were resolved. Instructional designers cited the need to select a course delivery system that met the needs of the students, faculty and designers, now and as education evolves. They also pointed out that a good delivery system can easily be hampered by administrative choices to either allow or lock out features. Designing asynchronous communication into a course may enhance deep learning, for example, but only if that tool is easily accessible. When designing for blended learning, the availability and reliability of diverse media tools can either enhance or detract from blended learning course design and how effective that course will be once it is complete.

Summary. Overall, respondents agreed that each institution generally has a mixed bag of supportive and non-supportive areas where blended learning is concerned. Changes in institutional approach and educational viewpoint take leadership and time, but making note of some of the roadblocks that get in the way of creative and effective course design for blended learning begins the change management process.

Chapter V – Conclusions and Recommendations

The central question of this research study is: *Which instructional design approaches for blended learning encourage deep learning?* This practice-oriented research study captures a purposeful sample of experience in the conversion of traditionally delivered courses and programs to blended learning using educational technology. It opens a window into instructional design approaches that can foster deep learning by increasing and enhancing learning opportunities, and further, provides insight into approaches to the design and development of engaging blended learning. Perhaps the most surprising aspect of the study results is that most of the instruction design approaches to foster deep learning in a blended learning environment would be applicable to any delivery method:

1. Target the course at the highest levels of learning reasonable.
2. Align all content, activities and resources to help students achieve the targeted levels of learning.
3. Weave the learning together as one conversation instead of discrete components.
4. Create assessments that measure whether the student has met the level of learning set out in the course syllabus / outline.

5.1 Conclusions

Study results suggest best practices in instructional design that apply to two distinct, yet overlapping areas of design: fostering deep learning, and designing for blended learning. Many of the practices and techniques used in the design of blended

learning may also be applicable to fully online course design. Practices that foster deep learning increase learning opportunities for students and are potentially applicable to instructional design for any delivery method. Tying the two concepts together with thoughtful instructional design can move courses past the first steps toward blended delivery made by most institutions, to courses designed to engage and support students as they move through the face-to-face and online course components in their studies.

Although it may seem difficult to design for both deep learning and blended learning at the same time, well-designed blended learning naturally encourages deeper learning by reinforcing concepts in both modalities. It also supports learner engagement, a critical part of fostering deep learning. Deep learning is easily embedded in the course through learning outcomes and objectives that target the highest possible levels of learning students can realistically be expected to achieve in that course. For effective blended learning design and to foster deep learning, all of the pieces of the course—content, learning activities and resources—need to align with and support the high-level outcomes of the course. Assessments strategies also need to be aligned, to measure whether the appropriate level of learning has been achieved. To promote deep learning, blended delivery courses need to consist of more than a series of discrete components separated by delivery method; the pieces need to link and intertwine to build student learning, woven together as one learning conversation. Designing to include the cognitive presence, social presence and teaching presence as outlined in the Community of Inquiry framework (Garrison & Cleveland-Innes, 2005, Garrison & Vaughan, 2008, Garrison & Ozden, 2009) can

help accomplish this. Teaching presence in blended learning brings course elements together, linking course components to carry the learning conversation forward. Cognitive presence is apparent when students question and connect concepts as they engage with course material, and social presence encourages the exchange of ideas among students.

Instructional design activity demands focused design and development time, whether the designer is dedicated to this work or is a faculty member who assumes the role for a course in their specific field. Determining which pieces to put online and how to structure them to connect the learning requires careful thought. Executing the design may require the efforts of several members of a development team. Educational leadership that recognizes and provides for sufficient time and resources can spur more effective courses blended learning.

It should be noted that course design can only provide the foundation for blended learning; faculty who are prepared to embrace the design and the delivery method to teach the course are critical to its success. Blended learning requires a shift from teacher-centered to learner centered; students have increased responsibility and control over their own learning. Teaching faculty must be prepared to give up the role of sage-on-the-stage to be successful, and to engage with students on their learning journey in the role of facilitator instead. Otherwise, even the best design for blended learning is likely to revert to disconnected pieces of a puzzle. Sometimes, faculty members who are assigned to teach blended learning courses are either unwilling or uncomfortable teaching in a blended delivery environment. The result may be rejection of the course and its overall design, and a return to more familiar teaching

methods. Educational leadership is in a position to circumvent these issues by providing and encouraging training for those who will teach in a blended environment.

Faculty in the study expressed concern that decreased instructional flexibility may be a drawback once a blended course is set into place, particularly if faculty who will teach the course have not been involved in design activities. For this reason, blended learning design is often more successful when a collaborative approach that respects the expertise of each professional educator—whether faculty, subject matter expert or instructional designer—is employed, increasing the likelihood of buy-in, particularly in cases of significant change.

Although designing courses from scratch is always easier than redesigning an existing course or program, educational institutions do not often launch entirely new programs. Redesign efforts can pose challenges where grandfathered course materials are no longer be appropriate for the new design. The need to develop new materials may not have been anticipated, adding pressure to a design team already working under tight timelines. The opportunity to review and adjust the scope of the project can alleviate some of these issues.

Despite challenges that may surface in redesigning courses to blended delivery, the application of learning theory to different methods of delivering education offers many opportunities to create effective learning opportunities—and remains one of the most exciting aspects in the field of instructional design. As blended learning courses move forward, opportunities to analyze what is working

well in each course and what may not be effective will be critical, with the analysis information used to improve the courses on an ongoing basis.

5.2 Recommended Approaches for Instructional Design of Blended Learning

"Instructional design is very fluid. There's no one answer or one way of doing anything," one research participant said, echoing Garrison & Vaughan (2008). Instead, redesigning a course or program from traditional, face-to-face delivery to blended delivery using educational technology opens the door to a myriad of possibilities that only increase in number as the latest software becomes available. Instructional design with the goal of creating engaging learning opportunities and fostering deep learning for students is limited only by creativity, available skills and technology, and the realities of institutional resources.

The two groups in this study—instructional designers and faculty members—all have experience redesigning face-to-face courses to blended delivery. Although the instructional designers begin course design activity at a macro level and then move to the detail, while faculty begin design at the micro level, both groups of educators work through essentially the same steps in a somewhat systematic manner. Decisions made about the redesign of a course from face-to-face to blended learning rest on the answers to a number of questions. The answers define the boundaries of the course, inform the direction that blended delivery course could go, and identify the level of learning to reach toward. They also determine how much flexibility and creativity in course design might work for the course, and potential amount of change that might be accepted and supported by institutional culture and available resources.

For every question, a wide variety of answers are possible; for every answer, more questions surface on the path to designing and developing a blended delivery course.

Approaches to instructional design to foster deep learning in a blended learning environment follows five key steps:

1. Information gathering
2. High level course design
3. Determine what existing course materials can be repurposed
4. Best application of learning for each part of the course
5. Effective use of the online part of blended learning

The answers also affect the amount of creativity that could be appropriate for a course design, and determine whether that creativity would be supported.

Information gathering. The path to redesigning a face-to-face course or program differs from one educational institution to another, and from higher education to industry; however, information gathering at the beginning of a design project is critical, to set the direction of the project before design and development work can begin. Two key areas need to be examined: program and subject considerations, and institutional / administrative issues and constraints.

Program and subject considerations. Instructional design professionals often work on many different courses in a variety of areas and programs, while faculty are more likely to work on courses where they have some subject matter expertise. The answers to the following questions provide context for the course and for design efforts.

- What are the program requirements and constraints?
- What external requirements for accreditation, industry and so on affect the structure of the course and program, and set requirements for learning?
- Are there overarching program outcomes that students are expected to achieve? What are they?
- Where does the course that will be redesigned fit into the program? First semester course that may require only lower level learning? Or a later course that relies on prerequisite learning and is expected to provide more depth to student skills?
- Does the course need to support more than one program, such as with service courses? If so, which programs?
- What type of subject matter does the course provide? Are there constraints around how the subject needs to be taught?
- Which learning domain is primary: cognitive, affective or psychomotor?
- Who is the expected learner? Given the subject matter and the fit of the course within the program, what is the anticipated learner profile? What is his most likely style of learning?

Institutional / administrative issues and constraints. Institutional and administrative issues cannot be ignored in favour of design. Details in this area set up some of the parameters for the blended learning design. For example, knowing whether the course design needs to account for reduced classroom hours or whether the skills to create interactive media objects are easily available will affect many design decisions.

- What is the institutional reasoning for redesigning courses to blended delivery?
- Does the institution define blended learning, and if so, what is that definition?
- What is the institutional scope for blended learning? One course? A whole program? Many programs over time?
- What is the scope of the particular redesign project?
- What is the design and development timeframe for the project?
- What skills are available to the project—technical, media development, writing, etc.—and at what level of proficiency?
- What is the time availability and constraints for project team members?
- What technology is in place to support the development of online components? Are the development skills available to maximize use of this technology?
- Will the institution support the use of alternate technologies, such as social media tools?
- What technology is in place to support the delivery of blended learning courses? What is its reliability? What constraints does it pose?
- Does the online delivery system have the capability to support high-level multimedia such as interactive pieces, video and so on?

High level course design. The course outline / syllabus is key to the course design, regardless of the course delivery method: the learning outcomes and objectives in this document should target the highest or deepest levels of learning that can be expected in the course. The whole course will be aligned to what is set out

here—all of the content, learning activities and resources—to work toward building the specific skills and the level of learning identified in this document. Assessments, regardless of delivery method, will measure the learning against the outcomes, to demonstrate whether the student has achieved what is described in the learning outcomes. Several questions arise during work on the course outline / syllabus:

- Which program outcomes (and in which programs, if it supports more than one program) does the course support?
- What are the requirements and constraints specific to the subject?
- Which learning domains are involved: cognitive, affective, psychomotor or a combination?
- What high-level skills will the student be expected to achieve in this course (application / analysis / synthesis / evaluation levels for deeper learning)?
- Do existing learning outcomes reflect those skills? If not, can the outcomes be reworked to reflect the correct learning, and how much flexibility is available? If there is no flexibility, what is the root cause? (Accreditation, industry requirements, outcomes imposed by an external body?)
- What lower level skills will be necessary to build to the outcomes? Describe these skills in the learning objectives, to set out a scaffolding pattern for student learning.
- Which assessment strategies will be able to measure whether the student has achieved the outcomes? (If an outcome cannot be measured, it needs to be reworked to be measureable before assessment strategies can be put into place.)

Determine what existing course materials can be re-purposed. Course materials that already exist can be a point of contention in the redesign of a course. Instructional designers caution against assuming that existing course materials are reusable; what has worked in the classroom for some time may be inappropriate for online delivery, dated, or no longer copyright compliant. Much of initial blended learning design consists of looking at the possible puzzle pieces of a course and determining where gaps exist. Comparing existing course material against learning outcomes and objectives, whether those statement have been reworked or not, is a necessary part of determining whether the course material will help to foster deeper learning. From a blended delivery point of view, a review of existing course material can help determine whether existing content might be easily adapted to online delivery, could be adapted given substantial effort, or should most likely be set aside in favour of new development activity. Significant gaps in written course material are likely to exist due to the face-to-face nature of the course to be redesigned. Although course material for some of these gaps will most likely need to be prepared for the online portion of the course, some course material will continue to be taught in the face-to-face environment. As course design evolves, the instructional designer needs to be aware of all content, whether it will be delivered face-to-face or online, to ensure the learning outcomes will be supported.

- Does existing content align with and support the learning identified in the outcomes and objectives?
- Is existing content current? (Work with subject matter expert.)
- Is existing content accurate? (Work with subject matter expert.)

- Is existing content copyright compliant? For which delivery method?
- Is the content available electronically, well-written, complete?
- Does the course already use educational technology? How and where is it used? Could the existing use of educational technology be folded into the blended delivery course?
- What learning activities are available that can be reused?
- What assignments, exams, and other assessments are available that might be repurposed for the blended delivery course?
- What part of the existing course materials might be appropriate for online delivery?
- Do existing formative assessments provide feedback to the student and instructor that is directly connected to required learning to the student?
- Do existing summative assessments measure the learning identified in the outcomes and objectives, or do they lean towards lower-level learning, such as can be measured with multiple choice questions?

Best application of learning for each part of the course. The course redesign process requires careful and creative thought to provide the best possible education for students. Designing a course for a blend of online and face-to-face delivery provides an opportunity to choose which modality best suits the learning for different parts of that course. Online and classroom learning must work together to form one integrated learning conversation, engaging students throughout the course to foster deeper learning. The role of an instructional designer is to create learning opportunities; for blended learning, that means finding answers to questions that help

them decide which modality will provide the best application of learning for each part of the course.

- What subject requirements and constraints may affect blended delivery?
- Are the main skills of the course in the cognitive, affective or psychomotor domains? How will the learning domain(s) affect delivery?
- How well would online learning work for the expected learner profile / preference / style?
- Which modality is best suited for each piece of learning? Are there some pieces that are a natural fit for either face-to-face or online delivery?
- What needs to take place in a classroom or lab?
- Which learning could work well online?
- Which pieces could be taught either online or face-to-face?
- Which modality would best suit the material that will have to be developed to fill gaps identified in the review of existing course materials?
- What activities can be designed to effectively integrate face-to-face and online components or bridge from one to another?
- Where will teaching presence be most critical?

Once the learning a course needs to provide has been determined, existing course materials have been reviewed for fit and the best application of learning has been sketched out, the creative part of instructional design can begin.

- What if some of the learning activities could be designed differently? How would each provide effective learning opportunities? Would they be online or in the classroom?

- How could the design of the learning activities increase learner engagement, help connect the learning material, and promote deep learning?
- What if students were challenged to research some of the content, instead of having it all provided to them? What online resources might be available? How reliable would they be?
- How could the formative assessments be changed to better challenge students? Could they be directly connected to each other to build learning throughout the course? Should they be?
- If new summative assessments need to be designed, how will they measure the expected levels of learning? What modality can be used?

The questions that can be asked at this stage are limited only by the creativity of the instructional designer. Discussions provide the opportunity to apply creative design, and to add value to the blended delivery course.

Effective use of the online part of blended learning. Blended learning that combines online and face-to-face delivery can summon one of two visions—reams and reams of dry online content with graphics and other images interspersed, carefully designed to feed information to students—or alternatively, a small amount of content that relies heavily on expensive and flashy media objects. The design of an effective blended learning course rarely reflects either of these visions, because these designs are unlikely to provide what the student needs to encourage deep learning, or even to achieve learning described in the outcomes. Courses designed with a large amount of online content to be read would essentially produce an online textbook as dry as any on a shelf, and completely remove the learner-centered element desired in

blended learning by trying to feed material to the student. Courses reliant upon expensive, flashy media objects may initially seem more attractive, but in addition to being tricky to develop and too expensive for most institutions, they often focus on garnering attention instead of providing useful learning opportunities.

Blended learning needs to consist of more than just an online repository for a course schedule, syllabus and a few links. Instead, a well-designed course for blended delivery usually provides a limited amount of online content, learning activities that encourage the student to search for meaning and connection as they work toward the outcomes, relevant media objects to the extent that resources permit, and then only if those objects are expected to enhance learning opportunities. Online components of a blended delivery course need to work in partnership with what is delivered in the face-to-face environment, which often means that components of an online learning activity are followed up or continued in the classroom, and the other way around. In every case, instructional designers must ask whether the required learning can actually be taught online, whether online delivery will be effective and/or enhance learning opportunities, and in the case of media objects, whether institutional resources will be able to deliver what would be required. Questions for the online part of the course speak primarily to: *What does the student need? What will add value to the course? What will promote deep learning? How could these requirements be met online?*

As instructional design for a course proceeds, information has been gathered, high-level course design has been established, existing materials have been reviewed to determine their value, and the best application of learning for each part of the

course has been discussed. Questions that will help design effective online pieces of the course include:

- What are some of the best ways to build student learning with online components for the specific course?
- Does the learning domain of the subject lend itself well to online learning? If not, where are the constraints? How could they be overcome?
- Will online learning allow the course to provide learning that may not be easily provided in the face-to-face part of the course?
- How does the learning management system function in delivering the online components? Does it have constraints that may limit design opportunities?
- Would integrating discussion boards into the course be effective for the subject? How would they keep the learning conversation going? Would they be graded, and if so, by what criteria?
- How much course content will be delivered online? Which parts of the course would the content support?
- Will classroom presentations be posted online? If so, to what learning benefit?
- What learning activities could be delivered online for the specific subject? Would they be entirely online or only in part? Which part online, which face-to-face? What would the student be expected to complete outside of classroom hours and how would that integrate into the face-to-face learning?
- What learning activities could be designed to target the highest levels of learning in the outcomes, and to foster deep learning in the student?

- Does the institution support the use of tools such as those provided by social media? How would they be integrated? Would they enhance learning?
- Would video clips increase learning opportunities, such as for detailed processes?
- Could high-quality media objects add to or improve learning? If so, where would they be useful and what would each look like?
- Could similar learning be achieved without the use of media objects?
- Are the skills available to develop possible media objects to the desired level of complexity? If not, can the media objects be purchased?
- Are synchronous visual tools available, and would their use be effective to enhance learning?
- Which formative assessments could be delivered online? What would they look like and how would the results be evaluated? At what places in the course are they required?
- How could summative assessments be designed to measure the highest levels of learning?
- If accreditation requirements demand multiple choice assessments, how could they be written to measure deep learning?
- Would lab instructions be made available to the student online? How would they be structured?
- Would assignment instructions be made available to the student online? How would they be structured?

- Will an instructor guide be required to prepare faculty who have never taught the course to provide the teacher presence necessary to help connect the online and face-to-face parts of the course?

Designing the online part of a blended learning course requires conscious choices about where and how each of the online pieces will connect to and integrate with the face-to-face portions. Regardless of how individual pieces will be delivered, all of the course components need to be aligned to support the learning outcomes, working together to create a package of learning that will engage students and encourage their achievement.

Summary. Instructional design is not prescriptive, regardless of how a course will be delivered. The questions posed throughout the process can only help a designer sketch out possibilities for a course. It is up to the designer to apply learning theory and creativity to bring design possibilities to life.

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Appendix A – Athabasca University Research Ethics Approval

MEMORANDUM

DATE:	February 17, 2012
TO:	Carol Guay
COPY:	Dr. Martha Cleveland-Innes (Research Supervisor) Janice Green, Secretary, Athabasca University Research Ethics Board Dr. Simon Nuttgens, Chair, Athabasca University Research Ethics Board
FROM:	Dr. Rick Kenny, Chair, CDE Research Ethics Review Committee
SUBJECT:	**Ethics Proposal #CDE-12-01:** *"Encouraging deep learning in a blended learning environment: a study of instructional design approaches"*

Thank you for providing revised documentation requested by the Centre for Distance Education (CDE) Research Ethics Review Committee in the Conditional Approval memo dated February 10, 2012. Your cooperation in editing to incorporate changes requested was greatly appreciated.

On behalf of the CDE Research Ethics Review Committee, I am pleased to confirm that this project has been granted **FULL APPROVAL** on ethical grounds, and you may proceed as outlined in the revised proposal.

The approval for the study 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/ .

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 approval at any time.

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 Janice Green at janiceg@athabascau.ca or rebsec@athabascau.ca .

Appendix B – First Stage Questions

Scenario:

You have been asked to convert an existing course or program delivered in the traditional face-to-face manner to blended delivery that combines the use of educational technology and face-to-face delivery. Your course development must support required student learning, in both delivery systems. As you consider each question, set aside the administrative tasks and constraints that go with your role in course design and development to focus on creating learning opportunities.

Initial Interview Questions:

1. Please tell me how you would begin the redesign / redevelopment process (from a learning point of view, not administrative)?
2. How do you determine the level of learning the course requires?
3. How would you choose the balance between face-to-face and online components?
4. What methods would you use to ensure the online components of the course are integral to the learning experience?
5. What do you do to ensure that deep learning is promoted with the online components of the course?

Appendix C – First Stage of Research - Themes and Codes

Themes	Codes
1. Program considerations	
	Program requirements / constraints
	External requirements – accreditation / industry / other
	Program outcomes
	Course fit within program
	Learner profile / learner focus / learner preference / learning style
2. Course syllabus / outline	
	Subject requirements / constraints
	Outcomes / objectives - taxonomy and alignment
	Assessment strategies - aligned to outcomes
	Learner profile / learner focus / learner preference / learning style
3. Review of existing course materials	
	Currency and accuracy of content
	Content alignment with outcomes and objectives
	Appropriateness for online
	Learning activities and assessments
4. Best application of learning	
	Content / subject requirements / constraints
	Learner profile / learner focus / learner preference / learning style
	Natural fit of f2f and online learning
	Build learner engagement
	Activities that align with outcomes, regardless of delivery mode
	Assessments that align with outcomes, regardless of delivery mode

Themes	Codes
5. Online methods to promote deep learning	
	Activities to target deep learning
	Assessments to target deep learning
6. Collaborative work among course design team members	
	Determine instructional issues
	Collaborative work required
7. Institutional / administrative issues	
	Institutional reasoning for and definition of blended learning
	Project scope (institutional)
	Time availability and constraints
	Technology availability, reliability, constraints

Appendix D – Second Stage Questions

Pre-amble:

There are three domains of learning:

- **Cognitive:** Mental skills – knowledge – facts procedural patterns concepts
- **Affective:** Growth in feelings or emotional areas – attitude feelings values
- **Psychomotor:** Manual or physical skills which require practice and are measured in terms of speed, precision, techniques, etc.

We know that all of these domains can be taught in a blended environment, although it may take creativity to design effective education in some areas.

1. Which of the three domains (cognitive, affective, psychomotor) do you believe best lends itself to online / blended activities? Why?
2. How might you design a learning activity for delivery either online or both f2f and online that promotes deep learning for each of the three domains (cognitive, affective, psychomotor)? *(Faculty may select one domain.)*
3. How might you create an assessment for delivery either online or both f2f and online that measures deep learning in each of these domains (cognitive, affective, psychomotor)? *(Faculty may select one domain.)*
4. What types of issues, whether educational, institutional or administrative, get in the way of creating blended learning courses that promote deep learning?

Appendix E – Letter of Invitation to Research Study

Letter of Invitation

Encouraging deep learning in a blended learning environment: a study of instructional design approaches.

Instructional Designers / Faculty Members:

My name is Carol Guay and I am a graduate student at Athabasca University's Master of Education (Distance Education) program.

This letter is to invite you to participate in a study designed to explore approaches to instructional design that can be used to promote deep learning in a blended learning environment.

Background:

As post-secondary institutions move from traditional, face-to-face delivery to a blended learning format, the level of learning must be preserved and potentially enhanced by the addition of technology. The goal of blended courses should be to combine the best of classroom teaching with the best features of e-learning (Gulbahar & Madran, 2009). "The overall goal of a blended learning experience is to provide a mix of online and face-to-face learning experiences which support each other in achieving desired learning outcomes" (Ginns & Ellis, 2009, p. 653). It's not enough to offer online course resources, post reams of course content or offer simple online activities. Instead, the online portion must support the depth of learning required by the course outcomes.

Thoughtful instructional design offers an opportunity to approach blended learning in a different way: to create online course content, activities and assessments that are integral to the learning process, to meet the level of complexity required by the learning outcome and to add value to the learner. The changes required by employing educational technology, combined with the shift from teacher-controlled to learner-centered instruction, are complex and transformative changes that require a closer look at constructing learning. Instructional design approaches tailored to blended learning can help educators realize the inherent potential of this type of course delivery (Campbell, Schwier and Kenny, 2005).

"Converting a traditional course to a successful online one requires more time, skills, and knowledge" (Keengwe and Kidd, 2010, p. 535). Whether offered through educational technology or in a face-to-face environment, content, learning activities and assessments need to be aligned to the course learning outcomes, and accordingly, reflect the appropriate level of learning.

The purpose of this research is:

1. To add to the knowledge base of instructional design for courses and programs offered through a blended delivery format.
2. To explore approaches to instructional design that will encourage deep learning in the online component of blended courses.
3. To identify best practices that can be used in the blended environment to promote deep learning.

Your invitation to participate:

You are invited to participate in this study because of your experience in instructional design and development, specifically in converting courses from traditional, face-to-face delivery to a blend of online and face-to-face components. Your experiences and perspectives in creating deep learning opportunities for learners in the online component of blended learning will benefit practitioners and decision makers involved in creating courses for blended delivery.

Your time commitment:

The study will take place March 2012 and April 2012 and will consist of two interviews, each approximately one hour long. The interviews will be conducted in person wherever possible. Should that be difficult to arrange, telephone interviews will be substituted. Interviews will be scheduled according to mutually agreeable times, in recognition of workloads and personal commitments.

The first interview will be based on a prepared set of open-ended questions about the research question. Once the transcripts of the first interviews are analyzed, new questions based on the themes that emerge from the first data will be developed, and then verified and discussed in the second set of interviews.

You may also be contacted briefly after your interviews, in the event that clarification of any of the responses becomes necessary.

Risks to you:

There are no anticipated risks to you in participating in this study. As a member of this study, you will be providing valuable guidance into instructional design approaches that deepen the learning experience. The results of this project will help develop a list of best practices to inform educational practices for blended learning.

Your voluntary participation:

Your participation in any part of this project is completely voluntary. You have the right to refuse to participate in the study, and you may withdraw from the study at any time without explanation or fear of any negative consequences to you. If you choose to withdraw before the first stage of research analysis, your data will be destroyed and will not be included in the study. If you withdraw after the analysis stage has begun, data collected to that point will remain part of the study. Furthermore, you may refuse to answer any question during interviews.

Confidentiality and Anonymity:

All information will be held confidential. The answers you provide in the interviews will be recorded with a participant identifier; your name will not be presented on any documents. All information collected from you will be stored in a secure electronic location that can be accessed by the researcher only and will be destroyed in a confidential manner five years from the data of collection. Furthermore, the data collected will include no identifying information and the names of all participants will be replaced with pseudonyms.

If you have any questions about this study or would like additional information to assist you in reaching a decision about participation, please feel free to contact Carol Guay at 403-275-6761 or carolguay@shaw.ca or Dr. Marti Cleveland-Innes at 1-1-800- 788-9041, ext 6426 or martic@athabascaau.ca.

This study has been reviewed by and received ethics clearance from the Athabasca Research Ethics Board. If you have any comments or concerns resulting from your participation in this study, please feel free to contact the Athabasca Research Ethics Board at 1-800-788-9041, ext 6718 or via email rebsec@athabascau.ca.

Thank you in advance for your interest in this project. To participate in this research, please read through and fill out the *Participation Consent Form* and return it to the principal investigator by March 31, 2012.

Receipt of the completed form will indicate your consent to participate in the study. Volunteers will be contacted by e-mail or telephone to arrange for interview times.

Best regards,

Carol Guay, Principal Researcher
MEd (DE) Student
Athabasca University

Appendix F – Informed Consent Form for Participants

How to proceed:

If you would like to take part in this research study, please complete and return this form by e-mail attachment to carolguay@shaw.ca. *Please keep a copy of this completed consent form for your own records.*

Consent:

I have read the Letter of Information for this research project and have had any questions answered to my satisfaction, and I will keep a copy of this letter for my records. My e-mail reply is meant to confirm my participation, indicates my consent to be part of this research study, and that:

- I understand the expectations and requirements of my participation in the research;
- I understand the provisions around confidentiality and anonymity; and specifically that my name or other identifying information will not be made known in the final research report.
- I understand that my participation is voluntary, and that I am free to withdraw at any time with no negative consequences;
- I understand that if I choose to withdraw after the first analysis stage has begun, the data collected to that point will remain part of the study;
- I am aware that I may contact someone in addition to the researcher if I have any questions, concerns or complaints about the research procedures;
- I am granting permission for the researcher to use a digital audio recorder to record the interview, if I am selected to participate in the interview process; and
- I am granting permission for the researcher to use anonymous quotes from me to be published in the final report, or used as described under the heading "Reporting research results" in the information section above.

Participant's First and Last Name	Date

Contacting the researcher:

If you have any questions about this study or would like additional information to assist you in reaching a decision about participation, please feel free to contact:

Principal Investigator:	Carol Guay carolguay@shaw.ca (e-mail) or 403-275-6761 (phone)
Thesis Supervisor:	Dr. Marti Cleveland-Innes martic@athabascau.ca (e-mail) or 1-(800) 788-9041 ext. 6426 (phone)

This study has been reviewed by and received ethics clearance from the Athabasca Research Ethics Board. If you have any comments or concerns resulting from your participation in this study, please feel free to contact the Athabasca Research Ethics Board at 1-800-788-9041, ext 6718 or via email rebsec@athabascau.ca.

The personal information recorded on this form is being collected under the authority of the Post-Secondary Learning Act and Section 33(c) of the Freedom of Information and Protection of Privacy Act. This information will be used to record consent to participate in this research project, and is protected under the privacy provisions of the Freedom of Information and Protection of Privacy Act. If you require further information concerning the collection and use of this personal information, please contact Alfred Yau (FOIP rep).