Problem-Based Learning in Technology at Fanshawe College

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PROBLEM-BASED LEARNING IN TECHNOLOGY AT FANSHAWE COLLEGE

(Thesis format: Monograph)

By

Frederick C. Varkaris

Graduate Program in Education

Submitted in partial fulfilment
of the requirements for the degree of
Master of Education

School of Graduate and Postdoctoral Studies
The University of Western Ontario
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Problem-Based Learning in Technology at Fanshawe College
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Abstract

In the qualitative case study presented, eight faculty members in the School of Building Technology at an Ontario community college were interviewed to explore their perceptions and opinions with regard to the possible introduction of an interdisciplinary, problem-based capstone project in the final year of three Ontario college advanced diploma programs. The themes emerging from the portraits discerned from participant interviews revealed no general or selective resistance to the proposed curriculum change and differences in resistance based on length of time teaching or length of time to retirement were not evident. Discussions and comparisons with previous educational change management studies in commensurate educational facilities are provided.

Keywords: Community College, educational change, resistance to change, problem-based learning.
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Chapter One: Introduction

*Changing Times*

The increasing recognition of global climate change in recent years has been a catalyst that has demanded a shift towards green, sustainable living in all facets of society. Buildings create one of the largest environmental impacts throughout their lifecycles from design through construction, commissioning, occupation, and finally decommissioning or repurposing. The creation and supply of building materials as well as building processes and attention given to green energy systems have evolved tremendously in recent years. To meet the requirements of sustainable building certification programs, such as the Canadian Green Building Council’s Leadership in Energy and Environmental Design (LEED) Green Building Rating System, the full life cycle of a building must meet prescribed criteria.

College educational philosophy is also changing to meet the needs of students and the stakeholders that will employ them upon graduation. Fanshawe College’s 2009-2012 *Academic Plan* promotes the increased use of problem-based learning strategies in the delivery of curriculum throughout the college. In addition, the introduction and expansion of interdisciplinary learning opportunities for students is promoted and encouraged.

In order to meet increasingly stringent requirements for energy efficient and sustainable buildings and building practices in Ontario and throughout Canada, many of those involved in the building industry are adopting the new Integrated Design Process (IDP). The increasing use of this innovative design process in the construction industry and the concomitant need for graduates familiar and experienced with the process has initiated discussion about the possibility of a new instructional strategy within the School
of Building Technology at Fanshawe College in London, Ontario. To introduce the concepts of the integrated design process, radical change to the sixth and final semester of the three technology programs within the School of Building Technology is being explored. The introduction of interdisciplinary problem-based learning (PBL), in which all related disciplines would work together within their burgeoning areas of expertise to meet a ‘real world’ need, would allow students to become more familiar with the integral relationship between their chosen disciplines, whether it be architecture, construction management or civil engineering, and the construction industry as a whole. The purpose of this study is to better understand the process of program change in higher education by examining one facet of the development and implementation of problem-based learning in the final semester of the three-year building technology programs at Fanshawe College.

Previous studies on change management in education (e.g. Fullan, 2007; Kee & Newcomer, 2008; Kozma, 1985) indicate that the people directly involved in the development and implementation of new processes or programs should be consulted both to gain acceptance and to include their knowledge bases. Using evaluative research methods, this case study explores the opinions of community college faculty members regarding their perceived need for and feasibility of problem-based learning in the sixth semester of building technology programs.

The integration of the three programs of study in the sixth semester represents a dramatic departure from any curriculum in a building technology program currently offered in a community college in Ontario. For this shift to be successful, however, the implementation process will need to be well supported in the key areas of curriculum
development, learning environment, and faculty support. For the successful
implementation of a problem-based learning pilot, and eventually a permanent program,
careful management and program design will be necessary. The requirements of faculty
members at the outset of this study were generally predicted to lie in the areas of
professional development, resources, and academic release time to enable the
development of the curriculum materials. The concept of having a problem-based
learning experience within a combined sixth semester is new, and thus poses some unique
challenges.

The Research Question

The need for faculty to be involved with the implementation process is one key
factor in the success of such an endeavour. As such, the guiding question for this study
has been:

What are the perceptions of faculty members regarding the need for and
the feasibility of implementing problem-based learning in the sixth
semester of building technology programs at Fanshawe College?

To gather and extract information pertaining to this question, faculty members in the
school of building technology were interviewed about their opinions and thoughts on this
topic. Digital audio recordings of the interviews were used to explore emerging themes
from the interviews (Merriam, 1998). The emerging themes allow for a more insightful
understanding of the issues that faculty members view as important aspects to consider if
the introduction of problem-based learning is to be successful.
Context

Integrated design process.

All building projects, large and small, require outstanding teamwork to ensure effective and efficient completion. The move towards sustainable ‘green’ buildings has emphasized this need for communication between all parties involved. The green building process not only requires that the final building conform to new standards of efficiency and resource use, but the building process itself must adhere to stringent guidelines that ensure minimal environmental disruption during construction. Green buildings are more complex than buildings completed previously and require more complex designs involving an ever-increasing number of specialized disciplines (Kilbert, 2008). To address the need to create green buildings in an increasingly environmentally conscious society, a new design process is necessary to ensure all facets of this complex process are addressed.

To be truly integrated, all stakeholders involved in the planning, design, construction, use, operation, and maintenance of a facility must fully understand the issues and concerns of all the other parties and interact closely throughout all phases of the project. The Integrated Design Process does not introduce any dramatically new ideas, but is an approach whereby the design team amalgamates discrete, proven linear approaches to building design into a systematic process that includes all aspects of design (Larsson, 2004). The integrated design process is differentiated from the more traditional design process by integrating the skills and experience of architects, engineers, stakeholders and specialized consultants from the initial conceptual and design stages through the construction and commissioning processes where the traditional methods
involve independent linear consultation following initial design. The traditional process may require the design to be continually readdressed and corrected as subsequent specialized consultants such as structural and mechanical engineers discover flaws or expensive challenges in the initial designs that may require design modifications costing time and money. Contrarily, cooperation among key disciplines from the outset results in a highly efficient design process with minimal and potentially zero incremental capital costs as well as reduced long-term operating and maintenance costs (Larsson, 2004). The benefits of the Integrated Design Process are not solely limited to the improvement of environmental performance. Past projects have shown that an open interdisciplinary discussion and synergistic approach often leads to improvements in the functional design, in the selection of more sustainable structural and mechanical systems, and in enhanced architectural expression (Ministry of Natural Resources, 2006). It is strongly believed by both faculty members and employers that students entering the workforce in the years to come need to be familiar with this new process that is gaining traction in the construction industry across Canada, the United States and elsewhere (Kilbert, 2008).

As is often the case in the construction industry, processes involving technology are never quiescent. Between the initial conceptualization of this research project in the fall of 2008 and the completion of the interviews in the winter of 2010, integration of Building Information Modeling (BIM) had become a priority in the School of Building Technology. BIM is the process of generating and managing building data during its life cycle employing three-dimensional, real-time, dynamic building modeling software to increase productivity in building design and construction. During the BIM process, a Building Information Model (also abbreviated BIM) is developed which encompasses
building geometry, spatial relationships, geographic information, and quantities and properties of building components. This model is then incorporated into the commissioning, ongoing maintenance and eventual decommissioning or repurposing of the building. This topic was brought up in several of the interviews as possibly needing to be incorporated into the interdisciplinary problem-based experience.

**Building technology programs at Fanshawe College.**

The community college system in Ontario was created on May 21st 1965 when a bill was passed in the Ontario legislature establishing the initial 18 Colleges of Applied Arts and Technology (Ontario Department of Education, 1967). Fanshawe College was among the initial colleges created by this legislation, although by comparison it has a much more modest history than universities serving the same primary geographical region. The college system was created in response to a growing need for employment-related vocational education. During the introduction of the bill to create the college system, the Minister of Education at the time, the Hon. William G. Davis, noted: “The world in which we live and must make our way is one which demands an ever-changing pattern of occupations and rising levels of skills. The occupations which are growing most rapidly are those which involve advancing levels of basic education and training” (Ontario Department of Education, 1967, p.5). This statement still holds true today as Ontario Community Colleges continue to provide vocational training, although they currently have evolved far beyond the initial concept introduced by the Hon. William Davis. Colleges have remained flexible educational institutions that continue to provide training to meet community and industry needs.
The original intent for the community college system that was envisioned and created in the legislation was to develop a system of postsecondary vocational schools that would serve the geographical region in which they were located. The addition of private vocational training schools coupled with the current practice of attempting to encroach on neighbouring colleges’ traditional catchment areas has created a highly competitive educational system. Adding to the competitive nature of education is the desire of many students to experience life outside the community in which they spent their pre-college years.

As Fanshawe College has continued to grow and evolve to meet the needs of students who are training to enter an ever-widening variety of work environments, so too has the vision of the academic leaders as to how this will be accomplished. The current Academic Plan for Fanshawe College makes specific reference to enhanced opportunities for students to participate in interdisciplinary problem-based learning (Fanshawe College, 2009). These learning opportunities are designed to result in graduates who are lifelong learners with the skills and knowledge necessary to compete in a work environment that is progressively more demanding and competitive.

Currently the three programs leading to advanced diplomas in building technology remain separate throughout the three-year courses of study, and the students studying civil engineering, construction management and architecture never have the opportunity to interact with each other on a disciplinary basis before graduation. The proposed problem-based learning in a combined sixth semester would allow cooperative interaction among the students, thereby fostering a greater understanding of the complementary roles of each discipline. The three key areas of curriculum development,
learning environment and faculty support would all eventually need to be considered to successfully implement a pilot project to assess problem-based learning in this environment.

The Ministry of Training, Colleges and Universities governs programs of study leading to advanced diplomas at community colleges in Ontario. Any program changes must continue to meet the learning outcomes currently in place. This will require new curricula to be developed with care and insight. In addition, this proposed departure from traditional teaching practices, to adopt the methods of interdisciplinary experiential learning, would necessitate a learning environment that would foster collaboration and discovery (Wolff, 2001). A traditional lecture theatre or classroom will not provide the ideal environment for discovery-based learning activities. The space must be large enough to accommodate a number of students and to provide a variety of work areas incorporating reconfigurable tables, computer workspaces, presentation areas, and the like (Wolff, 2001). Finally, in order for this change to be successful, the faculty will need to understand and support this evolution as well as participate in the development of the project, its additional curriculum materials, and the space in which it will be delivered (Pepper, 2008; Mitchell & Smith, 2008). The investigation into all three of these aspects of program implementation would be beyond the scope of research at the master’s level, therefore this research reports and explores the opinions of faculty members with regard to the need for and feasibility of implementing this new approach to learning. From this exploration, the readiness of faculty members to embrace this change can be gleaned.
Background and Literature Review

Educational change management.

There is a dearth of published information regarding change management at community colleges in Ontario. The literature that does exist exploring educational change management is primarily focused on primary and secondary school systems, mostly in the United States (e.g. Conrad, 1978; Duke, 2004; Fullan, 2007; Kozma, 1985). This literature reveals that these educational systems differ in the origins of curriculum change, but discuss a number of concerns that are applicable to the Ontario community college learning environment. The literature that addresses educational change in higher education is focused primarily on universities, again in the United States. The literature echoes some of the concerns found in the literature concerning primary and secondary levels, but also introduces academic constructs more unique to higher education.

One of the complicating factors in the search for published studies on educational change management at community colleges in Ontario is the multiple meanings of the terms ‘community college’ and ‘college’ within Canada, the US and abroad. When the term ‘college’ is used in the search criterion of a database, published works on a variety of educational structures are displayed. The term college is used to describe educational institutions ranging from secondary schools such as Regina Mundi Catholic College in London, Ontario, to constituents of larger universities such as Trinity College at the University of Toronto. In the US the term community college often refers to a public institution of higher education that generally offers two-year programs of study that may include, but are not necessarily limited to, technical and vocation studies (Clark, 1990, McCormic & Zhao, 2005). Compounding the problem is the variety of terms that are
used to indicate educational institutions that provide vocationally based education similar to community colleges in Ontario (McCormic & Zhao, 2005).

Geoff Scott (2003) echoes the sentiments of many in the field of educational change management when he states, “taking what looks like a potentially relevant, desirable, and feasible change idea and making it work in practice is by far the hardest part of the quality improvement and innovation process” (p.70). One of the most possibly insurmountable obstacles in change management is the potential resistance to educational change by the faculty members who will ultimately be involved in the functional implementation of the new curriculum or program (Kee & Newcomer, 2008; Kozma, 1985; Schultz, 2007). One of the most commonly cited reasons for the failure of implementation is lack of consensus and resources (Kee & Newcomer, 2008). It has been suggested that managers simply have not understood what stakeholders have required to make change successful. One key approach to change is to have advocates or stewards of change willing to champion the adoption of new methods to their colleagues (Kozma, 1985; Schultz, 2007). To this end, it is important for faculty members to be involved from the onset in this problem-based learning initiative proposed for the sixth semester of technology programs.

Fullan (2007) outlines what have become recognized as the three broad phases to educational change:

Phase I: variously labeled initiation, mobilization, or adoption – consists of the process that leads up to and includes a decision to adopt or proceed with a change.

Phase II: implementation of initial use (usually the first 2 or 3 years of use) - involves the first experiences of attempting to put an idea or reform into practice.
Phase III: continuation, incorporation, routinization or institutionalization – refers to whether change gets built in as an ongoing part of the system or disappears by way of a decision to discard or through attrition. (Fullan, 2007, p. 65).

One outcome of the first phase of change is an implementation plan that will act as a bridge between the first and second phases outlined by Fullan (2007). The implementation plan outlines the procedure to implement the change and include provisions for staff development, organizational development and the mobilization of resources (Duke, 2004; Wedell, 2009). Within this first phase, Duke (2004) identifies “the foundation of any good implementation plan is a careful and thorough assessment of readiness for and resistance to change” (p. 123).

Duke (2004) further expands on resistance by subdividing it into two general categories: general and selective. “General resistance manifests itself in opposition to any and all suggestions for change. Selective, on the other hand, is reserved for proposed changes of certain kinds or in certain areas” (Duke, 2004, p. 125). An exploration into the level of resistance at both of these levels enables an understanding of the readiness for change within the faculty. To determine the level of general resistance in this study, perceptions of faculty toward the need for the introduction of curriculum that addresses the integrated design process by means of a problem-based learning activity need to be established. To further explore resistance that faculty members may have, their concerns about aspects of the implementation of the problem-based learning activity will reveal the selective resistance that may need to be addressed.

A variety of approaches to and theories about educational change management have been explored by researchers such as Fullan (2006), Duke (2004) and Kozma (1985). These researchers have provided a comprehensive evaluation of the educational
change models and theories, subsections of which are used in an exploratory manner in this study. The purpose of this study is to examine one facet of the educational change process as defined by two of the researchers mentioned and is not intended to advance the educational change theories previously defined.

*Problem-based learning.*

Implementing problem-based learning in higher education began with medical education in the 1960’s at McMaster University, and throughout the next three decades it continued to gain momentum within and outside the medical education community (Pepper, 2008; Barrows & Tamblyn, 1980). Problem-based learning has continued to develop to the current point where it is used in multiple disciplines including the health sciences, engineering, business, science, agriculture and education in numerous educational institutions and a variety of countries (Pepper, 2008).

Problem-based learning has its foundations in experiential learning and is focused around scenarios developed by faculty to simulate real world situations that are likely to be encountered by students in the workplace after graduation (Maitland, 1997). Student preference for experiential learning is not new and is evidenced in apprenticeship, which has been used to educate carpenters, blacksmiths, plumbers and other people working in the trades long before the advent of classroom based education. Experiential methods in classroom based learning, detailed by J. Dewey in 1902 and applied by W.H. Kilpatrick in 1918, have been applied more recently in the work of D. A. Kolb who presented arguments to support experiential learning in his 1984 book *Experiential learning: Experience as the source of learning and development.* Kolb
(1984) provides this definition of learning: “Learning is the process whereby knowledge is created through the transformation of experience.” (p. 38).

Current theories of adult and lifelong learning advocate four key elements to achieve effective education: learning should be constructive, self-directed, collaborative and contextualized (Dolmans, Grave, Wolfhagen & van der Vleuten, 2005; Massa, 2008). These concepts are the main constituents found in the theoretical basis for problem-based learning. They contribute to “learning as a process of creating meaning and building personal interpretations of the world based on individual experiences and interactions” (Dolmans et al., 2005, p.39).

An appropriate problem chosen and presented in a PBL simulation will guide the learning activities of the small group of students presented with the task of finding viable solutions (Boud & Feletti, 1997). During the process the students will need to decide on the information and skills needed to perform the task. In order to develop a viable solution to the problem presented, interdisciplinary cooperation is necessary (Broussard, La Lopa & Ross-Davis, 2007). The process requires students to “build on current knowledge to synthesize then integrate new information” (Pepper, 2008, p.61) thereby reinforcing the experiential benefits of this instructional method.

**The Research Project**

As the faculty members in the School of Building Technology prepare to embrace new instructional challenges, an understanding of perceptions and opinions towards the radical change mentioned above would allow academic managers some insight as to the requirements anticipated by those who will be intimately involved in implementing
change. To this end this qualitative case study was envisioned as an important first step towards developing this understanding. During this exploration, different areas and levels of general and selective resistance, as described by Duke (2004) may be revealed. The level of resistance, or lack there of, will provide some insight as to the willingness of faculty to embrace this change. As previously indicated, this is but one facet of a more involved process to implement change at an institution of higher education. The chapters that follow are presented in monograph form beginning with this introduction and then proceeding to document and report the case study research process, relate the participant portraits and draw together insights from themes that emerged from interviewing faculty members.
Chapter Two: Methodology

Rationale for Study Design

This study was designed to be exploratory and emergent in nature, and as such the methods employed were best suited to yield qualitative data that is descriptive and convey participants’ opinions in their own words. A qualitative case-study approach was employed to gather and explore a rich data base, enabling themes to be drawn out concerning the faculty members’ opinions on the need for and the feasibility of implementing an interdisciplinary problem-based project in the sixth semester of the three programs (Siedman, 1991; Merriam, 1998). The methodology involved semi-structured interviews of eight faculty members within the School of Building Technology at Fanshawe College in London, Ontario, to explore their opinions and perceptions on this proposed change in curriculum delivery. In addition, the selection of the participants was purposeful (Patton, 1990; Merriam, 1998) in order to investigate the differences in responses, if any, associated with varying length of time teaching in a community college, length of time out of industry, and length of time remaining before retirement. Possible differences in opinion stemming from different attitudes toward change may depend on a faculty member’s career stage, with older members being more resistant to change both at the general and selective levels (Schultz, 2007; Duke, 2004; Fullan, 2007).

The purpose of this case study was to examine the perceptions of faculty members regarding the need for and the feasibility of implementing problem-based learning in the sixth semester of building technology programs and to relate the findings to the overall process of change and change management in higher education. Attention was given to three specific criteria for the sample: the suitability of the participants to provide a cross-
sectional faculty representation (Merriam, 1998; Hartas, 2010), the participants’ perceived level of general resistance or acceptance to the proposed change, and finally their perceived level of selective resistance or acceptance to the proposed change (Duke, 2004, Fullan, 2007).

Qualitative research methods involving semi-structured interviews, personal observation and document review have allowed detailed descriptions to be compiled into participant portraits enabling a more holistic analysis to be completed (Bogden & Bilken, 1982). In order to develop a deeper understanding of a faculty member’s views it was necessary to obtain the information directly from the individual by means of dialogue. The participant portraits were used as a means to capture and frame each of the participants’ opinions and perceptions regarding the need for and feasibility of implementing the proposed curriculum change.

Faculty members directly involved in functional implementation of any new curriculum or program have been identified as key players in the success of such change (Schultz, 2007; Duke, 2004; Fullan, 2007). The application of the case study method utilizing interviews allowed the researcher to explore the more subjective factors surrounding this phenomenon (Merriam, 1988, Siedman, 1991), which would not be revealed by the use of other methods such as the use of a questionnaire or survey. A review of qualitative research methodology literature reveals a differentiation between participant observation and intensive interviewing to gather meaningful data (e.g. Lofland & Lofland, 1984; Siedman, 1991; Mason 2002). Depending on the nature of the data sought in a particular study, the interview process has the potential to produce data with greater depth (Hoare, 1987) and to allow the depth of a participant’s emotions and
feelings to be revealed (Patton, 1990). Given that the purpose of this study is to gain a better understanding of faculty member’s opinions, the interview was used as the primary source of data acquisition.

Based on the literature concerning problem-based learning and educational change management, it was anticipated that several themes would emerge from the interviews (Conrad, 1978; Vardi & Ciccarelli, 2008). It was thought that these themes might include the importance of time and resources to develop curriculum materials, program equity concerns, competing philosophies and human flexibility in addition to the need for professional development.

**Participant Selection**

The participants were purposefully selected from full-time and partial-load faculty members in the School of Building Technology, Faculty of Technology (Patton, 1990; Merriam, 1998). Part-time and sessional faculty members were excluded from the study, as they are not responsible for the creation of curriculum materials. Participants were selected based on their response to an invitation to participate in the study (refer to Appendix C), which was placed in their mail slots in the Faculty of Technology offices. Faculty with a range of experiences in the different facets of the building industry such as construction, structural and architectural design and management were selected to gain an understanding of the range of opinions concerning the need to successfully implement problem-based learning in the sixth semester of technology. An attempt was made to recruit a range of faculty members from all three of the programs involved, with varying years of experience.
The Interview Process

Interviews were chosen as the preferred method of data collection in order to gain a deeper understanding of the opinions of participating faculty members on the implementation of problem-based learning (Seidman, 1991; Cohen, Manion & Morrison, 2007). In this study, a survey would not have yielded the same depth of results and would have been more open to ambiguities of terms and concepts. In addition, the small number of participants would have not provided statistical reliability. Interviews alleviated this problem by striving to address each participant’s personal experiences and opinions with regard to the need for and successful implementation of problem-based learning (Seidman, 1991).

After obtaining ethics approval from the University of Western Ontario and Fanshawe College (refer to Appendix A), semi-structured interviews were conducted to gather the opinions of full-time faculty members. With the participants’ permission the interviews were recorded using a digital audio recording device. In addition to the audio transcriptions, notes were taken during the interview and immediately afterwards as the interviewer reflected on all aspects of the interview. Using both the dialogue recorded during the interview and the interviewer’s notes, participant portraits were developed for each participating faculty member. The participant portraits, observer’s notes, and document analysis were then used to identify themes (Merriam, 1998; Cohen et al, 2007), which were substantiated using triangulation (Matheson, 1998; Cohen et al, 2007).

All of the interviews were conducted in the same room in an area of the college that provided a quiet environment, free from interruptions, which also protected the identity of the participants as much as possible. The interviews were conducted using a
standard approach to interviewing with the researcher and participant proximally seated on two sides of a corner of a table, and with an audio recording device between them on the table (Cohen et al, 2007). The questions used to guide the interview (see Appendix B) were occasionally referred to as the interview progressed. The interviews lasted between 20 and 50 minutes with the majority lasting approximately 35 minutes. An interview lasting about half an hour provided adequate time to explore all of the questions, but some of the participants were predisposed to digress to topics outside the focus of this research, resulting in longer interviews in some instances. These off-topic discussions, in some instances, provided a means of fostering rapport between the interviewer and the participant, which was more conducive to exploring the main research focus.

Preliminary questions were used to establish the length of time employed away from full-time building industry employment, and correspondingly the length of time teaching in the community college setting, as well as to approximate the career stage of each participant. Additionally, these initial questions formed the basis for confirming that the participant selection had resulted in a reasonable cross-section of faculty members from the school. The second set of questions was crafted to explore each participant’s understanding of problem-based learning, the integrated design process, and the perceived need to introduce this concept using this approach. This second set of questions was also used to evaluate any general resistance to the introduction of this educational change. The third set of questions probed for specific concerns each participant might have regarding the implementation of the interdisciplinary problem-based learning activity and it was used to gauge the level of selective resistance to or acceptance of the change. The identification of easily addressable concerns would suggest that the faculty
member would likely support and perhaps even emerge as a steward for change. All of the interviews were conducted between the end of January and the end of February 2010.

*Methods of Data Analysis*

The interviews were recorded using a digital audio recording device, and were then transcribed and used to construct participant portraits. In addition to the audio transcriptions, notes were taken during the interview and immediately afterwards as the interviewer reflected on the aspects of the interview. Using participant portraits, observer notes, and document analysis themes were identified (Merriam, 1998; Cohen et al, 2007) and substantiated using triangulation (Matheson, 1998; Cohen et al, 2007).

The three sources of information used in this study were the data gathered by interviews, participant observation during the interview and document analysis. The employment of triangulation helped to minimize the biases inherent in data sources, methodologies and researchers (Matheson, 1988). The participant portraits were essential in capturing the opinions and concerns of the faculty members and allowing them to possibly be compared with themes identified in similar studies elsewhere.

*Benefits of the Study*

A review of relevant databases on the subject of educational change revealed a scarcity of literature written on the process of educational change as it relates to community colleges in Ontario. This study provides a much-needed glimpse into one segment of the contemporary process of change management in this setting. As Ontario community colleges struggle to evolve to meet the changing needs of both students and
employers, the need for a more thorough understanding of educational change and the management of such has become an ever-increasing area of interest. Specifically, this study will be beneficial as the faculty in the School of Building Technology at Fanshawe College work toward the implementation of the interdisciplinary problem-based learning activity in the final semester of three advanced diploma programs. The opinions, perceptions and suggestions of the participating faculty members with regard to the PBL capstone project will help guide the next steps in the change process.

Much of the rich data that was gathered during the interview process was excluded from this presentation of the study due to the ethical requirement of identity protection. This data will be used in the subsequent reporting of this study when it is presented to the School of Building Technology and the need for identity protection is not as prevalent. It is hoped the faculty members that participated in this study will work with the remaining faculty members to further explore, and ultimately participate in the implementation of the proposed problem-based learning activity.

Limitations of the Research Design

Any research methodology used to examine a given subject has its inherent strengths and weaknesses. The strengths of this study lie with the methodology and the knowledge and participation of the researcher who conducted the interviews. The researcher’s understanding of the subject, of college teaching and of curriculum development allowed him to collect data through interviews that enabled the creation of meaningful participant portraits. This can also be viewed as a weakness in the project design, as it is impossible for any researcher to be entirely free of some biases and
precognitive expectations. The Research Ethics Board at Fanshawe College initially expressed concern over the relationship between the researcher and the participants. The Board only granted approval after it was assured of the collegial relationship between the parties and the lack of any duress or authority of the interviewer over the participants. The nature of the subject matter of the research and the information being gathered by means of the interview were also deemed to be within the realm of general conversation between faculty members.

Based on the reading of background literature, it was initially believed that career stage; length of time away from industry, and length of time teaching in the community college would influence the participants’ views regarding the implementation of the PBL method. It was expected that faculty members approaching the ends of their careers might be less likely to embrace change on both general and specific levels, while those in the earlier stages of their careers might be more likely to see the need for and accept change in curriculum and teaching methods. Since the integrated design process is a relatively new concept in the construction industry, it was initially thought that faculty members who had been out of industry for a shorter time would be more likely to be familiar with the process. Similarly, it was expected that participants who had been teaching for longer periods of time would be able to evaluate the learning potential and identify possible problem areas, despite being less familiar the IDP. All of these factors melded together to form the shape and colour of the lens through which this problem was initially regarded and this view was the basis on which the methodology was determined and the interview questions were crafted.
Chapter Three: Participant Portraits

Introduction

Ideally, this study would include all faculty members who fit the selection criteria of this case study to gain a more complete body of knowledge to allow a greater degree of understanding of the change process and its management in community colleges in Ontario. This option might well be considered after this exploratory research has been concluded and the results analyzed to determine if a study of that magnitude is warranted.

A Description of Faculty Members Interviewed

The participants in this case study were purposefully selected from the Fanshawe College’s complement of 35 full-time and partial-load faculty members in the School of Building Technology, Faculty of Technology in the winter semester of 2010. Part-time and sessional faculty members were not considered, as they are not customarily responsible for the creation of curriculum materials. Participants were selected based on their response to an invitation to participate in the study placed in their mail slots in the Faculty of Technology offices. The 22 full-time and partial-load faculty members who taught in the three-year technology programs were invited to participate in the study. Faculty members with a range of experiences in the different facets of the building industry, including both structural and architectural design, civil engineering and construction management, were selected to gain an understanding of the range of opinions regarding the requirements for successfully implementing problem-based learning in the sixth semester of technology. An attempt was made to recruit a range of faculty members from all three of the programs involved, with varying years of
experience. One female faculty member agreed to be interviewed representing the proportion of women present in the faculty in the spring semester of 2010.

Of the 12 faculty members who responded positively to the invitation to participate, eight participants were purposefully selected for interviewing to represent a cross-section of teaching experience. Unfortunately, none of the partial load faculty invited to participate in this study responded to the invitation. As the nature of this research demands that the participants agree to the interview with no implication of duress, the reasons for the non-participation were not determined. The eight chosen faculty members fit the criterion of providing opinions from people with a range of experiences in the different facets of the building industry such as, structural and architectural design, civil engineering and construction management. The following table summarizes how the eight participants fit the criterion.

![Participant Teaching Career Experience](chart)

*Figure 1.* Participant teaching career experience.
Since many faculty members do not spend their entire careers teaching in the college system the number of years to retirement indicated in the above figure will give some indication as to the career stage of each participant. Due to the cycle of faculty renewal, there are very few full-time faculty members with more than 20 years of teaching experience within the School of Building Technology. In addition, there were no full-time faculty hired between 1992 and 2002, which created a gap in the 10 to 15 years of teaching experience range in this school. (Fanshawe Faculty Seniority Report - January 2010).

![Bar chart showing years of teaching experience for full time faculty members in the School of Building Technology.]

*Figure 2. Full time faculty members’ years of experience (school of building technology)*

All but one of the faculty members interviewed have taught courses in at least two of the three programs and all have experience teaching students in semesters one through six.

Due to the nature of teaching building related subjects in a college setting, people who become faculty members in the School of Building Technology rarely have teaching
experience outside of the college environment before joining the college faculty. It is possible some have taught college courses part-time prior to becoming a full-time professor, but it is their technical expertise and work experience that is of the most value in a college setting. Newly hired full-time faculty members participate in a regimen of activities and programs over the first several years of their teaching career to enhance their ability to teach, but only a small percentage have formal teacher education prior to college teaching. Of the 46 professors (29 full time, 6 partial load, 11 part time/sessional) teaching in the School of Building Technology in the winter semester of 2010, only two had formal teacher education prior to teaching at the college.

The experience of the participants within the construction industry varies from just a few years to well more than 20. While all of the participants indicated they had not been employed full-time in the construction industry since becoming full-time professors, many continue to participate in construction related activities on a part-time or contractual basis. The yearly demands on college faculty members permit a modicum of time to pursue other professional activities thereby enabling professors to remain current in their field of expertise as well as up-to-date in their scholarship of teaching and learning.

In order to provide a reasonable level of participant identity protection, pseudonyms are used in the presentation of the their portraits. The pseudonyms chosen did not resemble any current faculty members’ names at the time of this study; no identification of any participant can be inferred from the assigned pseudonyms. The use of gender identifying third person personal pronouns cannot be taken to indicate the true gender of the participant in a particular portrait. The use of she and he has been included
to aid in the readability of the portraits and the proportion of gender specific personal pronouns represents the gender balance within the School of Building Technology in the winter of 2010.

While writing the portraits, it became clear that to include a detailed account of the participants’ work, educational and teaching experience prior to each of them joining the college faculty would compromise any attempt to protect their identities throughout this research. Unlike some areas of education, and indeed other faculties within the college, the work experience and education of the people who teach in the School of Building Technology is tremendously varied with some professors bringing only minimal formal education to complement their extensive work experience. Other professors within the faculty have achieved advanced degrees in their chosen disciplines within the construction industry with some also holding advanced degrees in education to further complement the education and years of experience they bring from the professional arena. As is presented in the portraits below, people are drawn to teaching in technology at a community college after varied lengths of experience in the construction industry ranging from a few years to several decades. Most are drawn to teaching as a means to strengthen the industry by passing on all they have learned to students who are interested in joining it. Almost unanimously, people become college professors in the School of Building Technology based on a ‘life style’ choice, and decidedly not a monetary one, as most will eschew higher salaries to teach at college. While not specifically indicated, the participants presented in the portraits below do represent the spectrum of varied life and work experience along with educational achievements of the faculty within the School of
Building Technology. The education of the participants ranges from college diplomas, bachelor’s, and master’s degrees to doctoral degrees earned in Canada and abroad.

As outlined above, the nature of the faculty in which the participants are members and the limited number of faculty members within the School of Building Technology greatly limited the use of quotes by the participants to strengthen and illustrate their opinions on the study subject. The combination of the varied disciplines, unique experience, education and voice of each participant ultimately shapes his or her response to each question asked. To include quotes would possibly weaken any veil of protection afforded the participants.

While the opinions of each participant are presented according to the order in which the questions were posed during each interview, the order of the interviews as a whole does not conform to the order in which these took place. The sequence of answers and opinions may have been rearranged to roughly match the sequence of questions. The portraits are presented in a random order.

The Portraits

Sam.

Sam had been teaching at a community college for more than 20 years, had not worked full-time in the building industry during this time, and planned to retire from teaching within the next 5 to 10 years. He had taught courses to students in all three of the technology programs but primarily taught courses in the Construction Engineering Technology program.
Sam enthusiastically participated in the interview despite minimal exposure to or knowledge of the integrated design process. Once the interviewer explained the concept, he could easily relate the process to the ‘design build’ model of construction. In addition, Sam could see a need for the integrated design process to be introduced to all three of the programs. As problem-based learning is a main component of many courses within all three of the programs, he was quite familiar with this teaching approach. Sam was very receptive to the idea of having an interdisciplinary project-based learning activity that would culminate in the sixth semester of each program. As an experienced educator in the college system, he outlined a number of concerns from a teaching and learning perspective including the need to maintain the current sixth semester learning outcomes. Other concerns included scheduling, accumulated knowledge of the students, group-member evaluation and student motivation during the sixth semester. Currently only the sixth semester of the construction and civil engineering technology programs coincide during the summer while the sixth semester of the architectural technology program occurs during the winter semester necessitating a scheduling shift to accommodate the proposed common interdisciplinary project-based activity. Since the sixth semester is their last, most students have already secured employment after they graduate creating a situation where some students are interested in the material being taught only if it relates to their chosen profession, but if not, “all they are concerned with is achieving a passing grade in the course to meet program requirements.” Each of the programs being considered is a cooperative program resulting in the students returning for fifth and sixth semester having a minimum of 12 months of work experience. Sam was quite familiar with the various courses taught throughout the three programs and could relate the
learning in a project such as this to previous courses. He felt that the project should be structured such that the students would work in groups comprised of four students from each program. A discussion during the interview, concerning the difference between the learning styles and processes between university and college, revealed his belief that the project would be a great way to introduce and develop many work related skills, a primary goal of a community college education.

Sam felt the physical environment should resemble a ‘lab’ setting and should include tables, computers, network access, whiteboards and the like that would enable all of the members of the group to work collaboratively in a comfortable environment, yet also maintain a workspace isolated from other groups. The other aspect that he expressed was the need to instruct students in collaborative problem solving, as this is only previously taught at a cursory level in the technology programs. Sam felt that the facilities currently within the college could be rearranged and combined to create an appropriate work environment for each group. When asked, he indicated that more time would be needed to ponder how much time would be required to prepare to facilitate the project for the first time given two semesters to prepare.

Throughout the interview, as new ideas were explored, Sam’s concept of a sixth semester project evolved. Initially he believed that the project should occupy the entire sixth semester, but nearing the end of the interview, he expressed that it should be more of a capstone project completed in concert with supporting courses, but maintained that the idea was sound and that it would allow the three programs to learn aspects of each other’s disciplines. Sam showed enthusiasm throughout the interview both by physical
indicators and the level of excitement expressed in the response to the questions being asked.

Taylor.

Taylor had been teaching exclusively in the college system for more than 20 years and planned to retire from teaching within the next five years. While he had not worked in the industry for more than 20 years, Taylor continued to teach courses in all three of the technology programs with a focus on teaching courses in Civil Engineering Technology. He remains current through professional development opportunities.

Taylor was amenable to the idea of participating in the interview but was a little reticent about the topic of the research due to length of time teaching at the college. He had heard the term integrated design process, but was not familiar with the process as it is used in the current building industry. Taylor could relate the process to those that had been used on a project ‘out west’ that he had worked on before joining the college. As with the others involved with this research, he was very familiar with project-based learning having employed this teaching technique in many courses. Taylor was very supportive of the concept of having an interdisciplinary problem-based learning activity in the final semester. He initially expressed concern about having enough time to prepare for such an activity but shared many good ideas about the types of projects that could be used and outlined a number of specific considerations that should be addressed within the project. Taylor also mentioned the need for alternative energies and other green technologies to be considered when preparing the project. He suggested projects such as a plaza, a small bank, a small sewage treatment plant and even a bridge, then suggested
perhaps having many different projects and let students choose which one they would be interested in working on. The varied projects might allow students to explore different aspects of the construction industry that they may have not previously considered and help to prevent the duplication of others’ work.

Taylor felt that the primary concern was not so much the space needed but the time involved to organize such an activity. He felt that a minimum of 5 to 10 hours a week would be needed throughout two semesters to properly interface with others and perhaps to bring in other areas such as the mechanical and electrical trades also taught within the School of Building Technology. Taylor did not have any concrete concept as to how the project should be organized from a scheduling point of view, but felt that it should not occupy the entire 14-week semester, perhaps 10 to 15 hours per week. He indicated there should be additional courses taught that would support the major project and work toward the meeting of established learning outcomes. Taylor expressed concern about the incomplete knowledge of the students to approach such a project. Smaller groups consisting of two or three students from each discipline was Taylor’s suggested group size, which he felt would be ideal to facilitate the best learning and avoid situations in which some students would participate minimally, while others completed the majority of the work. During the discussion, Taylor brought up the debate as to whether the groups should be assigned by faculty members or should be created by the students themselves and that in either instance the students need to develop the skills to work effectively in groups.

When asked about the resources needed to prepare for the PBL, Taylor once again emphasized the time that would be required and felt that the physical resources currently
available at the college would suffice to facilitate the learning. He reiterated that five to ten hours per week would be needed to develop the learning activity. Taylor also mentioned as a main component of the project that it should be practical and incorporate green technology. As the interview progressed Taylor became more enthusiastic about the possibility of the project in sixth semester and began to discuss a number of possible projects and how they might be approached. At the end of the interview Taylor conceded this would be a great idea but mentioned the need for time. Throughout the interview he remained somewhat reticent but became more comfortable with expressing opinions and thoughts as the interview progressed. Taylor appeared uncomfortable at first but seemed more relaxed throughout the interview.

_Terry_.

Terry had taught less than five years and looked forward to teaching for another two decades. He brought a wealth of knowledge focused on key elements to the Architectural and Construction Management programs. After receiving the invitation to participate, Terry was hesitant to agree to an interview due to a lack of understanding about academic research, and he requested some explanation before agreeing. His unease was initially evident during the interview but quickly dispersed during the first few minutes.

Terry was familiar with the integrated design process, was able to discuss the process in detail, and agreed that the process was particularly suited to the green building concept. Terry was familiar with project-based learning and indicated many courses he had taught utilized this approach using ‘real world’ examples.
Terry was quite supportive and even excited about the notion of problem-based learning in the sixth semester and thought the different disciplines would benefit tremendously from the interdisciplinary interaction. Terry expanded on the idea by suggesting that the programs should interact throughout the three years. He reinforced the idea of making the project reflect the current state of practice within the industry. Terry felt that the curriculum revamping would be the greatest concern, mentioning that there would be a concern about lost content from the current format based on the discipline specific perspective.

Terry felt that the project should not consume the entire sixth semester, and other classes should continue to be taught concurrently, though they should be related to the project and provide an opportunity to introduce topics that would span all disciplines. Terry reinforced the idea of a time together coupled with a time apart with time to work in their groups on the project. He suggested a 50/50 split between time devoted to project and to supporting courses, spending half the time in smaller groups split between several classrooms and regular classes. Terry had difficulty defining what type of project would be suitable, but after some discussion suggested that any project should provide an equal opportunity and workload for each program. While he did not suggest a specific project, Terry did outline a number of considerations that should be taken into consideration to maintain work equity between the programs.

When it came to physical space Terry felt that access to computer labs with enough space to facilitate collaboration would be imperative. As the discussion progressed, Terry developed the opinion that groups should have isolated space, perhaps a dedicated classroom for each group with computer access and moveable desks, for
example, to promote interpersonal teaching between students from different disciplines. Terry felt that the first time through the process would allow a better understanding of the time and space needed for such a learning activity to be successful. He expressed concern about the balance and timing of the work within the project suggesting that work for students from one discipline might require the completion of work from another group complicating the scheduling and hindering the process.

When asked about the time needed to initially prepare for such a learning activity, Terry suggested that some of the material from existing courses would likely be integrated into the new problem-based learning strategy, but suggested that three to five hours a week would be needed to meet with other involved faculty and to develop the additional material needed for the problem-based learning. With regard to resources, he felt that all of the needed resources are currently available within the college and mentioned that there would likely be no additional costs to the students beyond those already required. Near the end of the interview, Terry mentioned the need to introduce Building Information Modeling (BIM) into the program in general and specifically the problem-based learning project would be an ideal application of this emerging technology that will be important to the industry and our students. Terry expressed concern about the varied state of each of the programs but highlighted the advantage of faculty members teaching in several programs. During a discussion about the potential implementation of alternate semester formats and lengths Terry reinforced the support for problem-based learning in the sixth semester, suggesting the reorganization of the programs would lend itself to the introduction of the activity.
Terry expressed concern about the timing of semesters to implement the problem-based learning, mentioning that currently the sixth semesters of all of the programs do not coincide. He suggested that this might be offered as a separate course offered in addition to the regular curriculum, but expressed concern about being able to attract enough students from each of the programs. At the end of the interview, Terry reiterated support for such a learning opportunity and expressed a desire to be part of the initiative.

Kelly.

Kelly had been teaching in the college system for less than five years and planned to continue for another 15 to 20 years. She taught courses in all three of the technology programs, but had knowledge particularly suited to the Architectural and Construction programs. Kelly was more than receptive to participation in this research and was one of the first participants to respond positively to the invitation. She was at ease throughout the interview, even animated at times.

Kelly was not initially familiar with the concept of the integrated design process, but once it was explained, she recounted involvement in similar processes prior to joining the college where it was referred to as a “design-build” process. Kelly was able to relate many of the components in the integrated design process to previous experience. When asked about problem-based learning project, she was quite familiar with this method of teaching and learning, but mentioned that it was a technique she had developed since joining the college faculty, as she had never been exposed to it during university. When the possibility of an interdisciplinary problem-based learning in the sixth semester was discussed, Kelly was very excited about the possibility and related a number of ideas.
relevant to the project and the activities of each discipline. Kelly thought it would be difficult to cover all aspects of the integrated design process in a problem-based learning project within the constraints of the 7 or 14 week semester system given the lack of experience and knowledge the students have at that point in their education. Kelly suggested that a project that was partially developed be used to address this concern given the timing constraint.

Kelly thought that the project should be defined before any other considerations were addressed. She felt the project should be a larger structure such as a superstore or an arena, and perhaps a renovation or repurposing of an existing building with limited interior detail. Kelly believed that the students should also be engaged in other courses that would teach material supportive of the problem-based learning project. She thought that the students should work in groups of 8-12 comprised of equal representation from each program. She also mentioned the possibility of the course being offered as an additional course to be offered at the conclusion of the sixth semester as an additional endorsement for interested students. This option would address the imbalance in the size of the graduation classes in each discipline as well as a strategy to offer the experience only to interested students. Offering the problem-based learning experience only to interested students would take care of the problem of students who are disinclined to performing additional work, and would also create the opportunity for the more interested, usually the academically stronger ones, from each program to work together without the possibility of a tremendously intellectually and motivationally unbalanced group.
Kelly believed that the development of a new building would be more appropriate than a repurposing or renovation of an existing building due to the building code and municipal requirements. A new building would allow the groups a better learning experience as they could incorporate newly acquired knowledge about building materials processes. Kelly also believed the building should incorporate green technologies and practices to further reinforce the movement.

When asked about the time required to develop the problem-based learning for the first delivery, Kelly believed that the process should include a ‘walk-through’ by the involved faculty members to gain an understanding of the required teaching material and to minimize any unforeseen difficulties the students may have. Kelly felt that this would require a total of 40-50 hours of preparation but would like to see what more seasoned faculty said before making any firm time estimates. Kelly thought that each group would require computer access as well as space to examine drawings and work collaboratively. Kelly thought that space akin to a boardroom would be ideal, but that a classroom could be set up to serve the purpose. She felt that each group would require a dedicated space to allow consistency and continuity for the project. Kelly expressed a concern over the timing of the problem-based learning method, mentioning that not all programs’ sixth semesters coincide. She believed that the current college resources could be repurposed and rearranged to suit the project, but mentioned that BIM would complicate the process and might require additional resources. Kelly thought that it would be interesting to incorporate an actual site to be developed and reiterated that the interdisciplinary problem-based learning in the sixth would be an extremely worthwhile learning experience that would strengthen the existing programs across all three disciplines. Near
the end of the interview, Kelly expressed the excitement she felt about the possibility of problem-based learning in the sixth semester. Her excitement increased throughout the interview session. She repeatedly reiterated how enriching such an activity would be for the students.

Alex.

With 15 to 20 years of teaching experience in the college system and a number of years teaching elsewhere, Alex instructed students primarily in the Construction Engineering program, but had taught courses in the Architectural program as well. Alex planned to retire within the next five years. He was one of the first to positively respond to the invitation to participate and was quite at ease throughout the interview.

Alex was not familiar with the term “integrated design process” and had not had any direct experience the IDP conceptual method. He had participated in similar processes referred to as “design-build.” He expressed the belief that BIM would accelerate the adoption of this process. When asked about problem-based learning, Alex indicated that it was a common teaching technique he used throughout all of the courses. Alex was very supportive of the concept of an interdisciplinary problem-based learning sixth semester and mentioned that a similar idea had been bantered about for some time amongst faculty. Alex was concerned about addressing the needs of different types of learners and the disparate levels of knowledge of students entering the sixth semester. He suggested that the incorporation of such a method could pose a number of challenges, particularly with regard to fair and accurate evaluation. Alex also expressed concern
about logistical implementation of such a project but completely supported the idea on a philosophical level.

Alex mentioned the notion of an advanced diploma that would encompass a number of learning activities and would provide an ideal setting for such a learning activity. Additional considerations expressed by Alex included the disparity of the enthusiasm displayed by various faculty members and the need to engage the appropriate ones with complementary skills and expertise. Alex believed that the project teaching space would encompass both large lecture space to address the entire group and individual workspaces that would allow each group to work independently. He felt that the resources within the college could be adequate but expressed concern over scheduling. BIM was another concern of Alex’s from both a hardware and software perspective as well as the students’ knowledge. Alex expressed that the project should incorporate BIM concepts and would form an integral part of the project. Any space dedicated to the groups should be available all the time for work and meetings.

Alex felt 8-10 hours a week for the two semesters leading up to the first implementation of the problem-based learning would be required and perhaps an additional 2-3 hours per week during the project for consultation between faculty members. Other considerations mentioned included the unionized work environment, the slow bureaucratic process required for change for both technology and space and the need to have suitable faculty members. Alex reiterated the benefits that such a project would bring to the students, but again cautioned that it might be more difficult to implement than initially apparent.
Lee.

Lee had taught elsewhere prior to joining the college and had been teaching in the college system for 15 to 20 years. While his primary teaching had been to Architectural students, Lee had also taught courses in the Civil Engineering program. Lee hoped to continue teaching for another 10 to 15 years until retirement. He was very relaxed during the interview and quite animated at times.

Lee was quite familiar with the concept of integrated design process and thought it would be quite advantageous to introduce this process to the students. He believed that this would be a wonderful addition to the program, but mentioned that some students would be exposed to the integrated design process when on coop terms. Lee related quite a few experiences with integrated design process and indicated how this process might be integrated into the current program. He was quite familiar with the concept of problem-based learning and had utilized this process extensively within the courses he had taught. Lee expounded on teaching difficulties that had been experienced using problem-based learning. He felt that the introduction of the interdisciplinary problem-based learning in sixth semester would be an amazing addition to the current curriculum, but cautioned that it would not happen without “growing pains.” Lee expanded on this notion by indicating that the interdisciplinary learning would greatly expand the understanding of each student as to the roles, obligations and challenges faced by others in complementary disciplines.

When discussing the considerations that would be associated with the introduction of the problem-based learning in sixth semester, Lee mentioned the disparate levels of achievement evident in students even in the third year of a program after two coop terms. Other considerations included scheduling concerns, the imbalance of skills between
students and the need for multiple faculties to be involved from the beginning. Lee felt that the structure of the problem-based learning project chosen should mirror the industry practice, should involve students from the initial description and definition of the project throughout, and should be implemented cooperatively with the students in the other disciplines with regard to defining goals, timelines and deliverables. Lee had a tendency to take the topics of the interview and relate life stories that were somewhat illustrative but generally not the focus of this research.

Lee felt the project should reflect the current state of the industry and would need to be redefined each time the problem-based learning method was run. Lee expressed that the project could be the same for all groups and that the end product from each group would be different based on past experience, but reiterated that it should change from year to year to prevent students from relying on previous students’ submissions and ideas. Lee expressed hesitation at the notion of bringing in a client from outside the college as this might create a situation of conflict.

When the question of duration and group size was discussed, Lee expressed that the problem-based learning experience should take the 14-week full semester and occupy at least 9 hours a week, but expressed concern about the timing and need to discuss the idea with colleagues to resolve issues before this could be decided. Lee felt that students would accept any structure proposed for the problem-based learning that was presented in the appropriate manner with the correct emphasis on the benefits and learning opportunities. Lee later mentioned that the project should occupy half the semester. When discussing the amount of preparation time needed to introduce problem-based learning for the first time, he suggested two to four hours a week for one semester, but mentioned
that this time would need to continue throughout the project to address unexpected questions and problems. Lee thought that groups of nine – three from each discipline – would be the optimal size for this type of learning activity.

On the topic of space, Lee expressed that there was not currently an appropriate space within the college for this teaching method to be successful, but with some discussion came to believe that current space might be suitably adapted, though it should be dedicated to this learning activity for the full length of the project. He expressed that resources such as wireless connectivity, white boards, tables large enough for plans, and a data projector to share ideas would be required. With regard to the resources required for faculty, Lee felt that there would be no additional requirements as everything necessary is currently available. When asked about other considerations, Lee expressed concern over scheduling and double-booking rooms and the mismatch between the sixth semester schedules of the disciplines involved. Lee again voiced the need for such a learning activity, but expressed a concern about the disparate knowledge the students would bring both within a discipline and between the disciplines.

*Chris.*

Chris had been teaching exclusively in the Architectural program for less than five years and planned to retire in the next five to ten years. During Chris’s relatively short tenure in the School of Building Technology, he had been well regarded as an educator who had brought to the classroom many years of professional experience in a vast array of projects. Chris’s interview was a challenge to schedule as he had outside interests and a teaching load that dominated most of the free time he had. Despite this,
Chris was more than willing to participate in the research and was relaxed throughout the interview.

Chris had extensive experience with the integrated design process and mentioned that the creation of the initial team would be extremely important to the process. When asked about problem-based learning, Chris was familiar with the technique and related the teaching style to his professional experience. Chris thought that the interdisciplinary problem-based learning common sixth semester would be a tremendously rich teaching opportunity, but questioned why this was not done currently and not done prior to sixth semester, adding that perhaps it should be introduced in fourth or fifth semesters and continued throughout the remaining semesters.

When asked about considerations, Chris mentioned that the project should be structured to represent the industry practice. Chris expressed that in addition to the three disciplines represented within the School of Building Technology, other disciplines such as Landscape Architecture, Urban Design, and Business should be also be brought in to make the experience truly reflect the current industry practices. When discussing how this might be accomplished, Chris suggested that many of the courses could be team-taught and these courses could support the project as a whole, but that discipline-specific courses should also be taught to meet current learning outcomes. After a discussion about the main focus of the Civil and Construction Management programs, Chris suggested that all of the students should be brought together for the initial introduction, then divided into groups to discuss possible solutions for the project, with each discipline eventually working toward the final product with minimal interaction, bringing in the other related disciplines as required. Chris thought that the whole concept of an interdisciplinary
problem-based learning opportunity in sixth semester could expose and educate students about the function and responsibilities of all of the disciplines that are complementary to their own.

Chris felt that there was no need to change the physical space available in the college, but felt that it would be beneficial to ensure the availability of various resources such as desks and collaborative technology commonly used in industry for the exchange of information and documents. Chris also mentioned the need for document, decision and change tracking throughout the process and suggested that this could be used as part of the method of evaluation for the project. Chris also mentioned that BIM should be part of the project and could be used as part of this technology. The project should incorporate sustainable design and construction. Chris felt that, based on experience with previous courses, two to three hours a week would be required to develop course materials prior to offering the problem-based learning in the sixth semester for the first time.

With regard to resources, Chris mentioned that collaborative software and wireless connectivity would be key, but felt that the space would ideally include a smart-board to facilitate collaboration. Chris felt that the project should culminate in a presentation of the problem-based learning project to the rest of the class, faculty, and perhaps even industry representatives. Chris also expressed that existing space and resources could be adapted to facilitate the problem-based learning activity.

Chris thought industry representatives should be involved in the project, and might include projects such as renovations or repurposing to existing commercial or new construction of a small ICI building of an appropriate size. When concluding the interview Chris reiterated support for the concept and again mentioned additional
disciplines such as Landscape, Interior Design, and Business, but added the Electrical and Plumbing apprentices to the list.

Overall Chris was relaxed and at ease throughout the interaction and responded to the questions with a calm, composed demeanor. Chris was inclined to get sidelined in discussions tangential to the research questions and needed to be brought back to task several times. As the interview progressed, Chris became more animated and visibly excited about the possibility of this learning opportunity.

**Jamie.**

Jamie had taught courses in all of the Technology programs in the School of Building Technology for less than five years, and planned to continue teaching for 15 to 20 more years before retirement. While Jamie’s professional experience was applicable across all of the programs, he primarily taught courses in the Architectural Technology program.

Jamie was very familiar with and a self-proclaimed advocate of integrated design process, having used this process to develop many buildings over a number of years prior to joining the college. Additionally, Jamie was quite familiar with problem-based learning and had incorporated this teaching method in the educational setting since joining the college. Jamie was very supportive of the concept of having an interdisciplinary problem-based learning project in the sixth semester, but suggested that it should be introduced earlier in the programs. When discussing considerations to offering problem-based learning for the first time, Jamie suggested that any project should be sustainably designed, and should include such buildings as banks, small retail
outlets, and ideally provide a real solution for a client. Jamie questioned the focus of
efforts on merely theoretical projects when there are so many real-world applications that
could be explored. He suggested that even if the student designs were not ultimately
implemented, the chosen design could be presented, thus affording students the
opportunity to evaluate their own design in relation to the accepted one. The project
could be a repurposing of an existing building or new construction. During a number of
tangential conversations, Jamie expressed tremendous support for the experiential
learning offered by the interdisciplinary problem-based learning opportunity in the sixth
semester. Jamie felt the interdisciplinary problem-based learning method should
dominate the semester, perhaps occupying one full day from 8:00 a.m. to 4:00 p.m., but
felt that other courses would need to be taught in concert to achieve the learning
outcomes required.

Among other things, Jamie felt that the students should spend some time together
and some time in smaller groups of 6-12. He suggested the physical environment would
include an actual building site, as well as classrooms and other dedicated spaces for
groups. Jamie felt that the resources currently available in the college could be adapted to
adequately serve this purpose, but should be dedicated for the duration of the project.
Some of the resources Jamie envisioned as necessary included smart-boards, wireless
connectivity, moveable desks and a projection system. Jamie reiterated that the project
should either be an actual project or should at least model itself on an actual project. With
regard to time, Jamie thought that in addition to the time required to actually facilitate the
project and to collaborate with other faculty members throughout the problem-based
learning, 2-4 hours a week would initially be required to prepare to implement problem-based learning.

Jamie thought that this project should be facilitated in conjunction with industry representation, either in a consultative capacity or in a client capacity. Jamie believed that the existing resources of the college could be adapted to suit all the requirements of the problem-based learning method in the sixth semester. He reiterated the need to engage faculty members in the process to ensure success, but believed that with the proper conditions, it would be an invaluable learning experience for the students.

It was a challenge to keep Jamie on task with the research questions, since he had a tendency to relate most of the topics back to industry experience and to get side-tracked by excellent ideas that were unrelated to the research questions.

*Portrait Summary*

On the whole the participants were supportive of the concept of having an interdisciplinary project-based learning activity in the final semester of the three programs. Each shared his or her own unique view regarding how the project could be organized, as well as the types of projects that would be suitable. Since the participants had different backgrounds, the unique lenses through which they viewed the project influenced their perspectives. The faculty members from the civil program provided perspectives about the infrastructure while the architectural faculty members were more focused on the building design, and the construction faculty members provided insights from the construction scheduling and estimating facets of the process. Differing perspectives would necessitate the involvement of a variety of faculty members to
successfully effect the implementation of an integrated design educational practice. The interviewees suggested a range of possible projects and perceived different needs and constraints. The overall relationship to the research question and follow up analysis is provided in the next chapter.
Chapter Four: Discussion

Research Goals

The goal of this research was to examine the perceptions of faculty members regarding the need for and the feasibility of implementing problem-based learning in the sixth semester of building technology programs and to relate the findings to the overall process of change in higher education. The literature on curriculum change at other comparable educational institutions predicts this type of curriculum change will be well supported if the faculty members intimately concerned with the process support the change and have a sense that they will be involved and allowed time and resources to complete the task. This study was designed to be exploratory and emergent in nature, and as such the questions used in the participant interviews were crafted to explore this goal by seeking to yield qualitative data that is descriptive and conveys participants’ opinions in their own words. Within the portraits, several themes were found to be evident.

Emerging Themes

The questions discussed by the interviewer and participants during the interviews fell into three broad categories. The first series of questions were used to establish how each participant met the initial criteria of length of time teaching, length of time until retirement, length of time out of industry, and breadth of teaching responsibilities within the school of building technology. The second series of questions was included to establish individual participant’s knowledge, experience and understanding of both the integrated design process and problem-based learning. Based on the responses to this second series of questions and after a discussion about the concept of a culminating
interdisciplinary problem-based learning activity in a common sixth semester for the three technology programs, the third series of questions was used to explore the participants’ perceptions of the need for and feasibility of such a learning activity. From these last two series of questions, both general and selective resistance or support for the change to this new curriculum element can be gleaned gauging the participants’ readiness to implement the change.

The first series of questions posed during the interview were included to establish the background of the participating faculty members. As mentioned in a previous chapter, the participants satisfied the criteria that the faculty as a whole should be fairly represented with regard to four main criteria: the primary teaching area and discipline, the length of time teaching at the college, the length of time before retirement, and the length of time since working full time in the construction industry. The eight participants who were interviewed met these criteria in such a way as to provide reasonable representation of the faculty members as a whole in the winter semester of 2010.

The second series of questions established the participants’ level of knowledge of and experience with the two main facets pertaining to an interdisciplinary problem-based learning activity proposed for the sixth semester students in the school of building technology: the integrated design process and problem-based learning. With regard to integrated design process, the participants’ level of understating varied from no knowledge or understanding to a complete understanding of the process through extensive experience with the process prior to joining the college faculty. Of the eight participants, only one had not heard of the integrated design process and had no experience that could be related to the process. Three of the participants had familiarity
with a very similar process known as “design-build” that shared aspects of the integrated design process. Four of the participants were very familiar with integrated design and were able to discuss it in detail. All of the participants expressed that it would be important to expose students to such a process, and that as the industry moves more toward sustainable building practices, the integrated design process is becoming an important topic that should be woven into the curriculum throughout the various programs.

The participants all knew about and had extensively implemented problem-based learning throughout many courses. The nature of the material taught in construction related programs in a community college lends itself to the application of this style of teaching and learning, and as such it is widely used. Before the participants were asked questions in the third series, the interviewer ensured that they all understood both the integrated design process and problem-based learning along with the concept of an interdisciplinary problem-based learning activity bringing together all of the students in the sixth semester in the three technology programs. This created an atmosphere in which the participants’ general and selective resistance to this proposed curriculum change could be gauged by exploring whether they believed the introduction of the problem-based learning activity would be beneficial and if there would be any insurmountable elements of the implementation that would prevent its successful adoption.

The responses to the second series of questions, both in verbal interaction as well as nonverbal communicative indices such as facial expressions, tonal variances of voices coupled with body stance and gestures, indicate that no general resistance was conveyed by any of the participants. Most of participants’ vocal expressions indicated a level of
excitement or enthusiasm about the possibility of introduction of the new curriculum element as they discussed both IDP and its introduction by means of an interdisciplinary problem-based learning project.

The third series of questions was structured around the three broad topics of whether or not it would be a good learning experience for students, the needs each participant felt it would be necessary to address in the delivery of such an activity, and the elements they perceived would be necessary in the learning environment. The need for and the feasibility of implementing an interdisciplinary problem-based learning were explored by examining the responses to this last set of questions. Some of the questions in this series were used to establish relevance of previous opinions and framed other questions to allow discussion on the key topic, and were thus integral in the interview and discussion process, but had no bearing on the participants’ perception of the need for or feasibility of the problem-based learning experience.

Without exception, all of the participants expressed the opinion that some form of an interdisciplinary problem-based learning experience in the final semester of the technology programs, enabling students to interact in a meaningful way with others studying complementary disciplines, is an outstanding concept and supported it. The reasoning behind the support was focused around the notion that students must necessarily interact with all of the other disciplines after graduating college, so it is implicitly a good idea to expose them to the benefits and difficulties of such interactions and interdependencies in the learning environment. The response to these questions did not convey any general resistance to the proposed change as all of the faculty members recognized the need for the introduction of both the integrated design process and the
interdisciplinary interaction between students. The cumulative responses to this series of questions reinforced the participants’ support for the proposed curriculum change at the general level.

At the more selective level, the needs that each participant perceived ranged from concerns over group evaluation, to scheduling and level of student knowledge. Overall, the responses can be categorized into five emergent themes: maintenance of current sixth semester learning outcomes, time required to prepare for the implementation of the problem-based learning activity, the readiness of the students, scheduling, and evaluation.

All of the participants mentioned the need for maintenance of current learning outcomes either directly or indirectly during the interview. As the Ministry of Training, Colleges and Universities regulates the learning outcomes of any community college program, all participants recognized that any program changes must continue to meet the learning outcomes currently in place. The participants provided several possible approaches to maintain current program learning outcomes. It was suggested that the learning outcomes be incorporated into the problem-based learning activity or perhaps they could be met in concurrent courses. All of the participants provided ideas for solutions to the need for the maintenance of current learning outcomes indicating this requirement would not be a source of selective resistance to the implementation of the curriculum change.

While some of the participants with longer teaching experience had a more solid grasp of the time needed to prepare for the inaugural offering of the problem-based project, all of the participants mentioned the need for preparation time to be allotted in the semesters prior to the first offering. The more experienced faculty indicated that some
amount of time between 5 and 10 hours per week, or equivalent, during the two semesters leading up to the initial problem-based learning activity would be needed to facilitate both the development of the project and to liaise with other faculty involved. All of the participants expressed the view that they were not concerned about being allowed appropriate time to prepare and felt it would be generally recognized that time would be needed and provided. The time required for preparation was not a source of selective resistance for any of the participants.

One facet of the implementation of the proposed curriculum change that was of concern to all of the participants was the cumulative knowledge acquired by the students at the end of the fifth semester. Each participant expressed concern over the readiness of the students to tackle a project encompassing the scope of the one being proposed for the problem-based learning activity. Participants worked through this concern by discussing it during the interviews suggesting several approaches to how it might be addressed in different ways. The readiness of students remained a concern for most participants and might be the source of concern, but did not appear to be sufficient to create discernable selective resistance to the implementation of the curriculum change.

Scheduling of the problem-based learning project was the main concern that emerged from the interviews. The current timing of the semester progression of the three programs involved in the proposed curriculum change is not aligned such that the sixth semesters are concurrent. For the proposed curriculum change to be possible, scheduling concerns would need to be addressed. The scheduling concerns expressed by the participants were the only elements of the implementation of the problem-based learning activity that could be the source of selective resistance. Most participants felt scheduling
was far beyond their individual control and completely at the discretion of the college management, taking it out of the realm of selective resistance for individual faculty members.

The final theme that emerged from an analysis of the interviews was evaluation. All of the participants expressed concern over the form that evaluation would take in such a teaching strategy. The concerns were mainly focused around two main perceived problems – group evaluation and interdisciplinary evaluation – as each of the participating students would be part of a group that is comprised of students from each of the three programs involved, and the project would necessitate evaluation of both discipline specific outcomes and group outcomes. During the interview discussions, each participant suggested different approaches to address this concern with the more experienced professors, providing more possible workable solutions. All of the participants felt that the faculty members involved in the creation of the problem-based project could address the evaluation concerns. Despite the remaining concerns about evaluation, none of the participants felt that it was enough of a concern to be considered a source of selective resistance.

All of the participants expressed that the facilities currently available within the college would be, after some rearrangement, acceptable for use by the groups during the problem-based learning experience. This would indicate that in terms of physical space required, all the participants believe the implementation of this would be feasible. There was no indication that any of the physical space or resource requirements would pose a problem that could not be overcome indicating that any participant concerns about these facilities would not be a source of selective resistance.
The anticipated requirements of faculty members at the outset of the research were generally in the areas of professional development, resources, and academic release time to enable the development of the curriculum materials. While the latter two were evident in the participants’ interview responses, the requirement for professional development was never directly conveyed. When asked about resources that each participant would require to prepare for the new curriculum, none of the participants mentioned professional development, with several merely reiterating the need for adequate time. Additional themes emerged from the interviews as discussed above, but none can be considered to be the source of selective resistance as identified by Duke (2004).

Data Substantiation

The themes emerging from the participant portraits derived from the interviews coupled with the observer notes from the interviews have constructed a landscape depicting the opinions and concerns held by faculty members with respect to the proposed curriculum change. This depiction reveals the faculty members have no general or selective resistance to the introduction of curriculum change proposed. Nevertheless, the lack of expressed resistance cannot be taken as wholesale support for the curriculum change and many specific concerns remain to be addressed. As discussed previously, there is a dearth of literature on the subject of curriculum change in the community college setting in Ontario which severely limits the ability to use triangulation as discussed by Matheson (1998) and Cohen et al (2007) to substantiate the findings of this research. The intent of this research was initially to capture the opinions and concerns of
faculty members with regard to the implementation of the proposed curriculum change and compare with themes identified in similar studies elsewhere. Since no such studies can be found in a search of popular abstract databases, the more general theme of resistance to educational change found in literature examining somewhat similar educational environments such as secondary schools both within Canada and abroad as well as post secondary schools in the United States and elsewhere can be and were explored.

Fullan (2007) in his chapter on *Insights into the Change Process* states: “take any 100 books on change, and they all boil down to one word: motivation” (p.41). Michael Fullan has been researching and writing on educational change for decades and he provides a more comprehensive survey and exploration of the history of educational change than can be reasonably provided in this study (see Fullan, 2007). The general themes that are presented in his fourth edition of *The New Meaning of Educational Change* (2007) are primarily focused on primary and secondary educational settings, but many of the concepts and notions presented can be extrapolated to the community college environment. Fullan (2007) identifies three areas in which changes would be required during the implementation of new curriculum and suggests that change would “…likely occur in (1) curriculum materials, (2) teaching practices, and (3) beliefs or understandings about curriculum and learning practices” (p.85). All three of these areas identified by Fullan (2007) were explored and identified by participants as having to be addressed variously. The other relevant concept discussed by Fullan (2007) is one of teacher advocacy. Distilling his concepts and discussions, he finds that unless it is possible to have the support of at least some of teachers involved in the change, educational change
will not be successful. By having some advocates of change within the teaching staff, they are better agents of change than change applied by administrators. Conversely if the teachers that must implement the change provide resistance, successful implementation is much more difficult, if possible at all.

Fink and Stoll (2005) reinforce the need to address teacher resistance stating “it is, not necessarily the characteristics of teachers, per se, that cause resistance and the continuity it perpetuates, but the pressures on them and the limits placed on their involvement in making the decision to change” (p. 19). The implication of this statement is that if teachers are involved in the decisions involved in the change process, they will be less likely to resist change.

The most applicable exploration into teacher resistance is found in Duke (2004). He refers to “the extent to which individual teachers are prepared to implement a specific design” (p123) as readiness for change. Duke (2004) states, “assessing readiness for change requires understanding resistance as well as commitment” (p.124). It is the concepts of general and selective resistance to change outlined by Duke (2004) that have been explored in this study.

*Response Differences Based on Experience*

As discussed previously, the selection of the participants was purposeful (Patton, 1990; Merriam, 1998) so as to investigate the differences in responses, if any, associated with varying length of time teaching in a community college, length of time out of industry, and the length of time remaining before retirement. It was initially thought that possible differences in opinion stemming from different attitudes toward change might
depend on a faculty member’s career stage, with older members being more resistant to change both at the general and selective levels (Schultz, 2007; Duke, 2004; Fullan, 2007). While there were differences in responses and opinions expressed by the participants based on career stage, this study did not find any greater resistance by participants nearing retirement. The differences in responses were generally related to the participants’ understanding of the integrated design process, with those more recently in the workforce more familiar with the process. Other differences observed in participant opinions centered on the teaching and learning aspects of the proposed change. More experienced professors generally expressed more concern over evaluation, learning outcomes and interdisciplinary interactions than participants who have been teaching for a shorter period.
Chapter Five: Conclusions and Recommendations

Conclusions

The purpose of this study is to better understand the process of educational change in community colleges in Ontario by examining one facet of the development and implementation of problem-based learning in the final semester of the three-year technology programs at Fanshawe College. This descriptive case study is not intended to prove or disprove a particular hypothesis nor is it to derive theories, which may be used for predictive purposes. The goal of this case study is to develop an understanding of perceptions and opinions toward program change of a small group of faculty members in an Ontario community college. From this new understanding, the process of educational change can be better appreciated.

The participant portraits of the eight faculty members who were involved with this project revealed the concept of introducing an interdisciplinary problem-based project as a capstone learning activity in the three technology programs in the school building technology was well received and would be supported. This conclusion is drawn from direct discussions during the interviews coupled with the lack of any expression of general resistance to the idea of implementing this curriculum change. Overall, the participants had a varied and sometimes limited understanding of the integrated design process, but once they understood the concept they supported it as a design approach that students should be taught within the three programs. Problem-based learning is widely used within courses taught by the participants from the School of Building Technology, and as such it is not a source of resistance to broader overall changes to the program as proposed.
Within the topics discussed during the interviews there is no selective or general resistance expressed by the participants, although some concerns remain to be conclusively addressed. The main themes emerging from the participant portraits include the need to maintain the broad learning outcomes prescribed by the Ministry of Training, Colleges and Universities, and concerns about methods of effective evaluation, scheduling, and the level of student preparedness. Additionally, the participants felt the physical facilities currently available within the College would suffice or could be adapted to be used for the learning activity. The allotment of adequate time to prepare for the initial PBL activity was a concern expressed by all participants, although this amount of time varied slightly amongst them.

Although it was initially believed there would be differences in resistance to the change based on career stage, this pre-study expectation is not evident in the participants’ responses. While differences in resistance to the proposed change were not evident, other aspects explored in the study did reveal some career stage differences. The participants' initial understanding of the integrated design process varied according to the length of time since they had left full-time employment in the construction industry. In addition, opinions regarding the teaching and learning aspects of the proposed change varied with the length of time each participant had been employed as an educator.

As the faculty members in the School of Building Technology prepare to embrace new instructional challenges, this new understanding of perceptions and opinions towards radical change will allow academic managers some insight as to the requirements anticipated by those who will be intimately involved in implementing change. To this end
this research project was envisioned as an important first step towards developing this understanding.

Recommendations for Further Research

The dearth of published studies concerning the implementation and management of educational change in Ontario community colleges limited the use of triangulation to substantiate the findings of this study. This study will be of value as a resource for further studies into similar topics proposing to employ triangulation. This study examined only one facet of educational change at a single institution; thus, it is recommended that additional facets of educational change and its management be studied at both this institution and others to broaden the knowledge base on this topic. Specifically, topics addressing the implementation and the learning environment for such a learning activity warrant further study. In addition, post-implementation evaluative studies should be conducted to provide recommendations as to how to improve the undertaking of this or a similar process.
References


Appendix A: Ethics Approvals
USE OF HUMAN SUBJECTS - ETHICS APPROVAL NOTICE

Review Number: 0903-5
Applicant: Fred Varkaris
Supervisor: Ron Hansen
Title: Problem based learning in technology at Fanshawe College
Expiry Date: December 31, 2009
Type: M. Ed. Thesis
Ethics Approval Date: April 6, 2009
Revision #: 

This is to notify you that the Faculty of Education Sub-Research Ethics Board (REB), which operates under the authority of The University of Western Ontario Research Ethics Board for Non-Medical Research Involving Human Subjects, according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario has granted approval to the above named research study on the date noted above. The approval shall remain valid until the expiry date noted above assuming timely and acceptable responses to the REB’s periodic requests for surveillance and monitoring information.

No deviations from, or changes to, the research project as described in this protocol may be initiated without prior written approval, except for minor administrative aspects. Investigators must promptly report to the Chair of the Faculty Sub-REB any adverse or unexpected experiences or events that are both serious and unexpected, and any new information which may adversely affect the safety of the subjects or the conduct of the study. In the event that any changes require a change in the information and consent documentation, newly revised documents must be submitted to the Sub-REB for approval.

Dr. Jason Brown (Chair)

2008-2009 Faculty of Education Sub-Research Ethics Board

Dr. Jason Brown Faculty (Chair)
Dr. Elizabeth Nowicki Faculty
Dr. Jacqueline Specht Faculty
Dr. John Barnett Faculty
Dr. J. Marshall Mangan Faculty
Dr. Immaculate Namukasa Faculty
Dr. Robert Macmillan Assoc Dean, Graduate Programs & Research (ex officio)
Dr. Jerry Paquette UWO Non-Medical Research Ethics Board (ex officio)

The Faculty of Education
1137 Western Rd.
London, ON N6G 1G7

Karen Kueneman, Research Officer
Faculty of Education Building

Copy: Office of Research Ethics
THE UNIVERSITY OF WESTERN ONTARIO
FACULTY OF EDUCATION

USE OF HUMAN SUBJECTS - ETHICS APPROVAL NOTICE

Review Number: 0903-5
Principal Investigator: Fred Varkaris
Student Name: Ron Hansen
Title: Problem based learning in technology at Fanshawe College
Expiry Date: September 30, 2010
Type: M. Ed. Thesis
Ethics Approval Date: January 4, 2010
Revision #: 1
Documents Reviewed & Approved: Revised Study End Date

This is to notify you that the Faculty of Education Sub-Research Ethics Board (REB), which operates under the authority of The University of Western Ontario Research Ethics Board for Non-Medical Research Involving Human Subjects, according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario has granted approval to the above named research study on the date noted above. The approval shall remain valid until the expiry date noted above assuming timely and acceptable responses to the REB’s periodic requests for surveillance and monitoring information.

During the course of the research, no deviations from, or changes to, the study or information/consent documents may be initiated without prior written approval from the REB, except for minor administrative aspects. Participants must receive a copy of the signed information/consent documentation. Investigators must promptly report to the Chair of the Faculty Sub-REB any adverse or unexpected experiences or events that are both serious and unexpected, and any new information which may adversely affect the safety of the subjects or the conduct of the study. In the event that any changes require a change in the information/consent documentation and/or recruitment advertisement, newly revised documents must be submitted to the Sub-REB for approval.

Dr. Jason Brown (Chair)

2009-2010 Faculty of Education Sub-Research Ethics Board

Dr. Jason Brown Faculty (Chair)
Dr. Elizabeth Nowicki Faculty
Dr. Jacqueline Specht Faculty
Dr. Farahnaz Faez Faculty
Dr. Wayne Martino Faculty
Dr. George Gadandidis Faculty
Dr. Robert Macmillan Assoc Dean, Graduate Programs & Research (ex officio)
Dr. Jerry Paquette UWO Non-Medical Research Ethics Board (ex officio)

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1137 Western Rd.
London, ON N6G 1G7

Karen Kueneman, Research Officer
Faculty of Education Building

Copy: Office of Research Ethics
Fanshawe College Research Ethics Review Board

Approval Notification of Proposed Research
Involving Staff/Students and/or facilities at Fanshawe College

<table>
<thead>
<tr>
<th>Principal Researcher(s):</th>
<th>Fred Vakaris</th>
</tr>
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<tr>
<td>Research Project Start Date:</td>
<td>Jan 2010</td>
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<td>Expected date of termination:</td>
<td>September 2010</td>
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<tr>
<td>Documents Reviewed:</td>
<td>Protocol re-submission, letter of information, response form, consent form</td>
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The Research Ethics Board has completed its review of the above re-submitted Protocol and Approves the Project.

Comments and Conditions:

Please note that the REB requires that you adhere to the protocol reviewed and approved by the REB. The REB must approve any modifications to the protocol before they can be implemented.

Researchers must report to the Fanshawe REB:
a) any changes which increase the risk to the participants;
b) any changes which significantly affect the conduct of the study;
c) all adverse and/or unexpected experiences in the course of carrying out the study;
d) any new information which may adversely affect the safety of the subjects or the conduct of the study.

Researchers must submit a Progress Report annually for all ongoing research projects. In addition, researchers must submit a final report at the conclusion of the project.

ETHICS APPROVAL DOES NOT CONSTITUTE PERMISSION TO CONDUCT THE RESEARCH, AND APPROVAL FOR CONDUCTING THE PROJECT MUST BE OBTAINED FROM THE DEAN OF THE FACULTY IN WHOSE AREA THE RESEARCH WILL TAKE PLACE.

Dr. Terry Boyd
Chair, REB
Fanshawe College

Date: Dec 16/07
Appendix B: Interview Questions
Questions used in the semi-structured interview process

How many years have you been a professor in the community college system?
Has all of your experience as a professor and/or teacher been in the community college system?
    If not where else have you taught?
How long has it been since you worked in the building industry?
How many more years do you plan to teach?
Do you teach to students in the Civil Engineering Technology Program?
    Architectural Technology Program?
    Construction Engineering Technology Program?
    Is there a program that you primarily teach courses in?
Can you tell me about your experience with the integrated design process?
Tell me about your understanding of project or problem-based learning?
    (Explain or augment depending on level of knowledge)
    (Describe the concept of the interdisciplinary project based common sixth semester)
In your opinion, would it be a good learning experience for students to participate in an interdisciplinary problem-based learning activity in the sixth semester?
    Why or why not?
What are some of the things that you feel should be considered when implementing any program?
Probe for:
    What kind of PBL do you believe would meet the needs of the students?
    How do you think such a learning experience should be structured?
    What resources would you anticipate the college would need to make this a successful and meaningful experience for the students?
    How long do you think it would take to prepare to teach this pilot project based sixth semester for the first time?
    What resources would you need as an instructor to prepare for a new learning environment such as this?
In your opinion what elements would need to be included in a learning environment that will foster collaboration and discovery?
Have I missed any important considerations?
What questions haven’t I asked?
Appendix C: Letter of Information
Dear Fellow Educator,

My name is Fred Varkaris and I am a professor in the Faculty of Technology at Fanshawe College studying for my Masters of Education degree at The University of Western Ontario. The purpose of this letter is to invite you to participate in an interview as part of my research into faculty opinions on the requirements for implementing project-based learning in the sixth semester of technology programs in the School of Building Technology.

The aim of this research is to better understand the program change process associated with the design and successful implementation of interdisciplinary problem-based learning.

If you agree to participate in this study your opinions will be shared with me by means of a personal interview held at a mutually convenient time and place. The interview will last between half an hour and an hour with the audio being recorded. Once the interviews are complete, the audio recordings will be transcribed into written format. A copy of your interview transcription will be provided to you for verification, providing you with an opportunity to incorporate any changes you might feel are necessary to capture your opinions with regard to this study. It is my intention to complete the transcription and verification within three months after the interviews have been completed.

I will hold the interviews in a space within the college away from the Faculty of Technology offices so that you may feel at ease to express your opinions. Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time. There are no known risks to participating in this study.

The information collected will be used for research purposes only, and neither your name nor information which could identify you will be used in any publication or presentation of the study results. However, due to the nature of the information collected for this study, persons with close affiliation to you may be able to deduce your identity based on responses.
All information collected for the study will be kept confidential by encrypting all digital media and by keeping all transcripts of the interviews in a locked filing cabinet. All interview material will be destroyed, either by secure erasure or by shredding five years after the research is complete.

If you are interested in participating in this study, please return the attached response form to me by putting it in an envelope and placing it in my mail slot in the Faculty of Technology office. You may also express interest by email or by phone at the address and phone number provided below.

If you have any questions about the conduct of this study or your rights as a research participant you may contact the Manager, Office of Research Ethics, The University of Western Ontario at 519-661-3036 or ethics@uwo.ca. If you have any questions about this study, please contact me (Fred Varkaris) by phone or by email or my advisor Dr. Ron Hansen by phone or email.

This letter is yours to keep for future reference.

Thank you,

Fred Varkaris
Problem-based Learning in Technology at Fanshawe College

INVITATION TO PARTICPATE RESPONSE FORM

I have read the Letter of Information pertaining to the research being conducted by Fred Varkaris and I would like to participate in the study by agreeing to be interviewed.

Name (please print): ________________________________

What is the best method and time to contact you to set up an interview?

Phone _________________ Time __________ AM or PM Please indicate

Email __________________

Other __________________

Please return this completed form to me either by placing it in my mail slot in the Faculty of Technology office or by mailing the form to me,

Fred Varkaris
Appendix D: Consent Form
CONSENT FORM

I have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

Name of Participant (please print): ____________________________________________

Signature: ____________________________________________ Date: _____

Name of person obtaining informed consent (please print): ____________________________

Signature of person obtaining informed consent: ____________________________ Date: _____
Curriculum Vitae

Name: Frederick Costas Varkaris

Post-Secondary Education and Degrees:
University of Western Ontario
London, Ontario
2007-2010 M.Ed.

University of Western Ontario
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University of Western Ontario
London, Ontario
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Algonquin College
Ottawa, Ontario
1987-1990 Dipl.T.T

Honours and Awards:
University of Western Ontario Special University Scholarship (1999-2001)
Ontario Graduate Scholarship (1999-2000)
Natural Sciences and Engineering Research Council Undergraduate Student Research Scholarship (1999)
Certificate of Merit for Academic Excellence in the Final Year of the Honours Geography Program (1999)
University of Western Ontario Scholarship in B.Sc. Honors Geography (1998)

Related Work Experience:
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1997-1999