Online Problem-Based Learning: Perceptions of Nursing Educators

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Abstract

A qualitative study was conducted to determine nursing educators' perceptions about the online application of a problem-based learning strategy in undergraduate nursing education. The question asked in the study was: Can the essential elements of face-to-face problem-based learning be supported in an online format? The data for this study came from 2 individual tape-recorded interviews with each of the 5 participants over a 3-month period and from a research journal. The educators felt that student-centered learning and critical thinking could be supported within an online format. However, they noted that challenges could exist in terms of developing tutor roles, fostering student self-direction, facilitating group process and connections, and incorporating a nursing philosophy of online learning. The importance of tailoring an online problem-based learning course to reflect educators' philosophies and values in nursing emerged as an important theme from the interview responses. Overall, the participants suggested that an ideal environment would blend both face-to-face and online elements and that fewer elements would be offered in the first 2 years of the nursing program. They described a hybrid model of problem-based learning in which the online component could be used to support face-to-face sessions.
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CHAPTER ONE: THE PROBLEM

Introduction

The computer is the most powerful technological tool that has transformed the nursing profession. (Saba & McCormick, 2001, p. 9)

This is a study of nursing educators’ perceptions about online problem-based learning in undergraduate nursing education. The study explored the question of computer use within a problem-based learning strategy. Specifically, the study focused on educators’ perceptions about the process and the outcomes of problem-based learning in relation to course design, group process, student critical thinking, and student self-direction.

A qualitative approach was undertaken to investigate this issue. “Qualitative data seeks to capture what people have to say in their own words” (Patton, 1980, p. 22). In this study, the words of nursing educators were used to describe their perceptions of online problem-based learning.

By exploring the perceptions of nursing educators, the results of this study serve to add to the existing literature and to identify possible areas for future research.

This chapter describes the problem and the rationale for the study.

Background of the Problem

Nursing is an information-intensive profession. The introduction of computer technology has created new possibilities for nursing education. Computers can be used for sending and receiving messages, accessing resources on the Internet, conferencing
with groups and individuals, designing new knowledge databases, and supporting nursing research (Saba & McCormick, 2001).

The focus of this study is the question of computer use within a problem-based learning approach in nursing education. Problem-based learning as an instructional tool in nursing education was introduced in the mid-1970s at McMaster University in Hamilton, Ontario, Canada. This strategy is still being used in the university's undergraduate nursing program. In this approach, authentic and complex patient problems serve as the impetus for learning and the acquisition of both nursing knowledge and problem-based learning skills (Edens, 2000). The approach contrasts with the usual teaching practice of presenting concepts and situations in lecture format (Barrows, 1996).

The literature describes the cycle of problem-based learning to include the group and individual processes of problem presentation, hypothesis formation, inquiry, information sharing, reflection, and evaluation (Barrows, 1996; Bouhuijs, 1993; Gijselaers, 1996). Problem-based learning encourages critical thinking, develops problem-solving abilities, promotes self-directed learning, and enhances motivation (Dolmans & Schmidt, 2000; Morales-Mann, 2001; Murrell & Dip, 1997; Rideout, 2001). A major issue of problem-based learning that keeps surfacing in the literature is the role of the tutor (Barrows & Tamblyn, 1980; Moust & Schmidt, 1993; Neville, 1999; Rideout, 2001). Schmidt and Moust (2000) identify social congruence, subject matter expertise, and ability to be cognitively congruent as essential characteristics of an effective tutor. Ensuring the presence of a consistent and effective tutor is of the utmost importance.

From a pedagogical standpoint, computers have the potential to develop and to facilitate the same problem-based learning processes and outcomes that occur in a face-
The integration of computers in nursing curricula may introduce differences in course design and teaching/learning strategies. Certain distinct and unique questions present themselves when considering the implementation, development, and evaluation of a problem-based learning course conducted completely within a computer environment. Can these unique characteristics, processes, and outcomes be supported in an online format?

First, what is the ideal course design of an online course? Second, are student critical thinking and student self-direction outcomes of an online format? Are the processes leading to these outcomes facilitated, encouraged, or hindered? Third, how is group process affected by an online format? Are online groups able to proceed through the steps of problem-based learning in the same way as face-to-face groups? Are group dynamics and student participation affected by the online format? Fourth, what are the ideal characteristics of an online tutor? Are the characteristics similar to or different from face-to-face situations?

The intent of this study was to explore nursing educators’ perceptions surrounding these questions related to online problem-based learning.

The Problem Situation

The study was conducted at a school of nursing in a university in southern Ontario. Currently, the nursing program at the university incorporates a self-directed, problem-based learning approach to nursing education. The 4-year program includes three types of courses: nursing courses, health science courses, and electives. The theoretical and clinical nursing courses comprise 60% of the curriculum and use a problem-based
learning approach. These courses occur in a face-to-face format. Technology in the form of e-mail may be used for communication purposes. However, the groups are physically present throughout the process of problem presentation, hypothesis formation, self-directed inquiry, information sharing, reflection, and evaluation.

The university recently formed a collaborative partnership with two community college schools of nursing. Through this partnership, all graduates from the three institutions are granted a Bachelor of Science in nursing degree. Since the three institutions are physically separated, time and space issues arise in the ability to conduct problem-based learning courses. In the face-to-face group, students are required to be physically present in the institution. Developing an online problem-based course could open up possibilities for collaborative practice in this partnership. By offering an online format, students within the collaborative partnership could equally access the courses. Distance issues would no longer be of concern. Nonetheless, it is important to determine the most effective way to offer courses in an online format.

**Purpose of the Study**

With the increased pace of technological development and availability, nursing education needs to be examined through the lens of technology. The purpose of this study was to explore nursing educators' perceptions about the pedagogical issues concerning online problem-based learning. Educators' perceptions were explored to understand how the processes and the outcomes of face-to-face problem-based learning are affected by the introduction of an online format. Their perceptions are important because educators have the ability to articulate problem-based methods and outcomes and
they could eventually be responsible for educating nursing students in an online format. This study was exploratory in nature. However, the methods and the results can add to the present literature on problem-based learning in the online environment.

Questions to Be Answered

Generally, the study asked the following question: Can the essential elements of a face-to-face problem-based learning group be supported in an online format?

Specifically, the study addressed the following questions:

1. What are the perceptions of nursing educators about the ideal course design for problem-based learning in an online format?

2. What are the perceptions of nursing educators about the effects of problem-based learning in an online format on: (a) group process, (b) student critical thinking, and (c) student self-direction?

Rationale

There are four reasons for conducting this study.

First, introducing nursing students to the Internet and computer technology is fundamental in educating the nurse for the future (Clark, 1998). “The acceleration of technological development and availability of information will have profound effects on how students learn, how nursing is taught, and how care is delivered” (Saba & McCormick, 2001, p. 393). As well, universities are increasingly being challenged to incorporate technology into the courses and programs that they offer. In July 2001, the Council of Ministers of Education Canada (CMEC), which provides the national voice
for education in Canada, announced its vision for online learning for Canadians. Based on an advisory committee for online learning in postsecondary education, CMEC members support and encourage online learning in postsecondary education (CMEC, 2001). Introducing an online format in a university course that uses a problem-based approach is an innovation that has yet to be broadly implemented (Oliffe, 2001). This study focused on postsecondary educators' perspectives surrounding such an innovation.

Second, the College of Nurses of Ontario, the governing body of Registered Nurses, has set a standard of nursing practice in Ontario. Within these standards of nursing practice, it is expected that all graduating nurses will possess the knowledge relevant to their professional practice and will know where and how to access learning resources (College of Nurses of Ontario, 2002). Currently, computers are used in all fields of nursing practice (Saba & McCormick, 2001). Technology is used in hospitals, ambulatory care settings, community organizations, and research settings. Nurses use computers to access patient records, locate information, document, operate invasive monitoring devices, conduct research, and develop and facilitate educational sessions. Introducing an online format in instruction can help nurses integrate technology in yet another way.

Third, as a result of conducting a literature review and discussing the issue of online problem-based learning with nursing faculty members at the study university, I discovered that a gap in the literature exists on this topic. Many articles and books have been published on the topics of problem-based learning and online learning separately. However, only a few articles and studies have addressed the issue of combining problem-based learning and online learning in undergraduate nursing education.
Fourth, on a professional note, I am interested in this topic. I am a Registered Nurse and a clinical tutor in a university school of a nursing problem-based learning program. I have also had the opportunity to co-tutor in a nursing problem-based learning course for one semester. These experiences have provided me with invaluable insights into problem-based learning, nursing, and technology. My interests arise from my involvement in the process of problem-based learning in the nursing profession.

Significance of the Study

"The need to define the role of computers and information technology within nursing curricula has never been more important" (Carty, 1998, p. 260). Few research studies have been conducted on the topic of online problem-based learning in nursing education. Fewer still have been published. This research adds to the current literature on problem-based learning and online learning by examining the relationship between the two within the specific context selected for this study.

By exploring educators’ perceptions about the pedagogical issues concerning this teaching/learning strategy, the study findings and conclusion also identified questions and areas for future research. Furthermore, since universities are being challenged to incorporate computers and information technology, nursing educators and administrators may be interested in the results of this study. In addition, nursing students in the university setting may find this study of value.

As an educator myself, I have gained a new and different perspective of online problem-based learning. I will share the results and conclusions from this study with my colleagues and my students.
Limitations of the Study

Problem-based learning can be implemented in a variety of ways (Rideout, 2001). Variations may involve the use of large groups, the use of peers as facilitators, and the use of different teaching-learning sequences. This study focused only on issues surrounding online problem-based learning using the framework adapted from Schmidt and Moust (2000) and the six-step process identified by Barrows and Tamblyn (1980). Therefore, the results of this study apply only to the categories, processes, and outcomes of problem-based learning using the constructivist sequence of problem presentation, hypothesis formation, self-directed study, information sharing, reflection, and evaluation within a completely online format.

The type of online course model and the specific software packages selected by an institution can have implications for online problem-based teaching and learning. There are a number of different models of online course design and software packages, called course management systems, available for use in online learning. This study was limited in scope to online problem-based courses using FirstClass LearnLink software in the integrated model of online learning as described by Manson (1998). Thus, the results of this study are limited to a problem-based group conducted totally online using LearnLink asynchronous and synchronous conferences for patient scenario presentations and discussions, e-mail, and web resources.

The study was conducted at the undergraduate level of nursing education, specifically at a university affiliated with a large urban teaching Health Sciences Center. The university school of nursing has adopted a self-directed, andragogical approach to
education. Hence, online problem-based learning was only explored from the adult teaching perspective.

This study examined the perceptions of faculty from the university school of nursing. Faculty with experience in either problem-based learning or online learning, and sometimes both, participated in the study.

Outline of the Chapters

Chapter One has provided an introduction and overview of this study by identifying the study problem, purpose, rationale, significance, and limitations.

Chapter Two reviews the current literature on problem-based learning in the online environment. The educational philosophy, theory, strengths, and limitations of this teaching/learning strategy in nursing education are explored through the educator, the student, and the institutional perspectives.

Chapter Three describes the methodology used in the study. It includes a description of the design, researcher positioning, participant selection and descriptions, data collection and reporting procedures, analysis, assumptions, limitations, and ethical considerations.

Chapter Four discusses the findings of this study. It contains a description of the categories and themes related to the study framework. Emergent themes that were related to but not implicit within the study framework are also described.

Chapter Five presents the summary, interpretations, and conclusions of the findings. Implications and recommendations for theory, practice, and future research are discussed.
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CHAPTER TWO: LITERATURE REVIEW

The literature search on writings related to online problem-based learning was accomplished in multiple stages over a 3-year time frame. Courses were taken throughout my Master of Education studies from 2000-2003 that focused on philosophy, adult education, and technology. As a result, I began to identify a need for a research study on this topic.

First, a search was conducted on the general topic of problem-based learning to gain a foundational base concerning this teaching/learning approach. Second, the characteristics of online learning were explored from a nursing educational perspective. Third, literature on the two topics combined was researched.

University textbooks on problem-based learning, adult learning, nursing, and philosophy were explored first. I then carried out data searches in ERIC, Academic Search (Elite) Premier, Cinahl, and Medline. I limited my online searches to 10 years and used the key words problem-based learning, online problem-based learning, nursing, adult education, distance education, self-direction, and technology. However, due to limited publications on this recent topic, I encountered difficulty in obtaining research journal articles that contained information about online problem-based learning in nursing education. During this time, I also attended conferences and workshops on this topic. In particular, the 9th Annual Research Day conference held on October 10, 2002 in Hamilton provided important resources and educator contacts. The conference verified that published literature on this topic was indeed minimal.

Many books, descriptive journal articles, and qualitative and quantitative studies have been published on problem-based learning in general and with reference to nursing
education in particular. Sixteen articles were chosen for this literature review. The writings were selected based on the content of each study. A chronological approach was taken. Similarly, much has been written on computer-based (online) learning. Nineteen articles were chosen based on their reference to online nursing education, content, and currency. In contrast, few articles and research studies have been published on the topic of online problem-based learning. Fewer still have been published on the topic of online problem-based learning in undergraduate nursing education. Six documents were selected in this literature review: Three articles are descriptive in nature, two articles are the results of studies, and one source refers to a preliminary, unpublished study conducted at McMaster University.

Problem-Based Learning in Nursing Education

Problem-based learning in nursing education is defined as “learning that results from the process of working towards the resolution of a problem” (Barrows & Tamblyn, 1980, p. 1). Problem-based learning as an instructional tool is a relatively new strategy. The method of problem-based learning arose in relation to concerns from medical schools about the common practice of separating basic science teaching from clinical exposure (Patel, Groen, & Norman, 1993). In 1969, Dr. Howard Barrows and Robyn Tamblyn, a Registered Nurse, introduced problem-based learning as an educational approach for health sciences education at McMaster University. The approach was student centered and promoted clinical reasoning skills by incorporating clinical exposure with basic science teaching (Barrows & Tamblyn). Stimulated by the McMaster example, problem-
based learning has now spread worldwide in medical and nursing education (Rideout, 2001).

In this approach, a group of 5 to 10 students and a facilitator (tutor) meet to discuss a patient problem (Barrows & Tamblyn, 1980). The tutor provides the students with information about the problem. The group's task is to define aspects of the problem, gain insight, build knowledge, and develop skills within the discipline of nursing. This is accomplished by extracting information from the case, generating hypotheses, and formulating learning issues. The group members research the learning issues and then share their information with the group. At the completion, the students evaluate and reflect on the content and the process of learning (Hmelo & Evensen, 2000).

According to Barrows (1996), regardless of the many variations within different problem-based learning curricula, six characteristics of this strategy are consistent within all the variations:

1. Learning is student centered. Students take responsibility for their own learning.
2. Learning occurs in small groups. The process gives students practice in working with a variety of different people.
3. Teachers are facilitators or guides.
4. Problems form the organizing focus and stimulus for learning.
5. Patient problems are a mode for the development of clinical problem-solving skills. The patient problem is presented in the same manner that it would occur in the real world.
6. New information is acquired through self-directed learning. Students are expected to learn through their own study and research of library resources.
Problem-based learning derives from the theory that learning is a process in which the learner actively constructs knowledge (Gijselaers, 1996). The theoretical foundations of problem-based learning are grounded in the social-cultural views of constructivism as developed by Vygotsky (Hung & Nichani, 2001). Vygotsky (1997) states that the educational process is an “active one on three levels: the student is active, the teacher is active, and the environment created between them is an active one” (p. 54). Objective knowledge and truth are the result of perspectives (Schwandt, 1994). According to this theory, the student’s personal experiences form the fundamental basis of education. The social environment in turn determines the student’s experiences. The teacher becomes the director of the social environment, and social factors influence individual learning (Vygotsky).

Problem-based learning uses small group work to facilitate problem-solving methods, to attain conceptual knowledge, and to expose individual learners to alternative points of view (Gijselaers, 1996). Therefore, issues of group process and dynamics are central to the strategy of problem-based learning. The term group process refers to the emergence, maintenance, and transformation of group functions and development (Benson, Noesgaard, & Drummond-Young, 2001).

Students and tutors need to develop an awareness of the various roles, functions, and developments within the group. First, “for students, the challenge is to determine the expectations associated with the student role and to develop their individual style within those expectations” (Benson et al., 2001, p. 81). Second, faculty and students need to be familiar with different aspects of group functioning. Sampson and Marthas (1990) note five group functions that have relevance for nursing students and that are congruent with
the constructivist philosophy of problem-based learning. They state that the socialization, informational, empowerment, normative, and governance functions are important for successful group dynamics. The term group dynamics applies to a number of issues, among them, how relationships emerge within a group, how they grow and develop over time, how they are maintained at a relatively stable or steady state, and how they are transformed or changed (Sampson and Marthas). Finally, the group members need to be aware of the stages of group development: initiating, accomplishing the work of the group, and termination. Groups progress through these stages, and members gain knowledge (Benson et al.).

Problem-based learning is also congruent with cognitive psychology learning theory. The basic premise of cognitive psychology states that learning is a process of constructing new knowledge on the basis of current knowledge (Piaget, 1972). Students individually construct knowledge through problem analysis and reflection. The primary analysis of the problem serves to activate prior knowledge. In problem-based learning, cognitive experiences are situated in authentic patient problems. The goal of learning is not to teach students facts but to teach students to “use the principles, models, theories as a nurse might do” (Duffy & Jonassen, 1992, p. 23). Individualistic constructivism tells us to “pay close attention to the active learner’s mental activities (organization of his or her mind), and social-culturalism tells us to pay close attention to the cultural practices of the learner’s milieu” (Hung & Nichani, 2001, p. 40). These two views of constructivism are present and important in the process and outcomes of problem-based learning.

Problem-based learning as a strategy is also supported by the adult learning principles identified by Knowles (1990). Self-directed learning was defined by Knowles
(1975) as a “process in which an individual takes the initiative with or without the help of others in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing learning strategies, and evaluating outcomes” (p. 18). The origins of self-directed learning can be traced back to John Dewey’s definition of education as the means for developing an individual’s potential for growth. He defined the role of the teacher as one who guides learning (Dewey, 1938). The strategy incorporates the assumptions that adults are self-directing, that adults have varied experiences, and that adults prefer problem-centered learning (Knowles, 1990). Most adults strive toward self-direction for the purposes of personal growth (Chovane, 1998). These principles form the basis of a liberal and humanistic theory of adult education (Merriam & Caffarella, 1999).

A problem-based learning format is perceived as a tool for helping learners discover, explore, and create personal meaning, values, and skills. The facilitator creates a climate that values learning in the cognitive, social, affective, motor, and spiritual domains (MacKeracher, 1996). In addition, psychological feminist theories such as those advanced by Belenky, Clinchy, Goldberger, and Tarule (1986) support the strategy of problem-based learning. They suggest that the group, through co-operation, can explore personal and contextual issues. In the process of contextual learning, “knowledge and truth are understood as being dependent on the context in which they are used” (MacKeracher, p. 119). In addition, connected teaching and relational learning are encouraged (Belenky et al.), and students take responsibility in managing problem situations (Gijselaers, 1996).
Although theorists such as Mezirow (1991) and Brookfield (1995) support problem-based learning as an approach for adult learners, they view the approach through a critical lens. Mezirow defines adult education as a process of reflection and action. He notes that adults need to reflect critically, develop self-awareness, and evaluate their learning against the perspectives of others. Brookfield questions the role of the educator as one who passively works to meet the needs of the learner. According to Cranton (1992), educators need "to reflect critically on their practice, to be aware of their own values and assumptions, to make responsible choices based on their expertise and values, and through critical thought become aware of and develop their philosophy of practice" (p. 16). Adult educators have the added responsibility of helping learners develop this critical self-reflection (Brookfield).


Several researchers provide support for problem-based learning as an educational method (Bligh, 1995; Gijselaers, 1996; Murrell & Dip, 1997; Rideout 2001; Schmidt & Moust, 2000). The authors conclude that student motivation is increased in this instructional method. However, according to Schmidt and Moust, studies on motivation have been scarce.
Blumberg (2000), Doig and Werner (2000), Murrell and Dip (1997), and Schmidt and Moust (2000) provide support for autonomous learning and integration of deep knowledge in problem-based learning. Research conducted at the Medical School of Maastricht University led Schmidt and Moust to conclude that "problem-based learning fosters a kind of cognitive process and subsequent learning that cannot be observed in a more conventional curriculum" (p. 47). They note that a curriculum that consistently stimulates students to take responsibility for their own learning should be incorporated in education. Wilcox (1996) also feels that universities have an obligation to provide an environment in which instructors have the autonomy and support they need so that they can be effective mentors for students engaged in self-directed learning.

In contrast, critics of this instructional method assert that the expectations of problem-based learning are unrealistic and cannot be met. For example Berkson (1993), in researching the literature on self-directed learning, concludes that self-directed strategies may be more dependent on the proximity of available resources, peer expectations, role models, practice roles, and time constraints than on the skills previously acquired or refined in a problem-based learning curriculum. Similarly, Norman (1999) hypothesizes that application of learning principles such as self-directed problem-based learning may have three negative educational consequences. First, to achieve self-directed problem-based learning, students must be good at self-assessment. Norman claims that students are not good at self-assessment. Second, the mastery of knowledge in a profession such as medicine cannot be left to chance. Students should have core knowledge. Third, evidence does not show that problem-based learners
maintain future competencies better than traditional graduates. Although Norman critiques the adult learning assumptions, he is not able to disprove their benefits.

The literature reviewed identified the role of the tutor and the quality of the problem as two weaknesses of this strategy. Neville (1999) notes that a great deal of contradictory research results have been put forward concerning the characteristics of an ideal tutor. In a study comparing the use of student tutors versus faculty tutors, Moust and Schmidt (1993) found that subject matter expertise and the tutor’s ability to be cognitively congruent are essential characteristics of an effective tutor. Several authors note that further research needs to be conducted to determine effective tutor characteristics and criteria for quality problems (Doig & Werner, 2000; Gijselaers, 1996; Neville, 1999). Morales-Mann (2001) also identifies group size and student self-directed learning skills as major issues for further investigation.

Although problem-based learning is based on an adult learning model such as that developed by Knowles (1975), not all students respond effectively to this strategy. According to Kolb (1984), students have different learning styles. Kolb defines learning as “the process whereby knowledge is created through the transformation of experience” (p. 41). From this definition, he developed a model for adult learning conceptualized as a four-step learning cycle based on a learning style inventory. Knowledge of the learning style inventory can help learners to develop an understanding of their own learning styles, and educators to incorporate teaching strategies that are most likely to enhance the preferred learning styles of their students. Studies conducted by Mulligan (1999) and Patel et al. (1993) demonstrated that a learning environment using only problem-based learning strategies does not take into account different student learning styles.
The literature reviewed for this study established both limitations and strengths of this learning strategy. However, based on the writings reviewed, it can be concluded that problem-based learning may be an effective teaching-learning strategy for undergraduate nursing education.

**Online Learning in Nursing Education**

The introduction of computers into nursing education began around 1970. By the early 1990s, as computer technology advanced, computer laboratories were installed in the schools of nursing. Students began to use computer-assisted instruction, interactive videos, and CD-ROM programs (Saba & McCormick, 2001). Today, nursing students have access to the Internet, communicate via e-mail, transfer files, and access resources and courses on the web. “In a very short period of time, higher education in general, and nursing education in particular, has moved from the delivery of educational content via isolated networked computer-assisted instruction to the development of dynamic web-based sites” (Saba & McCormick, p. 393).

Carty (1998) conducted a stratified random sample of 347 diploma, baccalaureate, and masters nursing schools in the U.S.A. to determine the status of computer and information technology in nursing education. Findings indicated that all schools have access to computers and educational software. However, further data analysis showed that the majority of the schools lacked a co-ordinated plan for technology implementation. Also, nursing informatics was addressed in less than one third of the schools. Nursing informatics “includes the development, support, and evaluation of applications, tools, processes, and structures which assist the practice of nurses with the
management of data in direct care of patients” (Saba & McCormick, 2001, p. 405). Carty concluded that comprehensive approaches to define and to plan for information and technology need to be incorporated into nursing curricula. “As computer technology evolves at an incredibly rapid pace, it is important to recognize the role not only of computer technology in education but also of informatics technology in the nursing curriculum” (Carty, p. 260).

Online learning happens when learners and instructors use computers to exchange information and ideas and to access resources as part of the learning process (Haughey & Anderson, 1998). It involves the use of specialized hardware and software to create, to store, and to organize messages (Maier & Warren, 2000). Educational content can be delivered through many computer modes. The following is a summary of the different modes available for instruction:

1. Multimedia interactive video instruction involves the use of graphics, sound, video, and animation to enhance cognition.

2. CD-ROM technology of sound, graphics, and movement allows for an interactive on-screen learning environment.

3. Computer-assisted instruction is a software program that enables learners to interact with the computer to master content. This software may include drill and practice, tutorials, and simulations.

4. The Internet is a medium for communication and information. The worldwide web (WWW) represents the graphical part of the Internet incorporating text, color, graphics, sound, and video. Through web technology, learners and instructors can exchange e-mail, connect to mailing lists, transfer files,
participate in courses, download courses, obtain electronic journals, participate in discussions, and use distant information services and databases (Saba & McCormick, 2001).

There are two primary forms of communication that can be used with online learning. First, in synchronous communication, participants use the Internet environment to communicate with each other in real time (Saba & McCormick, 2001). This type of communication requires participants to be present (logged on) at the same time (Parrot, 1995). Second, asynchronous communication allows participants to communicate in delayed time by sending messages to an Internet address or an online course environment. The recipient can read and respond to the message when he/she accesses the address/course website. Asynchronous communication such as e-mail involves a delay between the transmission of the message and its reception (Maier & Warren, 2000). According to Cuneo (2000), through a messaging system called FirstClass, students have access to Internet e-mail links (asynchronous communication) and conferencing capabilities (asynchronous and synchronous communication).

Manson (1998) has proposed a classification system for online courses. The classification identifies three models and is based on the proportion of the coursework completed online. In the content and support model, the online component represents no more than 20% of the student’s time. The wrap-around model uses online interactions and discussions occupying about 50% of the student’s time. The integrated model consists of courses with collaborative activities, learning resources, and joint assignments conducted entirely online.
The literature reviewed indicates that computer technology is an essential component of the nursing profession. Nurses are consistently using computers and information technology in their everyday working environments. Therefore, nursing education must prepare students with the appropriate computer literacy and cognitive skills for the effective use of information technology (Saba & McCormick, 2001).

A study conducted by Clark (1998) supports this assertion. Clark introduced a web site into an existing nursing issues course. The purpose of the web site was to provide a resource for study and research. Students cited learning how to use a computer, the Internet, e-mail, and preparation for licensing exams as benefits. Moreover, a study conducted by Saranto (1997) demonstrated that students are dissatisfied with the current use of technology within nursing curricula. The findings showed that students take a positive attitude towards the use of information technology in nursing but want to see a larger number of hours allocated to technology in the nursing curriculum.

The central strength of computer-based learning in nursing education lies in the emphasis on the active engagement of the student in the learning process. Self-directed learning and adult learning principles are supported by the use of computers in learning. Studies conducted by Cravenger (1999), Daugherty and Funke (1998), Gillis, Jackson, and Braid (2000), and Ribbons (1998) show that computer-mediated education has great potential for developing student self-direction and collaborative group skills. In courses with appropriate design of learning activities, students can define issues, solve problems, acquire new knowledge, and work with group members towards a common goal (Haughey & Anderson, 1998). In such learning environments, the educator’s role can shift from lecturing to guidance and facilitation (Saba & McCormick, 2001).
A study conducted by Todd (1998) with 58 undergraduates in a child health-nursing course found that nursing students' inexperience with technology (e-mail) created anxiety during the learning process. The students were given an e-mail account and were required to complete 10 critical thinking exercises. Based on the results of a student questionnaire, Todd concluded that adequate faculty support was essential to a successful e-mail course component.

Studies show that technology can be stressful not only for students but also for educators. In particular, inconsistencies have been shown to arise concerning technological support, faculty knowledge, implementation, and funding (Clark, 1998; Saba & McCormick, 2001; Saranto, 1997). Lewis and Watson (1997) conducted a study to determine faculty concerns using computer technology. They found, for example, that faculty support for learning and teaching with computers was an indicator for course and student success. Faculty cited computer unavailability, lack of time to learn new technology, and lack of funding as the most common barriers in computer-based learning (Lewis & Watson). Likewise, Saba and McCormick maintain that a successful plan for the integration of technology into the educational process requires the availability of technology resources and an environment that sustains a supportive infrastructure. “Providing an environment for students and faculty to learn from computer scientists, programmers, and interactive technology specialists in the information age should be a goal of curriculum developers” (Carty, 1998, p. 263).

From a pedagogical standpoint, computers can be used as cognitive tools to facilitate the development of critical thinking and problem solving (Cartwright, 2000; Cessario, 2002; Daugherty & Funke, 1998; Gillis et al., 2000; Gillman, 1998; Yucha &
Princen, 2000). Gunawardena, Lowe, and Anderson (1997) outline a model of online learning based on a constructivist classification of online interactions. The constructivist approach was selected because constructivist learning theories are becoming widely accepted in all fields of education, including the application of technology to teaching and learning (Kanuka & Anderson, 1998). Analysis of text-based transcripts of the interactions that make up the online forum provides a tool to understand online learning. Gunawardena et al. theorize that active construction of knowledge online moves through five phases: sharing/comparing of information, discovery of inconsistencies, negotiation, testing, and summarizing. The last phase illustrates the construction of new knowledge. This model can apply to both asynchronous and synchronous communication modes.

Kanuka and Anderson (1998) found that “learners construct knowledge in online learning environments through social interchange and a discord discussion” (p. 9). Similarly, Ribbons (1998) noted that problem solving, critical thinking, and decision-making skills can be developed in an online environment. Ribbons designed and implemented a wound assessment and management database into a second-year undergraduate nursing program. The goal of the course was to prepare students to use problem solving in the care of acutely ill patients. Anecdotal evidence suggested that “wound assessment tools presented as part of the data base may act as a template for clinically-based wound assessment and management” (Ribbons, p. 226).

Although the literature in general supports online learning, Kanuka and Anderson (1998) caution that “there are many types of structures, motivators, and applications of online interaction that make the understanding of this communication medium both
challenging and exciting" (p. 1). In other words, course design and teaching strategies have an important impact on student learning in these environments.

**Online Problem-Based Learning in Nursing Education**

The literature on online problem-based learning is scarce. Only a few studies have been published examining the process and outcomes of online problem-based learning. Fewer still have been published in relation to nursing education. Of the studies reviewed, most are descriptive in nature.

Kamin, Deterding, and Wilson (1999) describe a problem-based learning course conducted using Web/CD-ROM programs in a medical course. Virtual problem-based learning teams of four to five students and a faculty member collaborated asynchronously through a digital video patient case. The online instructional design focused on integrating group work, problem solving, and faculty mentoring. Kamin et al. found that through use of problem-based learning cases, students could collaborate solving clinical problems and pursuing self-directed learning over the Internet. This strategy can reinforce learning as a social activity.

Edwards and Hugo (1999) researched the effectiveness of applying problem-based learning strategies to an audio conference educational format in a baccalaureate-nursing course. Using pre- and postcourse questionnaires, they concluded that audio teleconferencing is an effective means of developing problem-based learning. However, the authors propose that further research should study the effects of a lack of visual cues on group functioning.
Oliffe (2001) published the results of a qualitative study conducted in Australia whereby an online problem-based learning patient situated scenario was incorporated into the undergraduate nursing program. The study focused on the use of an online patient scenario within a traditional face-to-face problem-based course. The results “illuminated the need for high quality visual presentations, user-friendly access, clear structure for text on screen, and facilitation support in real-time” (Oliffe, p. 5). Although the study did not address the issue of an online problem-based course, the following important recommendations were identified for future research: ongoing evaluations of access issues and preferred learning modes.

An unpublished qualitative study was conducted in the nursing program at McMaster University. The purpose of the study was to investigate how problem-based learning could be modified for online delivery (Valaitis, Sword, & Hodges, 2002). Preliminary results presented at the 9th Annual Nursing Research Day in Hamilton, Ontario, show that challenges exist in the implementation of online problem-based learning. Identified strengths of online problem-based learning included connection, support, and sharing. Students identified increased anxiety, time, and Internet access difficulties as limitations of an online process (Valaitis et al.).

Similarly, Cracowski (2001) notes that “it remains undetermined whether this method supports better knowledge acquisition than a traditional problem-based learning format” (p. 394). Carlisle, Barnet, Sefton, and Uther (1998) caution that “technologies should not be seen as driving the learning process but rather integrated seamlessly into the normal practice of learning” (p. 226). Furthermore, the setup of course software and course tools can be costly (Kamin et al., 1999).
Nonetheless, the general consensus from the studies researched indicates that the online format can possibly support problem-based learning in nursing education. However, all authors conclude that further research is needed to explore this strategy in greater depth.

**Study Framework**

Based on the literature reviewed, seven components can be identified as major determinants of the characteristics, process, and outcomes of problem-based learning. The components are: student prior knowledge, quality of the problem, tutor characteristics, group functioning, student self-direction, student interest, and student achievement (Blumberg 2000; Dolmans & Schmidt 2000; Edens 2000; Morales-Mann 2001; Neville 1999; Rideout, 2001).

These components are addressed in Schmidt and Moust’s (2000) conceptual model of problem-based learning. The model describes the learning that occurs in a problem-based learning process. According to Schmidt and Moust, problem-based learning can be conceptualized by three constructs. First, problem-based learning is affected by three *categories*: the amount of prior knowledge that students bring to the learning situation, the quality of the problems presented to them, and the way the tutor deals with students. Second, these categories influence the *process* of problem-based learning and group functioning. Third, the functioning of the group in turn influences the *outcomes* of student interest, student self-direction, and student achievement. These components presented in graphic format (see Figure 1) provide the basis of the conceptual framework for this study.
In a conceptual framework descriptive categories are placed within a broad structure (Denzin & Lincoln, 1994). The framework informs both the methodological and the substantive aspects of a qualitative study (Glesne & Peshkin, 1992).

The following model adapted from Schmidt and Moust (2000) was used as a visual and an organizational guide for this study because it presented the seven components in graphic format (see Figure 1). Although Schmidt and Moust consider all variables to be important, this study focused only on the categories of student prior knowledge and tutor characteristics, the process of group functioning, and the outcomes of student self-direction and critical thinking (see Figure 2). I chose not to address the questions of student motivation and problem quality because, on the one hand, the literature base on the topic of student motivation is extensive and, on the other hand, there is a lack of attention in the literature on the issue of problem quality. Therefore, I felt that these topics were too complex for the purpose and the scope of this study.

This framework was applied within the context of the six-step approach to the process of problem-based learning as described by Barrows and Tamblyn (1980). The six-step approach was selected because it is the process adopted by the institution where this study was conducted. It is also the most common approach in problem-based learning (Rideout, 2001). The following steps fall into the construct of group functioning from the Schmidt and Moust (2000) model: problem presentation, hypothesis formation, information sharing, reflection, and evaluation. The step of self-directed study fits into the construct of student outcomes (see Figure 2).
Figure 1. Conceptual model of problem-based learning (adapted from Schmidt and Moust, 2000).
Online Environment: (Course exclusively online with asynchronous, synchronous, e-mail, and web resource capabilities)

Figure 2. Study model of online problem-based learning.
In addition, this study focused on these aspects of problem-based learning as they occur within a teaching/learning environment conducted completely online. The online capabilities of the LearnLink system with asynchronous, synchronous, e-mail, and web resource capabilities served as the online environment (see Figure 2).

Summary

In summary, this chapter reviewed the literature surrounding online problem-based learning in undergraduate nursing education. Generally, the writings indicated that problem-based learning may be an effective teaching/learning strategy for developing critical thinking and problem-solving skills in undergraduate nursing education under certain conditions. Similarly, the literature exploring online learning noted that computer technology could possibly support the process and outcomes of problem-based learning, but further research is needed. Furthermore, and most importantly for the purposes of this study, the research studies exploring online problem-based learning in nursing education are scarce.

Therefore, based on the literature reviewed, a framework was selected combining Schmidt and Moust’s (2000) model of the variables involved in problem-based learning with Barrows and Tamblyn’s (1980) six-step strategy. The framework was applied for the methodological and theoretical purposes of this study to explore in what way online technology could best support the process of problem-based learning as it is used in nursing education.
CHAPTER THREE: METHODOLOGY

The study was conducted to explore nursing educators’ perceptions of online problem-based learning. This chapter outlines the research methodology and the procedures used to collect, analyze, and safeguard the credibility of the data. Also included in this chapter are the descriptions of the participant selection procedures, methodological assumptions, limitations, and ethical considerations.

Description of Methodology

Qualitative research focuses on detailed descriptions of human perceptions and beliefs (Patton, 1980). It is founded on the theoretical assumptions that meaning and process are important elements in understanding human behavior (Charles, 1998). I chose a qualitative interpretivist methodology to explore educators’ perceptions of the processes and the outcomes of online problem-based learning for two reasons.

First, I felt that it was important to get a sense of participants’ perceptions about ideal course design, group process, student critical thinking, and student self-direction. Qualitative research provides firsthand knowledge of the problem through the perceptions of those directly affected by the issues in question (Creswell, 1998; Merriam, 1998).

Second, in this subjective interpretivist approach, research focuses on detailed descriptions of human perceptions and beliefs. Interpretivists see the goal of research as providing an understanding of an individual’s intentions, meanings, and values (Denzin & Lincoln, 1994). I determined that this qualitative approach would be beneficial in obtaining multiple and in-depth answers to my research questions.
Researcher Positioning

Qualitative research studies the thoughts, feelings, beliefs, and ideals of the researcher and the participants (Merriam & Simpson, 1995).

The research questions are important to me since I am involved in the use of problem-based learning in the nursing profession. I am a nursing educator with 8 years experience. My interest in this topic stems from my own experience in teaching undergraduate nursing students. I am positioned as an insider, which can be an advantage in some ways but necessitates caution in other respects. My knowledge of the problem-based learning process may have helped with my analysis, but it may also have introduced biases. In particular, the study participants are either colleagues or superiors. Such relationships can complicate the research process, particularly the interview process.

Selection and Recruitment of Participants

A total of 5 nurse educators participated in this study. Participants were selected using purposeful sampling and a snowball sampling technique from the faculty in a Bachelor of Science in Nursing program. Two educators who agreed to participate named other educators who they felt would be suitable for the study (Neuman, 1997). Those educators were personally approached and also agreed to participate. The criteria for selection of participants were educators' experience with problem-based learning and with the integration of technology in the problem-based learning process.
Description of Participants

Five middle-aged female nursing educators in a Bachelor of Science in Nursing program consented to participate in a series of two interviews. They are full-time faculty members in a large urban university school of nursing. The participants hold a Master or a Ph.D degree. They all have experience with the problem-based learning process and incorporate varying degrees of technology in their problem-based learning courses. E-mail, web resources, and asynchronous conferences are being used by all participants, while synchronous conferences are currently (at the time of this study) not being offered in the problem-based learning courses. One participant has had experience with an online problem-based course incorporating e-mail, asynchronous conferences, web resources, and synchronous conferences through her role as a researcher.

Four participants have taught problem-based learning in all 4 years of the 4-year Bachelor of Science in Nursing program. The same 4 participants have been teaching in the school for over 10 years. One participant has been formally teaching in the program for 2 years in level one and level two problem-based learning courses. This participant does have further experience in problem-based learning through her own studies. Overall, the participants have experience in and knowledge of problem-based learning in nursing education.

After completing all the interviews, I feel that my participants were honest and open in discussing their views on my topic. I also feel that they had a deep knowledge and strong commitment to the principles of problem-based learning. Because of this sound knowledge, I feel they were able to identify technological
issues, concerns, and benefits to this mode of teaching and learning. (Journal entry, March 28, 2003)

**Data Collection and Recording**

The data for this study came from two main sources. Primary data were collected through individual tape-recorded interviews. I transcribed and wrote a synopsis for each interview, sending both to participants for member checking. A research journal with field notes provided secondary data.

**Primary data: Interviews**

The desire to explore the understanding that educators had of problem-based learning in an online environment made the use of interviews the most appropriate primary data gathering technique. Patton (1980) states that “the purpose of interviewing is to allow us to enter into the other person’s perspectives. The assumption is that that perspective is meaningful, knowable, and able to be made explicit” (p. 196).

The study involved data collection by means of two interviews conducted with each of the 5 participants over a 3-month time period. This process began after ethical approval was received from the Brock University Research Ethics Board (see Appendix A) and the school of nursing at the study university (see Appendix B).

For the purposes of this study, an interview guide approach was combined with a standardized open-ended approach (Patton, 1980). “The interview guide provides a framework within which the interviewer develops questions that are explored in the course of an interview, sequences the questions, and makes decisions about which
information to pursue in greater depth” (Patton, p. 200). In the standardized open-ended interview, the interview questions are written out exactly the way they are to be asked during the interview (Patton). By combining the two modes, I had the flexibility to ask basic questions and to probe and explore certain subjects in greater depth.

There are at least six kinds of question that can be formulated for the interview process: demographics, experience, knowledge, opinion/value, feeling, and sensory elements (Patton, 1980). This study used five types of questions. Demographic and experience questions identified characteristics of the participants and located the participants in relation to other educators. Knowledge, opinion/value, and feeling questions were asked to gain an understanding of the perceptions of the interviewees on this specific topic (see Appendix C). The format was open ended to allow the participants to express themselves in their own words. Open-ended questions allowed for new ideas to emerge through the research process. Although the focus of this study was maintained within the boundaries of the study model (see Figure 2), the direction of data collection and interview questions was affected by the educators’ responses. Alterations were made to the interview guide after the first 2 participants were interviewed. They identified further questions that were added to the guide (see Appendix D).

Upon completion of the first set of interviews, a second interview took place with each participant to further explore questions (see Appendix E) and to discuss the transcripts and synopses of the first interviews. These interviews occurred 3 to 4 weeks after the initial interviews.

The participants determined the times and dates of the first and second interviews. The interviews were conducted in each participant’s office at the university. The doors to
the offices were closed to provide an atmosphere of confidentiality, to minimize disruptions, and to allow the participants to speak freely. The interviews were audio taped to increase accuracy of the data and to allow for greater researcher attentiveness. Each of the first interviews lasted approximately one hour, and the second set of interviews took approximately one half hour to complete.

The interview process presented a number of challenges. An interview takes place in a social interaction, and it is influenced by that context (Fontana & Frey, 2000). I had to continually remind myself that, as the researcher, I contributed to the outcomes of the interviews. I was not simply asking questions. In fact, I played a role in the discussions.

Furthermore, as an educator at the school of nursing, I had a professional relationship with the participants. I had to consider that these relationships might affect the interview questions and responses. In general, I felt comfortable interviewing my colleagues. However, prior to, during, and after the interview of one senior colleague, I experienced a nervousness that did affect the process. A journal notation written immediately after the interview describes the circumstances that were present.

The interview was held in the participant’s office with the doors closed for privacy. I felt extremely nervous throughout this interview. I began to get a terrible headache as the interview progressed. Although I tried to focus on my participant’s words, I had great difficulty concentrating. (Journal entry, February 19, 2003)

In addition, researchers should be aware of personal biases and the influence of those biases on the interview process (Merriam, 1998). Through journal notations, I
came to the realization that I favored the introduction of technology. During the interview process, I had to be careful when I encouraged the participants to express their views. The interview process is a conversation. The interviewer and the interviewee are both involved in the construction of the knowledge of the interview (Kvale, 1996). As identified in a notation, I had to be continually aware of my bias towards technology.

I feel a huge responsibility to perform the interviews in such a manner that will elicit the participants' perceptions. I need to be aware of my own feelings and thoughts towards technology. My objective during the interviews is to ensure that I don't influence the participants into saying what I want to hear. (Journal entry, February 20, 2003)

Although these challenges were present, no major difficulties occurred during the interview process.

The interviews went well. Our discussions detoured infrequently to topics that were not related to online problem-based learning. I was able to develop a rapport with my participants. I kept eye contact and a body language conveying my interest in their perceptions. The rooms were quiet, the chairs were comfortable, and most of all, the tape recorder worked. (Journal entry, April 16, 2003)

Transcriptions and Synopses

Following each interview, I personally transcribed the discussions verbatim from the audiotapes. Each interview was transcribed before the next interview took place. This process occurred during the initial and second interviews. The transcription process
included listening a second time to each tape to ensure accurate typing of the words of the participants. A synopsis of each interview was also developed. The synopsis included a one-page typed summary of the interview and included my interpretations of the participant’s perceptions.

Upon completion of the first five interviews, the transcriptions and the synopses were personally delivered to each participant for review and for comments following Tilley’s (1998) recommendations that “returning transcripts to participants, asking them to consider and respond to their words in print, is one way researchers can check their interpretations of the participants’ contributions” (p. 326). The participants were informed that they could make changes to the transcripts and synopses that they deemed necessary to ensure that the meaning intended was captured. However, no additions or changes were requested to the synopses, and few clarifications of missed words were required on the transcriptions. This process was repeated following the completion of the second set of interviews. Member checking ensured that the 10 sources of data represented accurate accounts of the educators’ perceptions, at least for that moment.

Although Lincoln and Guba (1985) claim that the member checks of transcripts are the most crucial technique in establishing credibility of data, limitations exist with transcriptions. A transcript is a text that “re-presents an event; it is not the event itself. Following this logic, what is re-presented is data constructed by the researcher for a particular purpose, not just talk written down” (Green, Franquiz, & Dixon, 1997, p. 172). Transcription work is complex and interpretive (Tilley, 2003). A field note notation written during the transcription of the first interview identified the thoughts and the difficulties that I experienced.
I am making a conscious effort to type the exact words of the participant...keeping the context of the interview in mind. I am trying not to interpret the words...but my mind keeps trying...I am focusing on just displaying the participant’s words in the typed format. I can’t believe how difficult and time consuming that can be. (Journal entry, February 20, 2003)

Secondary Data: Research Journal with Field Notes

My views, opinions, and observations as a researcher were further sources of data. A research journal with field notes was used for the secondary data collection. A research journal is “a kind of diary in which the investigator on a daily basis, or as needed, records a variety of information about self and methods” (Lincoln & Guba, 1985, p. 327). It consisted of three parts: a daily schedule, a methods sections, and field notes. Field notes are recording tools that address descriptions of participants, places, events, and conversations (Glesne & Peshkin, 1992).

Notations were made in the journal on a daily basis, exploring methodology and timelines, after discussions with my advisor, and after rereading the transcripts several times. My thoughts and insights on coding and categorizing were noted in the methods section. In addition, since the period after an interview is critical to trustworthiness and credibility (Patton, 1980), my observations, feelings, interpretations, and ideas were also noted in the field notes section immediately following each interview. I kept the journal with me at all times.

I found myself constantly thinking and dreaming about my research. I needed to have my journal close at all times so that when a thought, a feeling, an inspiration
occurred, I could write it down before the idea disappeared.... I really found it beneficial to write in my field notes immediately after the interviews. My thoughts were clear and vibrant at those times. (Journal entry, April 16, 2003)

Data Analysis

Data analysis involves organizing what the researcher has seen, heard, and read so that data can be categorized, synthesized, and interpreted (Denzin & Lincoln, 1994). The interactive model as described by Miles and Huberman (1984) was used for the analysis in this study. The approach contains three linked processes: data reduction, data display, and conclusion and verification (Huberman & Miles, 1994). Initial analysis occurred while conducting the interviews, writing field notes, transcribing audiotapes, and writing synopses. This ongoing analysis shaped and focused the study as it proceeded.

Three processes were used in this phase of the study. First, recurring themes and patterns were identified during the interview process based on the research questions and the study model.

Second, a coding scheme was developed once the first interview transcript was reviewed. Coding is a process that makes data more readily understandable and that enables the researcher to interpret and draw conclusions (Berg, 2001; Coffey & Atkinson, 1996). The scheme was amended upon analysis of the remaining interviews. During this time, a priori codes from the study framework and research questions and the emerging codes addressing philosophy and technology from the interview data were identified (see Appendix F). The transcripts of the two interviews from each participant were read at least four times and recoded twice.
The research journal and field notes were also systematically analyzed with the same codes to determine congruence with and or contradictions to the primary data. These data included participant descriptions, methodological insights, coding, category and theme identification, interview interpretations, explorations of participant and researcher bias, and my thoughts, feelings, and insights of the participants’ perceptions. The initial identification of the emerging code of philosophy of online learning arose during the field note notations of the first interview.

Paragraphs were assigned codes. Each paragraph was accounted for in the analysis. Once coding was complete, sections of data were compared with other sections with the same code. The codes were then organized into categories and themes addressing the study model a priori codes and the emerging codes from the interview data and the research journal with field notes. As a final check, outlying data were examined.

At the end of the coding process, I re-examined the uncoded passages. A few passages from each participant were not coded. I did not find any new themes during this step. The uncoded data focused on demographics and experience, such as families and occupational issues.

Data from each category and theme were color coded and arranged on different sheets of colored paper. A journal notation described this process.

I look around this room. There are colored sheets of paper everywhere. To an outside observer, it must appear like total chaos. But to me, it is complete organization. I can see the data, my theme, my codes, and my patterns. I can now begin to make some sense of these data. (Journal entry, March 12, 2003)
Third, the categories and themes were then organized into a classification system and displayed in chart format to permit conclusion drawing. The emergent themes and categories are depicted in italicized letters (see Table 1).

**Methodological Assumptions**

This study examined the perceptions of faculty from a university school of nursing. It was assumed that the participants were honest and open in their responses. The participants had knowledge of LearnLink technology and the strategy of problem-based learning. Following this is the assumption that they could engage in conversations about the processes and outcomes of problem-based learning in an online format.

The direct learners' perspectives are beyond the scope of this study. However, educators' perceptions of learners' issues were incorporated into the study on the assumption that educators would base their perceptions on student feedback from previous courses and experiences.

**Limitations**

There are limitations to the study that need to be acknowledged. First, the study reflects the perceptions of only 5 participants. The study participants were all females and of middle age. Participants of different ages and sex might have identified different issues. Second, the inexperience of the researcher can place further limitations on a study (Foddy, 1995). I began this process with great interest but with minimal qualitative methodology. An experienced researcher might have identified emerging themes and
Table 1  
Classifications and Theme Display

<table>
<thead>
<tr>
<th>Classification (category)</th>
<th>Themes</th>
</tr>
</thead>
</table>
| Course design            | 1. Modes of communication and steps of problem-based learning  
2. Technical aspects  
3. Educational support (students and faculty)  
4. Group size  
5. Ideal course design |
| Problem-based learning Process | 1. Group dynamics  
2. Program level (student prior knowledge)  
3. Tutor characteristics and roles  
4. *Student learning styles*  
5. *Connectedness*  
6. *Nonverbal communication* |
| Problem-based learning Outcomes | 1. Critical thinking (student achievement)  
2. Self-directed learning |
| Problem-based learning environment | 1. *Philosophy of online learning*  
2. *Important aspects of problem-based learning*  
3. *Important aspects of nursing*  
4. *Role of technology* |
participant and researcher biases that I, as a first-time researcher, may have missed. I noted at least one journal entry where I felt that I should have probed further.

I feel that my inexperience as a researcher was evident during this interview.

Although I concentrated on the participant’s words, I could have asked more in-depth questions around philosophy and group dynamics. (Journal entry, February 20, 2003)

**Ethical Considerations**

This research was conducted according to the standards set by the Brock University Research Ethics Board (see Appendix A). Participants were made aware of their rights through an information letter (see Appendix G) and through informed consent procedures (see Appendix H). The educators were informed that they could withdraw from this study at any time. No participant withdrew during the process.

This research used in-depth interviews for data collection. I had an ethical responsibility to capture the intended meaning of my participants’ words and to represent those words accurately and respectfully. In addition, since nursing faculty were interviewed, I was compelled to follow the ethical value guidelines of the College of Nurses of Ontario that include well-being, choice, privacy, confidentiality, truthfulness, and fairness (College of Nurses of Ontario, 2002).
Summary

This chapter described the methodology of this study. It included descriptions of the design, researcher positioning, participant selection and descriptions, data collection, analysis, methodological assumptions, limitations, and ethical considerations that were used during the study process.
CHAPTER FOUR: FINDINGS

In this chapter, the findings of the study are presented in two sections. Section 1 contains a presentation of the categories that relate to the study framework. The study framework focuses on the categories of course design, problem-based learning processes, and problem-based learning outcomes within a teaching-learning environment conducted completely online. Section 2 describes the emergent category and themes from the interview responses and journal entries (see Table 1).

By completing the participant transcriptions and summaries, I noticed that certain themes were emerging along with the ones that were inherent in the study framework. (Journal entry, March 6, 2003)

The emerging category of a problem-based online learning environment, that is, the philosophy of online learning, the important aspects of problem-based learning and nursing, and the role of technology, is presented in the section. As I noted in my research journal field notes, the participants introduced the word “essence” in relation to nursing and problem-based learning. These were unexpected outcomes from the data.

I am so surprised and intrigued by what themes have emerged. I didn’t even think about the essence of problem-based learning, nursing, and philosophy in relation to the online environment. But my participants sure did. (Journal entry, March 18, 2003)
Section 1: Study Framework

This section presents the findings according to the a priori codes, categories, and themes related to the study framework. Specifically these categories include online course design, online problem-based learning processes, and online problem-based learning outcomes.

Course Design

The framework underlying the study addresses course design within the boundaries of an online environment using FirstClass LearnLink technology. There are four components to a completely online course with LearnLink capabilities. Groups can communicate in synchronous real time conferences, delayed time asynchronous conferences, e-mail, and online web resources. The themes that relate to this model include: (a) modes of communication and steps of problem-based learning, (b) technical aspects, (c) educational support of faculty and students, (d) group size, and (e) ideal course design.

Modes of communication and the steps of problem-based learning. The educators described how the four components of the LearnLink system (asynchronous, synchronous, e-mail, and web capabilities) could be used to support the six steps of the problem-based learning process as described by Barrows and Tamblyn (1980). The six steps are: problem presentation, hypothesis formation, self-direction, information sharing, reflection, and evaluation.
All participants stated that LearnLink online communication capabilities could facilitate the steps of problem-based learning. However, they did not always agree on the types of communication modes that could be used during each step of the problem-based learning process.

One participant felt that the synchronous mode could be used throughout the six steps of the process.

Sure, I think that you can do all steps in the synchronous. The brainstorming for sure. Issue identification, hypothesis generating, the discussion about the background information. I think if you do an online course you have to have synchronous because that's really what pbl is all about. (Participant 4)

One educator in particular noted that the synchronous chat mode is required for the setting of objectives or hypothesis formation.

Setting learning objectives….Big challenge because any group decision making in an online asynchronous format is very difficult. You have to use chat for that. (Participant 1)

Two participants commented that different steps of the problem-based learning process require both synchronous and asynchronous capabilities.

Well, I think the chat portion can be the interactive part when they’re brainstorming coming up with their learning issues. That would have to be sort of a joint thing. And then the students go off and do their own research and look at the resources that they’ve needed to address the problem. (Participant 5)

Hypothesis generation, from what I can tell so far can be done asynchronously, but it slows everything down. There is a lag time of what happens. So because of
the lag time, people tend to lose a bit of that momentum that they may get in a face-to-face. (Participant 1)

Another participant also suggested that the asynchronous mode could be used to facilitate the information sharing and group discussion step.

Well, I think the group learning discussion format suits this very well with an online because people in a discussion aren’t all talking at once hopefully. So, I think the asynchronous. (Participant 3)

All participants identified the final steps of reflection and evaluation as important aspects of online problem-based learning. Nonetheless, they viewed the effectiveness of online reflections and evaluations differently. The issue of evaluation, especially, gave rise to several varied comments.

The educators felt that the students could evaluate themselves more easily in an online environment, thus increasing the capacity for self-direction.

So, if I was a student online, and I looked at my participation, I could pull up all the notes that I made, all the questions I asked, I would quickly be able to identify whether I only asked knowledge and comprehension questions. Or, do I actually challenge with application and synthesis questions? I could quickly do that. For the student who is in the face-to-face encounter, they have a lot of difficulty doing that. (Participant 2)

Two participants also concurred with this view to a certain extent, saying some of the evaluation criteria could be kept while others would need to change.

I think we may have to change some of the criteria depending how we decide we’re using LearnLink and what we decide are the standards for that. I think the
main aspects around critical thinking, being self-directed and group skill for the most part, those criteria would be able to stay the way they are. (Participant 4) It was noted, though, that criteria for evaluations of online interactions have not been adequately developed.

I don’t think we evaluated that way of knowing appropriately to determine for students. Here’s a grade where you’re above average, here’s average, here’s below average. I don’t think we’ve really done that fairly for students. We talk about boundaries of professional behavior in face-to-face. Do we have boundaries around professional behavior online? Where is it acceptable and where is not acceptable? Again it’s that normative perspective. We don’t have enough evaluation component of online dialogue to know what that means. (Participant 2)

The participants agreed that a difference exists in evaluations that occur in face-to-face interactions and those of an online group. In addition, they felt that evaluations of online discussions could be extremely time consuming.

You know, there’s a difference in evaluating the written communication and evaluating an e-mail or LearnLink compared to having someone stand up in a group and have a discussion, a critical discussion. To me, they’re two different skills. It’s called thinking on your feet and the other one is called having time to compose. (Participant 4)

It’s very time consuming...because you could be evaluating four or five people as the discussion is going on, but when it’s online, I find it much more labor intensive to try to “oh this person said this, and this person, oh, but these are
some good points” but then I have to go back to see if they were really only in response to someone else having said something. (Participant 3)

One participant even stated that this step couldn’t occur effectively in an online format. Evaluation…that’s a tough one for me…I have to interact with my students when I do the evaluations. I have to be there with them. I have to see their reactions. I have to be able to look at their facial expressions. I really insist on that. I rarely will give an evaluation without a student being present. You get a better feel for where the student is at. Plus they talk to me about other issues at that point that may have affected or may have future effect on their learning. So, it’s sort of a general “you and me type of discussion”. (Participant 5)

In general, the educators viewed this sixth step of problem-based learning, that is evaluation, to be an important issue in an online format.

Although they differed in their views concerning the effectiveness of the types of communication modes within the steps of problem-based learning, the participants were unified in their conclusions that students must be made aware of the expectations regardless of the mode of communication being used.

... Students should, in fairness to students, should know what the expectations are. (Participant 3)

They might not understand what quality means. The same thing goes for face-to-face classes. A student can come in prepared for a class with information and just as our students in our research study said, “they barf out their information” and it ends up not becoming a discussion but it ends up being a presentation of what they have found. The same thing can happen online. So we have to work
in both of those environments to help students recognize that we’re asking them to come and discuss their information and critically ask questions of one another, challenge one another. So that’s the kind of evaluation criteria that we have to help students understand. I think that’s in both face-to-face as well as online environments. (Participant 1)

In general, the participants felt that the online environment could facilitate the steps of problem-based learning. However, as identified in a journal notation, the educators did not discuss their views on the problem presentation and identification step.

Reflecting on the interviews, I am struck by the realization that the participants discussed all steps of an online problem-based learning group except for one. They did not talk about the problem presentation/identification step. How did I miss this during the interview process? Especially during the second interviews. Perhaps if I had more experience in research I would have elicited this data. Why didn’t the participants talk about this step in particular? (Journal entry, March 28, 2003)

**Technical aspects.** The technical aspects of online problem-based courses refer to the hardware (computer), the software (program), the support (technological), and the infrastructure of the course.

Three participants in particular focused on the technical aspects of an online course. One participant noted that the technology had to be user friendly.
I think whatever system you use must be user friendly and that it doesn’t create barriers. You’re always going to have technology problems. I think it’s inevitable. (Participant 1)

She also stated that the software should be current and have the capacity to support more advanced pedagogical functions.

The other thing is, it would be great to have software that would have current capabilities such as concept mapping, because that might help give direction better to the group to know where they have been and where they are going. (Participant 1)

Another participant supported this view.

I think technology has some barriers. One is that it’s rapidly changing all the time. If you’re going to develop and have a component of your curriculum and value that as a learning outcome, then you need to provide that through leasing technology so that students can upgrade their computers on an annual basis. So they have the most current programs. (Participant 2)

The need for a supportive infrastructure and technical support were also identified as being important.

I think the big thing is to make sure you have the technical support that will be there when you run into problems. To run an online course and not have technical support, I think is sinful. (Participant 1)

The infrastructure has to be supportive. Students and faculty need the resources at the school and at home. These resources need to be provided. (Participant 2)
One participant emphasized the need for all faculty and students to have the required equipment for the course.

Like for example, I just got a computer. Prior to this I didn’t have a computer that was functional even in terms of using the Internet. So there is a big assumption that the entire faculty has computers. The other assumption is around students. Now, I’m assuming that most students have computers. If it’s an online course….It’s like your right arm. So, I think having the actual equipment and the support. It has to be valued. (Participant 4)

Overall, the participants identified the need for an available and supportive infrastructure incorporating advanced software systems that are user friendly.

**Educational support.** Along with the technical support, educational support for both students and faculty was identified as a need. Participants stated that a learning curve exists around online learning and that students should have adequate training prior to and during the online course.

That’s part of the growing, learning curve around understanding how to do online. So, training has got to be very important for how you get people into the system, and the design has to be well thought out. (Participant 2)

You need to provide adequate training for students that is provided over time rather than a one-shot training at the start of the course. This would be especially true for first-time online learners. (Participant 1)

I think it can be something that’s developed. Just as you would develop your writing skills to be able to write. (Participant 5)
Participants further agreed that resources should be available for students. Therefore, the library staff needs to be continually trained in these resources.

So, students are challenged constantly by this change component in the environment. Building in resources, you have to have librarians who have an understanding of digital learning. (Participant 2)

Furthermore, faculty education and development were identified as important aspects in a successful online course.

If it were an expectation of the course...there would need to be faculty development. I don't know all there is to know about it being self-taught. I think as a tutor you have to know about it. (Participant 5)

And the other thing is, if I was going to do an online course, I'd like some training with someone who has experience with online formats and suggestions on how to manage it. (Participant 4)

Participant 2 described some difficulties that can arise with this expectation. She stated that time and workload constraints can create barriers for faculty and that there must be institutional support around issues of time, finances, and workload.

So, time and commitment by the organization for both your time and resources that are required to be able to teach a course are important. There's not collective time when we can say, “okay, we’re going to take an hour and we’re going to teach you about this”. We can’t do that because of the way our workloads work.

In addition, this participant felt that faculty members need to be educated for the new form of language used in an online environment.
They’re all abbreviations. They have a jargon that is their own vocabulary. “See you” is a C and a U. I’m thinking, what does that mean? So even as faculty, when we start to use online resources, I don’t think we have been educated for that. There’s a whole hidden code there that we need to understand in that online environment. (Participant 2)

In summary, participants noted that both students and faculty require ongoing education in terms of online learning, language, and resources. Faculty in particular need institutional support around time and workload concerns.

**Group size.** During the interviews 3 participants were adamant about small group size, and 2 others, experienced in the problem-based learning process, did not raise the issue. The 3 participants identified the size of the online problem-based learning group to have a strong influence on the effectiveness of online problem-based learning.

I think group size is an issue. We’ve capped it at eight. Any more than that and it becomes extremely onerous. (Participant 3)

Two participants concur with this view that the maximum group size should not exceed eight students.

Yes. Yes. Yes...It’s huge in both. It’s huge in face-to-face. Now, I haven’t taught with groups of 14 in pbl. But, I just can’t see how that could happen and be effective. In an online environment, if you have 12-14 students in a group, it’s a small crowd. It’s not a group. So, I would say, 8 is the maximum. Less is more (Participant one).
I think there should be a limit. Period. I’ve taught with 7. And, I’ve taught with 12. As a faculty member, it’s like juggling 12 balls in the air, all at the same time, having that number of students. I would say, less is better. Probably 7 or 8 is an ideal number. (Participant 5)

In general, the participants agreed that group size was an important consideration when performing problem-based learning online. They felt that group size should be limited to eight students.

**Ideal course design.** Educators’ perceptions about the ideal course design centered on the technical aspects of the course management system and on the inclusion of face-to-face components.

Based on their exploration of the modes of communication available through LearnLink technology, educational aspects, technological issues, and group size, the participants thought that the ideal course design would incorporate all aspects of LearnLink technology and more. (Journal entry, April 2, 2003)

However, they also felt that the current LearnLink technology could not support an ideal online problem-based learning course design.

One participant commented that the ideal design for an online problem-based learning course has not yet been developed.

The million-dollar question. The ideal design, I don’t think has been developed yet because there are some things that online is very supportive of and other aspects online does not support very well. (Participant 1)
Another participant suggested that the ideal design would incorporate both asynchronous and synchronous communication modes.

I think it would be good to have a bit of both. Because I think that happens in person. We have the synchronous communication with the group, but then afterwards we often send things out through e-mail, like web resources, reminders, and announcements. So, I think it would be good to have a balance of the two somehow, the asynchronous and the synchronous. I think if you do an online course you have to have the synchronous because that’s really what pbl is all about. (Participant 4)

The participants expanded on this view. They described a hybrid course design model combining face-to-face and online strategies.

I can see great gains to be had for having face-to-face pbl with online supporting them during the week or in between. I would love to do a research project where we had face-to-face on one Monday and 2 weeks later we come back face-to-face and we continue with online pbl during that 2-week period. (Participant 1)

I think students need to have both. Ideally, if you could have live teleconferencing, which is what some of the most advanced problem-based learning curriculum universities have, where you have face-to-face conferences with students in six different campuses across the state. (Participant 2)

..Face-to-face to set up the ground rules and expectations. I think you need that first interaction with them to establish what you’re doing...to get a connection. (Participant 5)
So, I don’t see it as something that I would want to see 100% and there’s no contact, face-to-face contact. (Participant 3)

In summary, the participants agreed that a face-to-face component should exist in an ideal online course design. A journal entry further emphasized this agreement.

Upon reviewing the transcripts, I can’t help but notice that the participants feel strongly that some portion of the face-to-face component needs to be incorporated into an online pbl group. (Journal entry, April 12, 2003)

**Online Problem-Based Learning Process**

This section addresses group process within the online format. The themes that relate to the study framework include: (a) group dynamics, (b) program level (student prior knowledge), and (c) tutor characteristics and roles. The emergent themes of (d) student learning styles, (e) connectedness, and (f) nonverbal communication are related to the process category. They are not directly found in the model but did emerge from the interview data.

*Group dynamics.* All participants noted that the various functions, roles, and developments within the group would be affected by an online format. In particular, they identified student participation and group communication as important considerations.

One participant felt that the online format would be supportive of group dynamics.
It's a real benefit. In face-to-face, you can easily lose the quiet student or the one who is very enthusiastic and talks a lot but is basically entertaining the group instead of bringing back quality resources. (Participant 1)

Others stated that group dynamics could be achieved in a synchronous chat format, for which boundaries around group process and student participation would need to be set.

Other participants noted that group norms, group boundaries, and etiquette issues should be addressed, because of the need to understand the online learning process.

The same sort of rules and etiquette of face-to-face groups norms need to be established in an online group. (Participant 1)

Although one participant thought that online problem-based learning could support group process, she identified the issue of communication difficulties.

One of the difficulties is keeping the conversation going. People have to learn how to respond to one another in an online environment. It doesn’t happen overnight. They tend to go in and write their notes and put up their information rather than having a discussion about it. The whole issue of miscommunication is there. And the research supports that. Students have a little bit of anxiety around having things misinterpreted. (Participant 1)

Participant 3, on the other hand, felt that the online format would not support group process. Although she perceived the online format to be another vehicle for accomplishing the communication process, she went on to say that this format could not provide a dynamic forum for it.
It's easier to attach something, click it, and send it. So, that's not group process. The idea of actually working in a dynamic way with a group at a speed that is sort of real life with nursing, is not seen online.

Overall, although 4 participants felt that the online environment could support group process, they noted that communication challenges would make group process problematic.

**Program level.** This category explored the concept of student prior knowledge about problem-based learning in nursing education by connecting it to the different levels (years) of the 4-year BScN program. The relationship is based on the assumption that students accumulate knowledge and build on prior knowledge throughout the 4-year program.

The educators perceived that the online learning format would not be suitable for students in level (year) one and possibly level two of the 4 year nursing program. They noted that students in levels one and two are learning about the problem-based learning process and need the personal contact of a face-to-face format. They felt that students in the first two levels are unfamiliar with the principles and the steps of problem-based learning and are learning how to be self-directed learners.

I think my gut sense says I'm hesitant to do it in the very first year of pbl. Once they know the pbl principles and process, then it's a different story. And I don't know how long it takes for someone to sort of get what's going on in pbl and how it's supposed to operate. Probably not in the first year while they still don't
know what’s going on. It’s hard enough to be able to tell them what’s going on in face-to-face. (Participant 1)

You need higher level students to do online with. I think in the lower levels, in the first and second years, the students are still uncomfortable with what they’re writing as learning plans. (Participant 2)

Two participants emphasized that students in levels three and four are aware of the process and could successfully perform the learning online.

I could see it being offered in the latter years of the program. The growth that I have seen in students from year to year….I think it would have to be a select type of student that was able to adapt to the pbl format and skills quickly. But certainly for levels three and four. By that point most students, I think, would be able to. (Participant 5)

In summary, the participants noted that students are quite technologically adept.

Students coming in today are quite computer savvy. I know just from watching them with information management. They all want to immediately zip off to the web. (Participant 3)

However, the educators felt that students lacked the knowledge of problem-based learning in the first two levels of a BScN program. A journal notation corroborates this view.

Upon reviewing the transcripts, I get the sense that the participants felt very strongly that online pbl should not be offered in the first two levels. They did concede that students are quite technologically mature and knowledgeable. From the participants’ words, though, I note that it is not an issue of knowledge of the
technology but an issue of knowledge of the pbl process itself. (Journal notation, March 30, 2003)

**Tutor roles and characteristics.** The participants discussed their perceptions of the roles and characteristics of an ideal online problem-based learning tutor. At the school of nursing in which this study was conducted, the faculty member is referred to as a tutor.

Four participants felt that the role of the online tutor was similar to that of a face-to-face tutor, that is, as a facilitator within the group. A facilitator coaches, supports, and guides students in their discussions and problem solving.

The role of the tutor is to be a facilitator...to stimulate discussions and to crank up the level of analysis. (Participant 3)

On the other hand, one participant stated that the tutor of an online group needed to take on the role of a moderator, that is, a person who oversees, directs, and manages online discussions.

I think you become a moderator, not a facilitator. I think they’re different roles.

In the group dynamics, there’s a difference in being a facilitator in a face-to-face encounter and being a moderator of an online discussion. (Participant 2)

Furthermore, she noted that this role would change according to the students’ level, from that of clearly identified leader to that of co-participant in the discussions.

Well, it depends how the tutor structures it. Some tutors in online groups are known as the tutor. In some other groups, the students get a code number. The tutor also gets a code number. So the students don’t know whether 649 is the
tutor or another student. And tutors determine that based on what level of analytical capacity they want their students to be generating. So, in a fourth-year group, I would prefer not to be known as the tutor, and in a first-year group, I would want to be known as the tutor. In a fourth-year level, you'll want to be part of the pack. (Participant 2)

The participants identified the potential for tutor burnout as a distinct negative result of this format. They noted that boundaries around tutor response times should be set and followed.

I'm very conscientious about responding to my students fairly quickly. So I do end up spending a lot of time responding to them. Even if it's a quick e-mail. But, now I have started to set some boundaries. I won't answer them in the evening or on weekends. I used to get all kinds of e-mails even on the weekend or at the last minute. They'll e-mail me at 10 at night and expect me to look at it before class the next day. Well, it's not going to happen. So I have now put my own boundaries with my students. (Participant 5)

Certain characteristics were also identified as being important. The participants stated that an online tutor must be able to promote critical thinking, foster self-directed learning, and serve as a resource to the students.

To promote critical thinking, to promote self-directed learning, to make sure that they address the course objectives, to be a resource for the students, to be a resource not just in terms of giving them articles and resources to read, but also if it happened to be my area of interest or expertise that I could contribute content as well. I think you could do all of that through LearnLink. (Participant 4)
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Furthermore, the online tutor must be able to set clear expectations.

I think you need to be clear...I mean...you can fall into the trap of overloading the students and then when they don’t know something, you give it to them. I think it’s extremely important to tell people up front what the expectations are.

(Participant 3)

Modeling is another important characteristic of an online tutor, both to stimulate discussion and to provide examples from actual nursing practice.

You model and stimulate discussion to crank up the level of analysis.

(Participant 3)

I think that there’s a lot of modeling you can actually do to help people along in the group. (Participant 1)

Another characteristic of an online tutor is experience with face-to-face problem-based learning groups. This experience means that they have already made the shift in roles from lecturer to that of facilitator of learning. This in turn prepares them for the role they need to take on in the online environment.

I feel that the online tutor is someone who has had face-to-face experience in pbl and who knows how the process works very well. Someone who’s got a very strong role as a facilitator and understands that role very well. Online learning already is such that the tutor is seen as the facilitator. It’s a big paradigm shift in their thinking about their role. For us, the shift is quite seamless. You take people that have done pbl fly into this online environment and basically you continue to do what you’ve done all along. (Participant 1)
The last characteristic of the tutor is computer literacy, which means that the tutor needs to be familiar and comfortable with using the technology.

Well, they'd have to be computer adept. I would have to know what happens with the synchronous thing and what the capabilities of the technology are.

(Participant 5)

In general, the participants identified seven characteristics of an online tutor.
They felt that an online tutor should promote critical thinking, foster self-directed learning, serve as a resource, set clear expectations, be computer literate, have experience with face-to-face problem-based learning, and act as a role model.
In addition, 4 participants stated that an online tutor should take on a facilitator role within the group, especially as co-participant with fourth-year nursing students.

.Student learning styles and characteristics. The participants felt that student learning styles and characteristics would affect group process and outcomes. They stated that a student’s ability to participate in an online format and to meet course objectives would be dependent on attitudes, motivation, and skills.

Two participants thought that the online format would suit the reflective learner and ESL students.

In online you are picking up more the reflective learner. The reflective learners like online because they have time to ponder. Students who have English as a second language do better in an online environment because they have time to think about what the written word is saying to them. (Participant 2)
One participant stated that the online format would be ideal for learners who prefer to slow the learning process.

There are certain learners who are very deep thinkers who prefer to have that extra time to think through something and write it down and really process it deeply and that sort of thing. So, for those students it supports their ability to go and look at the evidence, look at how it may apply to clinical practice, and think it through. (Participant 1)

Furthermore, the participants identified skills required in order to function online as a learner. They listed writing and typing skills as issues that need to be explored.

I think some people’s skills are really good at writing and not as good in conversing. So, I’m not sure how that would play out in an online course. (Participant 4)

All participants agreed that, as in a face-to-face format, online learning could be beneficial for some students and not for others.

The point is we want to facilitate student learning. And so it’s not for everyone.

It is another way. (Participant 3)

**Connectedness.** A theme that emerged from the interviews centered around the participants’ views of group members’ abilities to connect with each other during the group development. Connection refers to a learner’s ability to “function in ways which connect self to others, focus on issues related to affection, affiliation, and caring, and include others in the learning process through co-operation and collaboration”
One participant stressed that achieving a connection with a faculty member helps students to discover what nursing means to them personally.

That personal contact... I think they need to see, to have a role model in terms of nursing. At the beginning, they're trying to latch on to what is nursing. I think one of the dangers of not having someone there physically, you don't have that personal contact, the chance to be unstructured once in a while and share personal clinical experiences. (Participant 4)

Another participant further supported the need for face-to-face contact between the faculty member and the students in order to establish the connection.

I feel that I'm connected with my students when I meet them.... I think there's that identification somehow that's there. (Participant 5)

Furthermore, the participants alluded to the importance of face-to-face contact between students within the grouping order to foster connection. One participant noted that a feeling of disconnection could exist in an online environment.

Students are more comfortable with technology, but what they need is the individual contact. Like for example, in level 1 they're getting their biochemistry online. A lot of their anatomy and physiology is coming online. The comments I've had from students is that "oh finally, someone I can have a discussion with in a group, rather than having to do it through the technology." (Participant 4)

I myself "felt" this theme of connection during the interview process.

In my roles as research and educator, I was bound to my participants by personal and professional values and beliefs. I felt a sense of connection. I also began to
wonder whether this sense of connection would have been different if these interviews were conducted online. (Journal entry, April 14, 2003)

In general, the participants noted that personal contact was one way of facilitating group connections.

Nonverbal communication. Four participants identified the importance of nonverbal communication in group process. They noted that this type of communication was vital in both online and face-to-face situations in order to assist the tutor and the students in group process.

The nonverbal is a big part of the group process because other students will challenge students based on those types of behaviors. I also tend to get a tone of the group by looking at their body posture. What’s a class going to be like? If they all come and they’re slouched into their chairs or they’ve got their heads on the desk...the whole tone of the group is different, is changed. (Participant 5)

Facial expressions, inflections, and personal contact were considered to be a vital component of the communication that occurs within the group, and the technology should have the capacity to transmit these nonverbal components.

The technology should be such that it enables synchronized face-to-face dialogue where you have the capacity to see the nonverbal as well as the verbal.

(Participant 2)

Two participants felt that nonverbal communications are important aspects of group dynamics and the nursing profession, but that these would be lacking in an online environment.
When you’re online and you’re reading what someone has typed....You don’t know the inflection, and sort of the pondering, the thinking that goes on and that you see as people. Like, as I’m flapping my hands here as we speak to emphasize points. You miss the body language in the online. (Participant 3)

My bent is that I would like to have that personal contact with people. To be able to see their face, to talk to them, and know what they’re thinking. It’s the interpersonal part that I think would be difficult online. (Participant 4)

**Online Problem-based Learning Outcomes**

The study’s conceptual model included critical thinking and self-directed learning as outcomes of the problem-based learning process.

**Critical thinking.** Critical thinking can be defined as “an intellectually disciplined process” which “allows the learner to think fairly, explore, and appreciate the adequacy and cohesion of their own beliefs and opinions, as well as those of others” (Crooks, Lunyk-Child, Patterson, & LeGris, 2001, p. 58). All participants noted that critical thinking could be supported through an online asynchronous format. Students could reflect on the written word and then synthesize the information.

Students actually have to work very hard at thinking through what they’re going to write. Because they’re writing it, they have to put a lot more energy into it. Like writing one note. It looks like there isn’t much there. There may be four paragraphs, but it’s taking you a really long time to digest all the information,
synthesize all the information that you’ve read and put it down into some sort of meaningful message. (Participant 1)

Similarly, one participant felt that the development of critical thinking would be less challenging online since students can take the time to think and to respond.

I think there’s a concern about building depth in the group. We talk about the student’s ability to critically think. Well, when you can reflect on the written work and you critically think, you ask a different kind of question. When you are doing it in a face-to-face environment, it’s much more challenging. Your ability to analyze, to think through, and to respond has to be done in a much shorter time frame. (Participant 2)

Participant 5 expressed the opinion that critical thinking can be encouraged and developed online and that it does not necessarily have to be face-to-face.

I don’t see how critical thinking is not going to be developed in the same sort of fashion, because I develop my students in the group with their critical thinking based on my inquiry of them. I’m constantly asking them questions, and I’m role modeling. So I don’t think it would have to be a face-to-face type of thing to develop critical thinking and clinical reasoning.

**Self-directed learning.** The promotion of self-directed learning, seen as a strength of the problem-based learning approach to nursing education (Barrows and Tamblyn, 1980; Blumberg, 2000; Bouhuijs, 1993; Gijselaers, 1996; Rideout, 2001), would be difficult to support online in some levels of the program, according to the participants in the study. They felt that online problem-based learning courses in levels
one and two would not facilitate the development and reinforcement of self-directed learning skills, but that it could be done in later years.

I think it depends on what level of PBL you’re talking about and what the expectations are for self-directed learning. But I think if you were going to introduce the online format in level one, you would have to be really clear on what your expectations are. I think it would take longer for students to get it... because even with the groups we have now, we’re seeing them every week.... I still find that it takes them until Christmas for the lights to go on as far as ‘what is self-directed learning... what’s this all about.... who am I.... what’s my role... what’s your role... what’s a learning plan.... So I think students would have to be fairly self-directed already to succeed in an online course. (Participant 4)

Students, I think, don’t get the whole self-direction thing until second year... and then some of them don’t even have it in their second year. They are very dependent on the tutor to tell them what to do. Some of my students are still struggling with it. And this is term two, level two. So, I’m really not sure that in level one it would be appropriate. I think that in the other years... yes. I have interacted with students in levels three and four, and they’re totally self-directed. (Participant 5)

Two participants stated that LearnLink technology could support this self-directed learning outcome.

To promote self-directed learning... I think you could do all of that through LearnLink. (Participant 4)
I think that's another way that self-directed learning can be supported. The students have access to different types of resources and can share them more readily with others online. (Participant 1)

One participant noted that the asynchronous mode could be used to accomplish this goal.

Okay, when you think about that, what happens if you have asynchronous is that you have self-directed problem-based learning. (Participant 2)

Overall, the participants expressed the opinion that the issue of self-directed learning in an online format would be an interesting topic for further research.

Section 2: Online Problem-Based Learning Environment

This section describes findings related to an emerging category that resulted from the interview data but that was not directly addressed in the study model or the initial specific research question. This category, related to the broader context of online problem-based learning, includes subjects’ perceptions of: (a) the philosophy of online learning, (b) the important aspects of problem-based learning and nursing, and (c) the role of technology.

Philosophy of Online Learning

The participants in this study discussed their philosophies of an online educational program within the context of the Learnlink capabilities of the FirstClass Client system in operation at the university school of nursing. The university at which this research occurred holds to a philosophy of online learning that compares learning
to an electronic little red schoolhouse in which all students at the university have open and equal access to all electronic learning. Through this philosophy, commonly referred to as an “open” philosophy of access, all students at the university can access any course electronically through conferences and folders. The goal of this philosophy is to encourage collaborative learning and to provide an interactive environment for discussion.

Participant 1 initially identified this theme during the first interview. When the last 4 educators to be interviewed were asked about their views concerning this “open” philosophy of access to learning, they felt that an online problem-based learning course in a nursing program could not be open to all students in the university. They held the belief that each online problem-based learning course should be electronically accessible only to that particular group.

In our nursing faculty, there’s this belief that what happens in the group stays in the group and it’s private. LearnLink administrators’ philosophy is that it’s a one-room schoolhouse. The idea is that cross-fertilization between groups is happening and we are supposed to be reading what other people are doing. Right now, what our pbl groups are doing is that each pbl group has a LearnLink folder and the groups actually close them off to keep them private. (Participant 1)

One participant raised the issue of confidentiality. She noted that the concept of patient confidentiality is an important ethical and legal consideration in nursing.

I totally agree with the closed concept. The same as the closed classroom.

When I go into my pbl group at the beginning of the year, and I have to reinforce
that several times throughout the year, what goes on in the group is confidential.

I think that builds on the professionalism. (Participant 5)

Another reason for making discussion folders available only to participants in a course is the need to encourage and support safety, trust, and confidentiality within the group. I think it should be closed. That's because that fits with the idea of what I call safety within the group. In other words, one of the norms or standards we set up at the beginning of the year in all of my groups is that what we say in-group stays in-group. There has to be that level of trust. I think we should keep that confidential in the group. (Participant 4)

I think in the pbl environment that group as a collective sets up norms. It implies a norm of confidentiality. It implies openness in a learning environment not for world view. (Participant 2)

An added reason for not adhering to the university's open policy of access to online discussion forums is the need to meet the standards of the College of Nurses, which stipulate the importance of patient confidentiality.

The other thing I have, because this is a nursing program, is if we start to discuss actual patients which students bring into our pbl case when they talk about a particular scenario. If that's breeched, we may have breeched the privacy of an individual who's been a patient. So I have a real issue around the privacy legislation. (Participant 2)

One of the educators shared a strategy for ensuring confidentiality within the "little red schoolhouse" philosophy. She reconciled the two issues in the following manner.
What I do is I set up the courses so that there are a number of “open” folders and then they go progressively more selective in terms of who can get in. We close off the evaluation folder. (Participant 3)

However, participant 3 stressed that she would control access to both the online and the face-to-face problem-based learning groups.

I set controls on who has access to our discussions... because then we would have to go back to a complete change in our program if we’re going to have it open. Because in tutorial groups we don’t have everyone just walking in and out when they choose to.

The overall reactions to this topic were quite emotional. As identified in a journal notation, the participants expressed strong feelings and opinions whenever this topic was discussed.

Whenever I asked the participants the question of whether the online courses should be open or closed, I felt during the interviews that my participants were passionate in their feeling about maintaining the confidentiality of the group within an online environment. Because our present LearnLink capabilities are limited, I sensed that they felt that online pbl could occur only within a closed philosophy. (Journal entry, April 5, 2003)

**Important Aspects of Problem-Based Learning and Nursing**

The educators' opinions of online learning were related to their views on what they termed the “essence” of problem-based learning and nursing. They supported their
philosophical educational stances by sharing their personal beliefs about nursing and problem-based learning.

One participant felt that the essential characteristics of problem-based learning were discussion and group learning and that these components of problem-based learning apply to nursing as well.

Nurses have to do exactly what groups do in pbl. They work collaboratively. They also have to come up with decision making in their practice, and they need to understand how they make their decisions and be critical about how they make their decisions for giving care to patients/clients. (Participant 1)

Through the problem-based learning process, nursing students can work together in groups to develop critical thinking.

I think the essence for me is developing critical thinking, which included integrating knowledge from various disciplines. But you do that in a group. The whole purpose of pbl is to get away from the idea of spoon-feeding and then giving students problems to solve. (Participant 4)

The sharing of information, communication, and reflection were also identified as important aspects of both problem-based learning and nursing.

Well, I think the essence of nursing is that we have to be able to communicate with individuals around their health and illness and to communicate with their families and the team that is working with them. (Participant 2)

Confidentiality and professionalism were seen as crucial components within this communication process. Four educators felt that the online environment could not support the attainment of these important goals of problem-based learning and nursing.
The development of professional behaviors involves nonverbal types of behaviors. Students need to be aware of these behaviors. This cannot be accomplished online. (Participant 5)

Although face-to-face contact was perceived as being vital in nursing and problem-based learning, the educators identified that future expectations within the scope of practice for nurses will nevertheless require nurses to be competent using online resources.

One of the things is about scope of practice. This is going to be an expectation that nurses have a competency level related to being able to manage information exchange through online resources. (Participant 2)

**Role of Technology**

The theme centering on the role of technology emerged as the educators described their perceptions of an ideal online problem-based learning environment. They explored how technology could be used as a pedagogical tool to support problem-based learning. Once again, this theme seemed to be related to the participants’ views on the philosophy of online learning in nursing education. They viewed the role of technology as a means of supporting student-centered learning.

I really would hope that the technology is something that assists us in our program, which is student-centered learning. I think it’s a methodology. It’s just a different format. The tutorial process is a communication process. It is just another vehicle for accomplishing that. (Participant 3)
The introduction of technology has led the school of nursing to reflect on problem-based learning and the nursing curriculum.

It’s interesting because it’s another vehicle...another tool. It has caused us to reflect on what the essence of our teaching, our curriculum, is. It’s important to determine what we think is the essence of pbl, and that’s what we don’t want to lose just to go on a bandwagon or just to be expedient or to capture an audience. (Participant 3)

Two of the educators raised the idea of exploring the differences between an online problem-based learning course and an online curriculum. They identified the uniqueness of the problem-based learning program at the university and expressed the opinion that technology should be tailored to the program and not vice versa.

I balance it by saying that we’re not an online program. We offer the program online...some components of it. Students should not take the whole program online. I would like us to maintain that this is a unique curriculum, that group process is important enough, that students can’t graduate without having done an actual live human tutorial. (Participant 3)

By exploring this issue of the role of technology and its place in nursing problem-based education, I had the sense that the 3 educators who shared their thoughts had strong feelings on this topic.

By their expressions, words, and emotional body language, the educators were very clear on their views. However, it is interesting that 2 participants did not discuss their views on this topic. (Journal entry, April 5, 2003)
Summary

In summary, this chapter described the findings of the data obtained from the in-depth interviews and journal notations. The categories and themes that related to the study framework and that emerged from the interviews were presented.
CHAPTER FIVE: SUMMARY, DISCUSSION, AND IMPLICATIONS

This study explored the perceptions of 5 nursing educators about online problem-based undergraduate nursing education. This chapter includes an overview of the study by outlining the information presented in the preceding chapters and by discussing the significant trends and results in comparison to previous literature on the topic. Conclusions from the data and implications for theory, practice, and research are also presented.

Summary

This exploratory study addressed the issue of computer use within a problem-based learning approach to nursing education. Specifically, the study explored educators’ perceptions about the processes and outcomes of problem-based learning within an online format.

A review of the writings on problem-based learning identified that a gap in the literature exists on this topic. Many articles, books, and studies have been published on the strategy of problem-based learning in nursing, and much has also been written about adult education and computer-based (online) learning. However, I found very few research articles that contained information about problem-based learning in the online format. The literature noted four strengths of problem-based learning: constructing knowledge, promoting self-directed learning, enhancing motivation, and developing critical thinking. Conversely, the role of the tutor and problem quality were identified as weaknesses within the strategy as it is currently applied. The literature reviewed also indicated that computer technology could support adult learning
principles, student self-direction, and critical thinking. The online format could possibly support problem-based learning in nursing education, but that further research was needed to explore this issue. A study framework was developed to address the methodological and theoretical purposes of the study. The framework, taken partly from Schmidt and Moust (2000), included the categories (student prior knowledge, tutor roles and characteristics), the process (group functioning), and the outcomes (student critical thinking and self-direction) of problem-based learning within a teaching and learning environment conducted completely online (see Figure 2 in Chapter Two).

A qualitative approach was used to capture 5 nursing educators' perceptions on this issue. The study involved data collection by means of 2 interviews conducted with each of the 5 participants over a 3-month period and a research journal with field notes. The findings pertain to the educators' perceptions around course design, online problem-based learning processes, and online problem-based learning outcomes, as well as certain themes that were not implicit in the study framework: the educator's philosophy of online learning, the important aspects of problem-based learning and nursing, and the role of technology. Generally, the educators felt that problem-based learning in nursing education could be supported within an online format. However, they noted that challenges could exist in terms of designing courses, facilitating group dynamics, developing tutor roles, and fostering student self-direction, especially in the first 2 years of an undergraduate nursing program. The participants stated that an ideal online problem-based learning course would incorporate a face-to-face component to facilitate group connection and communication. They felt that access to group
discussions online should be available only to the group members and closed to outside participants. In addition, the educators suggested that online courses should be offered only in levels three and four and that group size should be limited to eight students.

Interpretation of Findings

This section contains an interpretation of the study findings. The study asked if the essential elements of a face-to-face problem-based learning group could be supported in an online format. These essential elements are course design, group process, critical thinking, and student self-direction. The question concerns the support of these elements within a course design using online LearnLink capabilities of synchronous, asynchronous, e-mail, and web (access to information through websites) resources.

The interpretation of the study findings revealed a general congruence between educators' perceptions and current literature on the issues of course design, group process, student critical thinking, and self-direction, as well as the discovery of new aspects of problem-based learning when offered in the online environment to mostly female students. The importance of tailoring an online problem-based learning course to reflect educators' philosophies and values in nursing education emerged as an important theme from the interviews. The educators noted that technology should be used as a pedagogical tool to support the process and outcomes of problem-based learning.
Course Design

The findings of this study add to a further understanding of problem-based learning course design. The study participants identified modes of communication, technical support, software design, and accessibility to technology as important considerations of an online problem-based learning course design. Furthermore, they felt that an online course should incorporate a face-to-face component within the design.

The participants stated that a successful online course should incorporate both asynchronous and synchronous modes of communication. The few research studies in the literature that explore online problem-based learning provide support for the educators' views (Cracowski, 2001; Kamin et al., 1999; Valaitis et al., 2002). Kamin in particular found that students communicate effectively within an asynchronous online environment. Valaitis noted that the synchronous mode of communication could be an effective tool for group discussions.

This study specifically focused on the modes of online communication in relation to the six steps of the problem-based learning process: problem presentation, hypothesis formation, self-directed study, information sharing, reflection, and evaluation. Some participants felt that the synchronous mode could be used for hypothesis formation and information sharing (dialogue, debate, and group decision making). They also noted that the asynchronous mode could facilitate self-directed study, sharing of information (sending information and resources, developing nursing diagnoses and care plans), reflection, and evaluation. Upon reflection, I noted that the participants did not state their views about the problem presentation step.
Research literature does not specifically address online learning and the six steps of problem-based learning. As expressed in a journal notation, I experienced difficulty in locating research exploring the question of online course design and the six steps of problem-based learning.

I know that the design of the face-to-face course is quite important. The design of the problem, the way the problem is presented to the group, and the processes used by the group to explore the problem are important considerations in a face-to-face format. It has been a very frustrating experience trying to find studies and research in the literature that addresses online course design issues. And yet, I am at times glad. I feel that my research is important. The words of my participants can shed some light into this topic: a topic about which little has been written.

(Journal notation, March 15, 2003)

However, general research focusing on asynchronous and synchronous communication modes does support the educators’ views on self-directed learning, group discussion, and information sharing (Cartwright, 2000; Clark, 1998; Daugherty & Funke, 1998). The participants’ perceptions around nursing diagnoses and care plans in problem-based learning online are new results that are not found in the literature. Furthermore, the educators expressed the need to determine how this vehicle of online learning can support the steps of problem-based learning. Studies on online learning in higher education support the view that “educators must consider what they want their students to learn, and the appropriateness of the medium for achieving these learning goals” (Weston & Barker, 2001, p. 15).
The participants also emphasized the importance of technical support, software design, and accessibility. Their insistence that technical support is vital for both students and faculty, that students and faculty need to have an understanding of how to use available technology, and that faculty development should be incorporated into the process concurs with recommendations from Maier and Warren (2000), Oliffe (2001), Todd (1998), and Yucha and Princen (2000). Oliffe in particular noted that online problem-based learning courses require "high quality visual presentation, user friendly access, clear structure for text on screen, and facilitation support in real time" (p. 5).

Moreover, the participants concluded that the ideal course design would need to be a blend of both face-to-face and online. The face-to-face component could support spontaneity and communications in a visual way, and the online component could support the building of sequential depth and critical thinking. This description of a hybrid online problem-based learning course is not addressed in the literature. However, research studies do support the participants' views that an online component can foster critical thinking and knowledge acquisition (Daugherty & Funke, 1998; Duffy & Jonassen, 1992; Kanuka & Anderson, 1998).

**Group Process**

Issues of group process and dynamics are central to the strategy of problem-based learning. Student learning styles and characteristics and tutor roles and characteristics play a role in these issues.

As noted in the problem-based learning literature, students and tutors need to develop an awareness of the various roles, functions, and developments within the
group (Barrows, 1996; Schmidt & Moust, 2000). These issues become even more important in an online environment. The participants stated that challenges to the group would exist in an online format especially because of miscommunication tendencies, netiquette (informal sets of standards), and a group’s difficulties in decision-making. They added new insight to the literature on online problem-based learning in nursing literature by identifying these challenges. Although netiquette was linked to proper nursing practice, the participants in this study provided few elaborations and explanations. Issues of norms, functions, and netiquette still need to be further explored and researched (Billings, 2000; Cravenger, 1999; Maier & Warren, 2000).

The size of the problem-based learning group influences the degree to which learners can participate in the group process. Three participants in this study also identified the importance of limiting online group size. They shared the view that the group size should be limited to six to eight students in both face-to-face and online groups. Although a journal entry supports the educators’ views, I also question why only 3 participants identified this issue.

Upon reflection it is interesting to see that 2 participants did not mention group size as an issue of online problem-based learning. The 3 were adamant that group size should not exceed eight students. I can’t help but wonder why the other 2 participants did not mention this to be an issue. (Journal entry, April 2, 2003)

After surmising as to why 2 participants did not raise this issue, I feel that the contexts of the interviews were a factor in this situation. I was distracted and focused on my thought processes during these two interviews.
The results of this study conform to the optimal size suggested for most problem-based learning groups. A group of 5 to 10 members is considered more likely to be cohesive, interactive and caring (Barrows, 1996; Benson et al., 2001; Hmelo & Evensen, 2000; Rideout, 2001).

Another concern raised during the interviews dealt with the notion of nonverbal communication, which constitutes an important part of group process. The participants noted that individual and social environments online differ from those of a face-to-face format and that learners and teachers need to be cognizant of how student learning could be affected by the lack of auditory and visual cues. These findings on the effects of nonverbal and social cues are confirmed in the literature on online learning (Edwards & Hugo, 1999; Kanuka & Anderson, 1998).

In addition, the participants’ perceptions of the importance of building a sense of trust and shared purpose in order to minimize the risks due to an absence of social cues online reflects Edwards and Hugo’s (1999) findings that social cues are an important aspect of group process since they help group members connect with each other and with the tutor.

Furthermore, the educators noted that the majority of nursing students in the BScN program are females and, as women learners, would prefer an environment that includes support, co-operation, mutuality, and caring. These same perceptions of female student relationships in group process can be found in the literature dealing with women as educators and learners (Flannery, 2000; Flannery & Hayes, 2000; Maier & Warren, 2000; Saba & McCormick, 2001). However, the study participants felt that it would be difficult to attain these relational behaviors online. This finding is different
from the conclusions drawn by Conrad (2000). Conrad's qualitative study explored adult learners' views on connection and community and found that both were possible within an online environment. These results may differ in part because the participants in this study were educators focusing on a nursing perspective.

**Student learning styles and characteristics.** The participants stated that self-directed learning, critical thinking, and group process can be achieved in the online environment but are affected by the learners' characteristics and preferred learning styles. They identified three reasons why the online format may not be beneficial for some students.

First, the educators perceived that, due to age and previous experiences, students in levels one and two may not have the necessary attributes and skills necessary to learn in an online problem-based learning format. This perception cannot be found in previous studies exploring online problem-based nursing education. Second, they felt that some students might be better at conversing than at writing and that some students may communicate more effectively in person than online. Third, the educators felt that students, as adult learners, should be given a choice as to which format best suits their learning styles and characteristics. The study's findings on the importance of taking into consideration a student's preference for oral or online communication, learning styles, and readiness for self-direction when conducting any teaching and learning experience reflect many writings on adult teaching and learning (Brookfield, 1995; MacKeracher, 1996; Williams, 2001).
**Tutor roles and characteristics.** Ensuring the presence of a consistent and effective tutor is of utmost importance in problem-based learning (Barrows, 1996; Schmidt & Moust, 2000). As identified in the literature, issues concerning the role of the tutor and ideal tutor characteristics apply to both the face-to-face and online environments.

The study participants noted that further research is required to explore this issue. Although one participant felt that the tutor’s role would be that of an online moderator (a person who facilitates discussions online), the remaining participants thought that the online role would be similar to that of a tutor facilitating in a face-to-face group. Similarly, Kamin et al. (1999) and Valaitis et al. (2002) identified facilitation as a tutor role. In this facilitation role, according to the nursing educators interviewed, the tutor should promote critical thinking, foster self-direction, establish norms, provide feedback, stimulate discussions, and be a role model. These traits are similar to Haughey and Anderson’s (1998) recommendations that tutors need to provide support, clear expectations, and appropriate communication techniques. Furthermore, participants stated that experience with a face-to-face group was essential before becoming an online tutor in problem-based learning. They identified awareness of tutorial style, expertise in content and process, familiarity with the technology, and knowledge of the profession as important characteristics. This is a unique finding in terms of the available research on this topic.
Critical Thinking

The outcome of critical thinking is viewed as an expectation and a strength of problem-based learning in face-to-face situations (Bouhuijs, 1993; Gijseelaers, 1996; Schmidt & Moust, 2000). All participants agreed that the outcome of critical thinking would be supported in an online format.

The participants stated that the online format slows down the process. This lag time positively affects synthesis and critical thinking, and it may help support deep thinking or deeper learning. Similarly, Haughey and Anderson (1998) note that the asynchronous mode gives learners more control over their own learning. Studies conducted by Cartwright (2000) and Yucha and Princen (2000) support the educators' views that computers can be used as cognitive tools to facilitate the development of critical thinking.

The educators in this study indicated that critical thinking could be supported through an asynchronous format. This is supported by the findings of Kanuka and Anderson (1998), although Gunawardena et al. (1997) had theorized that active construction of knowledge and critical thinking can occur through both asynchronous and synchronous communication modes.

Self-Directed Learning

Self-directed learning, defined as a process in which individuals take the initiative in diagnosing their learning needs, formulating learning goals, identifying resources, implementing learning strategies, and evaluating outcomes, is a common concept in adult learning theory (Merriam & Caffierella, 1999). The basic assumptions in this
theoretical view are that adults want to learn material that is relevant to them and that they have the ability to take responsibility for their learning (Crooks et al., 2001).

Most of the participants felt that self-directed learning would be supported in an online format, especially in the asynchronous mode. Since students are on the web already, they may tend to go to the web more to look for information and thereby take a more independent initiative. The literature was found to support these views. Kamin et al. (1999) concluded that self-directed learning could be accomplished using web/CDROM components in a medical problem-based learning course.

Two participants, on the other hand, thought that certain factors were required for this self-direction to occur in an online environment. The educators in this study thought that students in levels one and two are learning how to be self-directed learners, that is, one of the aspects of self-direction posited by MacKeracher (1996). They would have difficulty writing learning plans and would have to be taught how to be self-directed.

The findings suggest that educators feel students become more self-directed regardless of the mode of delivery, whether online or face-to-face, as they advance through their program. Crooks et al. (2001) found a similar pattern in face-to-face problem-based learning. They noted that in the beginning levels of the 4-year program, students frequently express frustration when asked to make decisions about how they will undertake learning experiences and often have little or no experience in controlling their learning.
As posted in a journal entry, the participants, who were experienced faculty members, added depth and insight into the topic of self-direction in the online environment.

At the beginning of the process, I felt that the participants would strongly suggest that the online environment would be an ideal vehicle for this outcome of self-directed learning. The literature states that self-directed learning would be supported in an online environment. However, my participants brought the issue back to a nursing perspective. Their insights into this topic are revealing, deep, and quite insightful. They really opened my eyes. (Journal entry, April 10, 2003)

**Online Problem-Based Learning Environment**

The standard of confidentiality is an important ethical consideration in nursing (College of Nurses of Ontario, 2002). A study theme that emerged based on this standard of nursing practice centered on the question of the philosophy of learning within an online environment. The educators stated that the course design would need to ensure group privacy. The professional standard of confidentiality would be reinforced through information technology procedures that close access to outside participants, just as in the closed classroom. Although the Learn Link environment is designed for equal access in the institution in which the study was conducted, the study participants felt that a philosophy of limiting access would facilitate trust, communication, and safety within the class group. While these three aspects are considered important in both online and face-to-face formats, according to several
authors (Barrows & Tamblyn, 1980; Bligh, 1995; Gijselaers, 1996; Schmidt & Moust, 2000), the study's findings uncovered a new element.

The educators noted that the “essence” of problem-based learning included discussion, group learning, reflection, and student-centered learning. They perceived that these elements of problem-based learning could be achieved and supported through a “closed” online environment that ensured confidentiality. As identified in a journal notation, this finding is unique in terms of the available writings on this topic. The educators raised the new and interesting question of closed versus open access learning in the online problem-based learning format in nursing education.

Closed versus open? I find this question to be intriguing. I am so grateful to my participants for identifying this question and then sharing their views with me. In particular, I am grateful because the literature does not address this question; but my study does begin to. (Journal entry, April 14, 2003)

Conclusions

The study focused on educator perceptions about online problem-based course design, processes, outcomes, and environment. Overall, the educators felt that the online format could be used as another vehicle for problem-based learning.

The ability of an online problem-based learning course to facilitate a student’s preferred learning style was seen as a major benefit of this mode of learning. In particular, the educators felt that the reflective learner would benefit most from the online format. Students online have the ability to reflect on their own growth and learning and have the time to ponder. The educators also noted that this format could
make the problem-based learning process more explicit. In addition, the participants agreed that the online format would support student critical thinking and that self-directed learning could be supported in levels three and four of the 4-year nursing program.

Although the participants noted a number of strengths, they identified a larger number of possible limitations. The most prevalent limitation dealt with the lack of personal contact. They felt that students need to see and to have a role model in terms of nursing. The educators also identified that online courses would not help students in the development of professional behaviors. Communication online is not reality nursing, mostly because in the majority of nursing roles, face-to-face contact is still the main mode of communication. The participants concluded that the personal contact was of utmost importance but that it could be ensured in an online format only if face-to-face sessions were incorporated into the course design.

A second limitation raised by the participants is the need for faculty and students to learn how to overcome difficulties in communication posed by the online environment, especially in decision-making, keeping discussions going, and synchronous chats. Both students and faculty would require technical and educational support to facilitate this process.

In summary, although the educators identified certain advantages of online problem-based learning, they challenged the benefits of a problem-based learning course conducted completely online. The personal contact of a face-to-face model was deemed a crucial aspect in a nursing program, since nursing is a face-to-face profession.
Implications and Recommendations

Based on this exploratory study, I have identified implications for theory, practice, and further research.

Theoretical Implications

This study was based on Schmidt and Moust's (2000) theoretical framework of face-to-face problem-based learning. The framework components of student prior knowledge, tutor characteristics, group functioning, and student outcomes were explored within a problem-based learning process conducted completely online.

The findings of this study point to two main theoretical considerations. First, in Schmidt and Moust's (2000) model, group functioning is affected by student prior knowledge, tutor characteristics, and problem quality. The functioning of the tutorial group in turn influences the student outcomes. Therefore, the variables have a direct effect on each other. This study introduced the variable of an online format into the equation, more specifically that of the FirstClass LearnLink course management system. The study results show that the "online" variable influences the four study framework components. One, most educators felt that students in levels one and two of a 4-year nursing program lack a prior knowledge of problem-based learning. As such, the online format should only be offered in levels three and four. Two, most participants noted that the online tutor role would be similar to that of a tutor facilitating a face-to-face group, but felt that further research is required to better understand this issue. Three, to facilitate group functioning, the educators introduced the possibility of a hybrid problem-based learning course model that would include
both online and face-to-face components. They felt online groups should be limited in size to eight students. Last, the participants commented that the online environment would be supportive of student-centered learning and that students could take initiative and responsibility for their own learning as well as develop critical thinking skills.

Second, Schmidt and Moust’s (2000) framework conceptualizes a collaborative and contextual form of learning whereby students work in groups to explore the context of a concrete problem. The educators noted that information technology could affect collaboration and contextual learning, usually by limiting the capacity for collaboration and by not providing sufficient opportunities for contextual learning and connection among female learners. They felt that role modeling was difficult in the online format and that a lack of nonverbal cues affected group dynamics. The results of this study indicate that collaboration is possible if access to the group is closed to outside participants in order to ensure group trust and confidence. Furthermore, the participants identified the importance of attending to educators’ values and philosophies of nursing when courses are delivered online.

These theoretical implications should be included in a framework that explores online problem-based learning in nursing education.

Recommendations for Practice

Based on the results of this study, I have developed the following recommendations for undergraduate nursing education:

1. Problem-based learning seeks to place learners in control of their own learning. However, students have different characteristics and learning
styles. Therefore, a student’s preferred learning style must be taken into consideration regardless of the vehicle of delivery. The decision whether to take problem-based learning in a face-to-face or an online format should be based on student choice.

2. Educators felt that students in the first 2 years of a 4-year undergraduate nursing program are unfamiliar with the principles and steps of problem-based learning and are learning how to be self-directed learners. The online learning format should be offered only in levels three and four.

3. Online group size should be limited to eight group members. The size of the group influences the degree to which learners can participant in group process.

4. The online format presents certain technological challenges. Technological and educational support should be readily available for students and for faculty. Educators need to ensure that students have equal access to equipment and that software programs are user friendly.

5. Group process differs online. Issues of group norms, functions, and netiquette need to be discussed by students and educators within the group. In addition, an ideal environment would blend both face-to-face and online elements within the course design to facilitate group process, communication, and connection.

6. Although these implications for practice are important, I feel that the identification of an institutional and personal philosophy around online
problem-based learning is of utmost importance. The participants in this study shared their views on their philosophies of problem-based learning and online learning in nursing education. Most participants viewed nursing as a face-to-face profession that values confidentiality and communication. They believed that an online problem-based learning course should support these values. Educators in general need to be aware of their own values and beliefs around confidentiality, privacy, and nursing education. Institutions need to explore the implications of online curricula (entire programs online) versus online courses. The philosophies of the institutions, the educators, and the students can play a vital role in these decision-making processes.

Implications for Research

As few articles and studies have explored online problem-based learning in nursing education, many potential areas for future research exist.

Research exploring student perceptions around online problem-based learning could be compared with educators’ perceptions to determine any commonalities or differences, especially by exploring the views of students at the beginning and the end of a program. The perspectives of male students and male educators could be added to this exploration. An administrative perspective could also add to the depth of knowledge surrounding problem-based learning online, in particular around issues of open or closed access to courses and educational support for problem-based learning in an online environment.
Also, study questions might focus on the characteristics of an ideal online learner and an ideal online tutor. Many studies have explored these areas in a face-to-face environment, but research on problem-based learning in nursing education is lacking from the online perspective.

Further inquiry could address the macro- and microstructures of an online course. Questions could explore case presentation, problem formulation, identification, and quality, and navigation concerns from both educator and student perspectives.

The participants identified that research should be conducted to explore how student self-direction can be supported online. In particular, studies could focus on student self-direction during the first 2 years of a 4-year nursing degree program.

Finally, this study was conducted in a face-to-face format with female nursing educators. It would be interesting to conduct a similar study using an online format with both male and female educators and students. Would the study results be different if the interviews were conducted online? This question opens up the issues surrounding qualitative research in text-based communication.

**Final Thoughts**

A thesis is a text, a piece of writing produced by a certain author with a certain audience in mind. It is not an objective window on reality. (Edge & Richards, 1998, p. 340)

Throughout this study, I have made a conscious effort to the best of my abilities to reprint and represent the words of my participants accurately and respectfully, that is, to conduct respectful research as defined by Tilley (1998): research that is “sensitive to
individual participants and research contexts, with both researcher and participants benefiting—research that included but pushed beyond concerns for ethical behavior by the researcher” (p. 317).

I hope that my participants will benefit from the results of this study. I also hope that my research speaks to people and that I have provided in my work the details necessary for the continuation of this research in other contexts.
References


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Appendix A
Brock University Ethics Approval

DATE: February 10, 2003

FROM: Joe Engemann, Chair
Senate Research Ethics Board (REB)

TO: Denise Paquette-Frenette, Education
Barbara Scott

FILE: 02-180, Scott

TITLE: Online problem-based learning: Perceptions of nursing educators

The Brock University Research Ethics Board has reviewed the above research proposal.

DECISION: Accepted as is.

This project has been approved for the period of February 10, 2003 to September 30, 2003 subject to full REB ratification at the Research Ethics Board's next scheduled meeting. The approval may be extended upon request. The study may now proceed.

Please note that the Research Ethics Board (REB) requires that you adhere to the protocol as last reviewed and approved by the REB. The Board must approve any modifications before they can be implemented. If you wish to modify your research project, please refer to www.BrockU.CA/researchservices/forms.html to complete the appropriate form REB-03 (2001) Request for Clearance of a Revision or Modification to an Ongoing Application.

Please quote your REB file number on all future correspondence.

Deborah Van Oosten
Research Ethics Officer
Brock University http://www.brocku.ca/researchservices/
phone: (905)688-5550, ext. 3035 fax: (905)688-0748
Appendix B

Letter to University School of Nursing

November 4, 2002

Dr. ____________________________
Assistant Dean, BScN Programme.

Dear———:

I am studying for a Master of Education degree at Brock University. I am conducting my research on educators’ perceptions of online problem-based learning in undergraduate nursing education. I will be asking nursing educators in the school of nursing about their perceptions on the process and the outcomes of online problem-based learning in relation to student self-direction, student critical thinking, group dynamics, tutor characteristics, and course design.

Very few articles and research studies have been published on the topic of online problem-based learning. Fewer still have been published with reference to undergraduate nursing education. As educators in the school of nursing have experience in problem-based learning and technology, I am very interested in their perspectives on this topic.

I would like to conduct interviews to collect the data for this study from five nurse educators in the School of Nursing. I would be conducting two interviews with each participant. The first interview may take approximately one hour and the second interview will be shorter. I intend to tape record the interviews. The interview tapes will be transcribed for participant verification. The transcriptions will be identified by a previously assigned code, to ensure anonymity. Only my thesis advisor and I will have access to these transcript responses.

Participation in this research is entirely voluntary. Participants can decline to answer any question and can withdraw from the research at any time.

The study will commence once approval has been received from the Brock University Research Ethics Board. If you would like, I can provide you with a copy of my research study when it is completed.

If you have any questions or concerns, please contact me at Bscott47@cogeco.ca.

Sincerely,

Barbara Scott
Appendix C

Interview Outline

Part I
Introduction: These questions are meant to explore your thoughts and perceptions about online problem-based undergraduate nursing education. Other questions could emerge in the interview. You are not required to answer any question in our interview if you consider it to be in any way invasive, offensive, or inappropriate.

Part II
1. Please describe your position at the School of Nursing.
2. Please describe your level of experience with the problem-based learning process.
3. Have you incorporated technology in problem-based learning courses? If so, how?

Part III
There are possibly four components to a completely online problem-based course. With LearnLink capabilities, groups can communicate in real time such as in synchronous conferences and they can communicate in delayed time such as in asynchronous conferences. Conferences can occur in the form of written chats or meetings. Problem-based learning groups can also use online web resources and e-mail.

1. How would you describe the ideal course design of an online problem-based learning group?
2. In your opinion, how would group dynamics be affected by an online format?
3. In your opinion, how would student participation be affected by an online format?
4. How do you think that student self-direction would be affected by an online format?
5. In your opinion, how would student critical thinking and clinical reasoning skills be affected by an online format?
6. Do you think that an online problem-based learning format could be offered to students in all four levels of this programme? Why or why not?
7. What do you believe are the characteristics of an effective online tutor?
8. Do you perceive that an online environment can effectively support problem-based learning? Why or why not?
9. Are there any questions I should have asked to develop a better understanding of the issues of online problem-based learning?
Appendix D

Interview Outline

The questions that were added to the guide are in italics.

Part I
Introduction: These questions are meant to explore your thoughts and perceptions about online problem-based undergraduate nursing education. Other questions could emerge in the interview. You are not required to answer any question in our interview if you consider it to be in any way invasive, offensive, or inappropriate.

Part II
1. Please describe your position at the School of Nursing.
2. Please describe your level of experience with the problem-based learning process.
3. Have you incorporated technology in problem-based learning courses? If so, how?

Part III
There are possibly four components to a completely online problem-based course. With LearnLink capabilities, groups can communicate in real time such as in synchronous conferences and they can communicate in delayed time such as in asynchronous conferences. Conferences can occur in the form of written chats or meetings. Problem-based learning groups can also use online web resources and e-mail.

1. How would you describe the ideal course design of an online problem-based learning group?
   (a). Looking at the steps of the problem-based learning process, what aspects of the online design would be important to consider in each step of the process (problem identification, hypothesis generation, self-directed learning, information sharing, reflection and evaluation)?
   (b). How do you feel the issue of a closed vs. open access philosophy should be incorporated into the design?
2. In your opinion, how would group dynamics be affected by an online format?
3. In your opinion, how would student participation be affected by an online format?
4. How do you think that student self-direction would be affected by an online format?
5. In your opinion, how would student critical thinking and clinical reasoning skills be affected by an online format?
6. Do you think that an online problem-based learning format could be offered to students in all four levels of this programme? Why or why not?
7. What do you believe are the characteristics of an effective online tutor?
8. Do you perceive that an online environment can effectively support problem-based learning? Why or why not?
9. What do you perceive to be the essence of nursing?
10. Are there any questions I should have asked to develop a better understanding of the issues of online problem-based learning?
Appendix E

Interview Outline

The following are examples of the types of questions asked during the second participant interviews:

1. Are the transcript and synopsis accurate reflections of what you said in the first interview? If not, what changes are required?

2. Do you have anything to add to what was said in the first interview?
## Appendix F

### Summary of Codes

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CD</td>
<td>Course design—overall</td>
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<td>CDPP</td>
<td>Course design philosophy of programme</td>
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<tr>
<td>CDPT</td>
<td>Course design philosophy of tutor</td>
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<td>CDTA</td>
<td>Course design technical aspects</td>
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<td>CDCT</td>
<td>Course design types of communication</td>
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<td>Steps of problem-based learning</td>
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<td>ES</td>
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<td>EF</td>
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<td>EPBL</td>
<td>Essence of problem-based learning</td>
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<td>EN</td>
<td>Essence of nursing</td>
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<td>Group size</td>
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<td>CDHC</td>
<td>Hybrid course design</td>
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<td>SPI</td>
<td>Student professional identity</td>
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<td>Critical thinking</td>
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<tr>
<td>QP</td>
<td>Qualitative process</td>
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</tbody>
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Appendix G
Letter of Information

Dear Participant:

I am studying for a Master of Education degree at Brock University. I am conducting my research on educators' perceptions of online problem-based learning in undergraduate nursing education. I will be asking about your perceptions on the process and the outcomes of online problem-based learning in relation to student self-direction, student critical thinking, group dynamics, tutor characteristics and course design.

Very few articles and research studies have been published on the topic of online problem-based learning. Fewer still have been published with reference to undergraduate nursing education. As you have experience in problem-based learning and/or technology, I am very interested in your perspectives on this topic.

I would like to conduct two interviews to collect the data for this study. I expect the first interview may take approximately one hour and the second interview will be shorter. The interviews will take place on dates and times most convenient to you. I intend to tape record the interviews to ensure that I can concentrate on the conversation and your perspectives. After each interview, I will return to you at a later, pre-arranged date, a transcript of our interview to give you the opportunity to review the transcript. The transcriptions will be identified by a previously assigned code. Only my thesis advisor and I will have access to these coded transcripts.

Throughout the study, I will be keeping the audiotapes, interview transcripts, and my field notes in a locked filing cabinet in my home.

Participation in this research is entirely voluntary. You can decline to answer any question and you can withdraw from the research at any time.

The study has received ethical approval through the Brock University Research Ethics Board. If you would like, I can provide you with a copy of my research study when it is completed.

If you have any questions or concerns, please contact me at Bscott47@cogeco.ca.

Sincerely,

Barbara Scott
Appendix H

Informed Consent Form

Title of Study: Online problem-based learning: Perceptions of nursing educators

Researchers: Barbara Scott and Denise Paquette-Frenette (thesis advisor)

Name of Participant: ____________________________

I understand that this is a study exploring nursing educators’ perceptions about the process and outcomes of online problem-based learning. By participating in this study, I will be contributing to the academic literature on the topic of online problem-based learning.

I understand that my participation in this study is voluntary and that I may withdraw from the research at any time without explanation or penalty. I understand that there is no obligation to answer any question that I feel is invasive or inappropriate.

I understand that the study will consist of two individual interviews. I understand that the first interview may take approximately one hour and the second interview could take approximately thirty minutes. I understand that the interview sessions will be audio taped and that these tapes will be transcribed. After each interview, the transcripts will be returned to me for review.

I understand that the interview transcriptions will be identified by a previously assigned code. I understand that only the research advisor and the researcher will have access to the transcripts and researcher field notes. I understand that the transcripts and field notes will be destroyed after the study is complete.

I understand that all personal data will be kept confidential. I have read and understood the above information.

Participant’s signature ____________________________ Date ____________________________

This study has been approved by the Brock Ethics Board (file # 02-180)

If you have any questions, or concerns about your participation in the study please contact either Barbara Scott at bscott47@cogeco.ca or Denise Paquette-Frenette at dpaquett@ed.brocku.ca

Thank you for your help. Please take a copy of this form with you for future reference.

A summary report will be available in September 2003 and will be provided to you upon your request.

I have fully explained the procedures of this study to the above participant.

Researcher’s signature ____________________________ Date ____________________________