INTEGRATING MULTIMEDIA TECHNOLOGY INTO CONTINUING NURSING EDUCATION: EXAMINING THE EFFECTIVENESS

A THESIS

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ABSTRACT

Adult learners living in remote areas require non-traditional access to higher education. Currently, throughout the higher education system, and especially in distance education, changes are occurring in structural delivery models. Because technology has become an integral part of modern life and accessibility of computers has grown rapidly, their use in the higher education system has increased dramatically.

The study describes research carried out at St. Francis Xavier University to examine the effectiveness of interactive CD-ROM technology in a distance education program for working nurses from communities across Nova Scotia and Prince Edward Island. The well-established program (part-time Bachelor of Science in Nursing) was currently available in a print-based correspondence format. The study sought to determine if the new CD-ROM technology could improve the existing method of delivery, in terms of increasing cognitive achievement, attitude toward learning, and learners' satisfaction.

The thesis discusses the implementation and evaluation of the study. Data were collected through audiotaped group dialogues, pre and post-tests, and questionnaire responses. The findings revealed that both print-based and CD-ROM treatments produced successful course experiences for the participants. Students were empowered by the process of learning at a distance, particularly the CD-ROM group who in addition to learning about nursing also mastered computer technology at the same time. The study concludes with several recommendations for nurse educators for improving access, course development, and delivery of distance nursing courses in the future.

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CHAPTER 1

INTRODUCTION

Adult learners, especially those living in remote areas, require non-traditional access to higher education in order to complete their courses of study. Distance education has evolved over the past number of years to assume a prominent position among educational options for these students. Important issues for adult students have been those of accessibility and quality when choosing educational options. Currently, throughout the education system and especially in distance education changes are occurring in structural delivery models. Because information technology has become an integral part of modern life and accessibility to computers has grown rapidly, their use in the educational system has increased dramatically during the past decade. However, designing and adapting course offerings so as to use this technology effectively can pose a challenge. In this thesis I describe the process of planning, implementing, and evaluating an undergraduate nursing course delivered by distance in the CD-ROM multimedia format for diploma graduates in nursing.

Background Information

Universities are witnessing a profound increase in the use of multimedia presentations, video teleconferencing, and more currently on-line course delivery. The university in which I work has attempted to meet this need by providing quality distance programs that are rooted in adult education principles. Distance education technologies have been used, historically, to extend access for adult learners to classroom instruction to rural or isolated sites. The emergence of new technologies enables educators to shift the

focus from delivery of classroom-based instruction to the delivery of new materials and the facilitation of new ways of learning.

Although St. Francis Xavier University is better known as an undergraduate institution, it provides opportunity for part-time students to complete their education at both the undergraduate and the graduate level, and has a reputation for providing education rooted in principles of adult education and accessibility to quality education. Through its Extension Department, the division in which I work, the university is brought to the people. The university currently offers two award-winning distance nursing programs: the part-time Bachelor of Science in Nursing program and the Certificate in Continuing Care program. These programs are offered jointly through the Extension and Nursing Departments and were among the first distance nursing programs across Canada.

The Extension and Nursing Departments cooperatively began the distance nursing program in 1989 as a direct response to the mandate set by the Canadian Nurses' Association (CNA) that by the year 2000 entry to practice be a degree in nursing. A market survey conducted by CNA indicated that a large number of registered nurses wished to return to university for their degree, but existing choices made this impossible. The majority of nurses were working full time, did shift work, had young families, and were not living near a university that offered post-RN degrees.

There was an overwhelmingly positive response to studying at a distance. We received approximately 500 applications for the first cycle of the degree program. From these, we accepted 230 applicants from Nova Scotia and Prince Edward Island. The program now accepts 150 new students every 2 years and offers elective nursing courses to registered nurses outside the program. These distance nursing programs are primarily

print-based, developed around course manuals, and are enriched through audiocassettes, videocassettes, and a variety of reference materials.

The distance model for this program has four critical elements, all of which promote student progress and satisfaction. The first element is the establishment of a local resource center, based on student geographical clustering. A local educational consultant is recruited to facilitate regular group meetings, supervise exams, respond to assignments, and promote student progress. These consultants provide a critical mentoring experience to students. A toll-free telephone line to the main campus further enhances the students' access to course professors and program staff. The fourth element is the provision of distance library services, available to all students through a toll-free telephone line.

Although the print-based delivery mode has proven successful in providing quality education to distant and remote students, the university has sought to further enhance this educational experience by using technology as a delivery tool. An interactive CD-ROM prototype was developed as part of this initiative, based on the content in the first course of the Certificate in Continuing Care program. Audio-video, animation, graphics, and text were all included in this student-centered learning package. This prototype provided insights into the development of a new CD-ROM for the baccalaureate in nursing program, the program I coordinate.

Problem Statement

The development of the distance nursing program and of multimedia technology delivery tools responded to two important changes in health care policy. First, the CNA mandate for a baccalaureate degree for entry to nursing practice implies that a broad educational base in the liberal arts, sciences, and professional studies is required for

effective practice. Second, health-care programs across Canada now emphasize the importance of community-based health care as an area of nursing expertise. There is increased emphasis on an educational role for nurses in the areas of health promotion, illness prevention, and self-care. More attention is focused on increased responsibility for nurses in strategic planning for effective, economical health care at all levels of society. Interactions between students and faculty members, and among students in a classroom are traditional ways to promote these types of competencies. Thus, the testing of interactive multimedia technologies is an important ingredient in enhancing educational resources and services, and increasing educational access to those who study at a distance.

The challenge of creating province-wide access to the Bachelor of Science in Nursing program using multimedia technology was not simply a logistical problem, but one that involved change in attitudes about the use of technology to deliver nursing courses to groups of post-RN students, some of whom had minimal computer literacy skills. Not only was it necessary to address the concerns of potential students but also the concerns of the faculty members who taught in the program, using traditional print-based strategies, and many of whom were skeptical about the proposed use of technology with this group of students.

Although distance education had evolved over the past number of years at the university and had assumed a prominent position among educational options for post-diploma nursing students, many obstacles still remained. The issues of accessibility, standards of quality education, the pedagogy of distance learning, interactivity of learning, and educational outcomes to be achieved were of paramount concern to both students and faculty members. The introduction of a new medium capable of delivering content and

engaging participants in the teaching-learning dialogue was one important issue that needed to be negotiated skillfully with the stakeholders. Therefore, my task of fusing multimedia technology with a course design in order to meet the individuals' learning needs encouraged me to record and study the development and implementation of the CD-ROM component. As the coordinator of the degree program in which this CD-ROM component was to be introduced, I was not only breaking new ground at the university but was also involved in innovation of possible interest to nursing educators elsewhere. In essence, I engaged in an innovative educational study designed to examine the effectiveness of interactive multimedia technology as a medium to make professional education accessible to adult learners.

Purpose of the Study

Development of the CD-ROM involved three activities: (a) assessing the adult learning needs of a group of post-diploma students related to the use of multimedia CD-ROM technology in the delivery of the nursing curriculum; (b) examining the application and effectiveness of multimedia technology in the distance delivery of a post-diploma Bachelor of Science in Nursing program; and (c) communicating the policy implications of the research to stakeholders. The intended outcomes of the development were to increase access to nursing course content and supplemental material for distance nursing students, to promote increased retention of nursing content, to enhance critical thinking and decision making in nursing, to balance the use of technology and personalized mentoring in the delivery of a distance education course, to enhance the learning experience by promoting greater interaction among students and the faculty member, and to use leading edge multimedia educational software effectively. The purpose of this thesis is to examine

each of these activities and outcomes in light of the broader adult education and nursing practice perspectives.

In this thesis, I describe my involvement in the implementation and evaluation of the nursing CD-ROM study. I particularly examine the following areas: (a) the consistency with using the principles of adult education, (b) the success of existing distance education programs, and (c) the increased benefits of multimedia technology in providing an effective, enriching, delivery model for adult students in a distance nursing program.

Scope and Limitations

This study focuses on the application and effectiveness of interactive multimedia technology in the distance delivery of a nursing course to adult learners. Specifically, I examine the design, development, and implementation of CD-ROM technology in delivering quality nursing courses to adult learners at a distance. Inherent in this process is an assessment of the adult learning needs of this group of distance university nursing students related to the use of the technology. It is difficult to evaluate the effect of technology without attention to other factors in the learning environment. Hence, factors such as, multiple personal and professional responsibilities, social support, and self-confidence were assessed through focus group interviews. Both quantitative survey data as well as qualitative focus group data are required to adequately reflect the views of participants related to learning outcomes and the factors that impact them.

The university nursing course selected to be delivered by CD-ROM format was the first course of the program, and was labeled A Conceptual Model for Nursing. In order to offer this course in conjunction with the development of the CD-ROM, a decision by the distance nursing Steering Committee was made to take in a new class of students, even

though it was not a scheduled period for a new intake of students. Marketing thus became an immediate concern of the study; furthermore, this was not an opportune time for accepting a new class because we were in the process of evaluating the curriculum of the program in relation to current Canadian nursing education practice and anticipated implementing a new curriculum with the next intake of students. Such factors may have contributed to only 90 participants for this course compared to larger numbers for prior enrollments.

The participants in the study were registered nurses from Nova Scotia and Prince Edward Island. The students' ages ranged from 35 to 50 years. The study was conducted over a period of one year, August 1997 to June 1998. The actual course was delivered over 13 weeks, the standard time for a three-credit course.

Assumptions

While planning and developing this study I made some assumptions. First, I assumed that all nursing students would want to be part of the research study because typically nurses are clinically involved in research on a daily basis; I assumed that participation in this study would be neither new nor stressful. Second, I assumed that educational technology had the capacity to use information in a way that addresses several learning styles and could enrich the learning process for students who came from varied learning backgrounds. Third, I assumed that any student fears and anxieties would be related primarily to doing their first university course, not to the new technology. Most nursing students in the post-RN BScN Program have been out of the academic stream for 20 years or more, but they are current in clinical practice.

Definition of Terms

The following definitions are provided to clarify their meaning within the context of this thesis.

Multimedia environment is the learning context that employs the use of text, graphics, animation, pictures, video, and sound to present information. The diversity of these media follows a common assumption that multimedia environments help people learn (Najjar, 1996).

Critical thinking involves identifying the assumptions that underlie ideas, beliefs, values, and actions that are taken for granted, and then examining their accuracy and validity, within the context in which the assumptions are being applied. Alternatives to existing ways of thinking and living are realized through reflection, skepticism, and careful scrutiny (Brookfield, 1991).

Interactive video instruction is a technical medium that combines the interactivity capacity of computers for information management and decision-making with the audiovisual capabilities of videodisc and videotape (Boscoe, 1986).

The compact disc-read-only memory (CD-ROM) is capable of storing large quantities of information at a relatively low cost. One CD-ROM disc can store approximately 1000 times the amount of data of a floppy disc (Grauer & Barber, 1998). This feature offers educators' potential advantages for such as Internet links, search engines, computer-based library services, and animation or video clips to name a few.

Web-board is an interactive bulletin board application used to transmit messages electronically to one or several subscribers to the network. Each student may query the

message, ask for further information, or reply to the question posed by the instructor or peer (Romiszowski, 1988).

Plan of Presentation

Following this introductory chapter of my thesis, I provide an overview of selected literature in chapter 2. I pay particular attention to the literature on adult learning because all participants in the study are adult learners. I also provide an overview of current trends in nursing education, multimedia technology, distance education, program planning, evaluation, and continuing professional education.

In chapter 3, I describe the study. I elaborate on the process I undertook to develop, implement, and evaluate my research study. I discuss each step of the study including: the design process, the marketing phase, the needs assessment, the focus group process, the assessment of perceptions of learning experiences, and the study outcomes. In the final chapter, I discuss the overall merits, achievements, and relevance of the study in relation to the literature, as well as identify the results and recommendations emerging from the study.

CHAPTER 2

REVIEW OF THE LITERATURE

In this chapter, I review selected adult education literature from four perspectives. First, I analyze the literature on adults as learners, including the philosophy and principles that underlie adult education. Next, I examine various aspects of planning programs for adults. In the third section, I examine the issue of distance education as a strategy for increasing access to learning opportunities, especially for women and within community and nursing education. In the fourth section, I examine the use of multimedia technology in nursing education, including the influence of technology on factors such as knowledge access, cognitive achievement, learner satisfaction, and student attitudes.

Adults as Learners

A rich and varied literature base exists on adult learning especially within the contexts of continued professional education and lifelong learning. Backes (1997) suggests that the reasons adults return to classrooms for learning include, but are not limited to, technological advances, job training and retraining, literacy skills, a quest for knowledge, a desire to learn new skills, and job displacement. MacKeracher (1996) describes the adult learning process that these adults return to as "making sense and giving meaning to life's experiences; using these meanings in thinking, making choices, solving problems and then acting in ways to help us get feedback that either confirm or disconfirm those meanings" (p. 245). An understanding of the basic philosophies of adult education provides a helpful framework for understanding the purpose of adult education, the response of students, and the formats that are offered.

Principles of Adult Learning

A large number of adult learning principles have been described in the adult education literature. Merriam and Caffarella (1999) point out that "if learning in adulthood is embedded in its context, a single set of principles is not likely to hold true for the wide-ranging diversity of learners and learning situations" (pp. 388-389). However, the adult learning principles found in the literature provide a useful, if not definitive, framework for planning education programs for adults in various settings. Vella (1994) discusses the principles of adult learning, emphasizing the importance of learner involvement in all aspects of the process. Included in these principles are needs assessment, safety, praxis, team work, and accountability. She stresses the importance of the application of these principles in the workplace and urges educators to integrate knowledge and ideas, feelings and attitudes, and actions and skills in meeting educational goals. Similarly, varied adult learning principles are categorized by Burge and Roberts (1998) under the acronym CARE: "Construction and Confusion; Achievement, Affiliating, and Acknowledgement; Relevance, Responsibility, and Relationships; and Expression" (p. 19). Burge and Roberts claim that these principles are interrelated and demonstrate a holistic approach to understanding adult learning. They believe that incorporating learning needs, and prior experience and knowledge, into the educational experience is key to assisting adults to become productive and responsible learners.

In their discussion of adult learning principles, Daines, Daines, and Graham (1993) suggest that people learn best when they are in a safe and secure learning environment, when objectives and goals are clear, when they have had an opportunity to participate in

setting their own learning objectives and goals, and when they receive encouragement, respect, and validation.

Adult learning principles are particularly relevant in nursing education. Rambo (1994) describes the changing demographics of the traditional nursing students from a majority of 18-year-old female high school students to an increase in the number of adults in nursing programs. She encourages nursing educators to meet their students' learning through application of principles of adult learning because post-diploma nursing students are adult learners.

Characteristics of Adult Learners

MacKeracher (1996) describes five characteristics of adult learners. These include physiological factors, past experience, time perspectives, sense of self, and self-direction. She suggests that although these five characteristics are described as separate entities, each affects, and is affected by, the other. Physiological characteristics play a role in the learning of adults. According to MacKeracher, these factors relate to the "physical well-being, sensory acuity, and the effectiveness of physiological and physical responses in learning activities" (p. 30). She adds that "older adults generally require more time to learn material, although experience, good health and fitness, and good learning skills will compensate for all but the most marked declines" in ability to learn (p. 32). According to Daines et al. (1993), adults bring a vast amount of experience and relevant knowledge to a learning situation. Adults assume the roles and responsibilities of everyday life with confidence. As with these daily responsibilities they make a commitment to education and bring experience and knowledge to each learning situation. Adults, at the same time, can

demonstrate anxiety about not succeeding and lack of confidence in themselves as learners.

Konicek (1996) also discusses the unique characteristics of adults. These include: adults learn best when they have meaningful tasks, adults are problem-centered learners, adults learn better when given choices, and adults take responsibility for their own learning but need to work within a supportive environment. Konicek concludes that understanding the characteristics of adult learners is essential in constructing an effective adult-centered classroom. Adults have varied ways of learning. Burge and Roberts (1998) observe that adult learners' motivational drives to action, developmental stages, past experiences, knowledge, gender, culture-based differences, and learning style all influence how they learn. However, Brookfield (1986) cautions that there are pitfalls to following a generic set of learning characteristics:

> Even if we leave aside the variables of physiology, personality, and cultural background, we still have to consider the implications of those developmental theories that hold that adults function in very different ways when responding to the societal and personal imperatives required of them in young adulthood, midlife, and old age. (p. 26)

He suggests that because the generic concept of adulthood is so broad it has limited use in research.

In contrast, Knowles (1984) states that adults are often likely to display characteristics that are unique. This is especially evident when adults undertake the task of learning to use computer software. Ference and Vockell (1994) describe 14 adult learning characteristics and suggest that as instructors we must recognize these adult learning characteristics in order to bring about effective instruction and to help insure that learning takes place. They emphasize that "adult learners bring to the classroom a vast amount of

real-life experience in addition to formal education" (p. 27). Experience is very important to adult learners and they want it valued by their instructors. MacKeracher (1996) explains that adults must integrate new knowledge with past experience, which often is a time-consuming task, and that often "knowledge for which the learner has no experiential base may be acquired without conflict but may not be easily understood or immediately applied" (p. 40).

Wlodkowski (1999) points out that self-direction is a characteristic of adult learners but that not all learners are ready to be self-directed. He cautions that not all learners will respond well to a self-directed learning environment, especially if there is a mismatch between the learner's style and that of the facilitator. He indicates that self-directedness in learning has not been addressed from a cultural perspective and that as an instructional approach "self-directed learning may need to be more often negotiated as an option than mandated" (p.11). Similarly, MacKeracher (1996) suggests that if self-directedness is a learned characteristic "then it is amenable to the educative process" (p. 52). If so, increasing learners' self-direction can be considered during the program planning process.

Program Planning and Development

Planning and developing adult educational programs involves adult educators at all levels. The literature on this topic acknowledges the diversity of thinking about program planning, the variety of adult educational programs and settings, and the numerous participants and program outcomes. As described by Knowles (1980), "The starting point in program planning is always the adults' interests, even though the end objective may be to meet their (and an institution's and society's) real needs" (p. 82). This section focuses

on the process of program planning (including the importance of collaboration in planning) and especially on the evaluation component of planning.

Program Planning Process

Caffarella (1994) developed a popular and effective interactive model of program planning consisting of 11 components. The components include the overall phases of the initial planning and identification of needs, the development of objectives to ensure the transfer of learning, the development of operational plans including budget and facilities, the formulation of plans for the evaluation process, and the communication of the value of the program to stakeholders. Cafferalla maintains that program planning involves a number of components that are not necessarily followed in a particular order. She bases her model of program planning on six assumptions: that educational programs should focus on the learners and how the learning will result in changes; that program planning involves both systematic and planned tasks as well as last minute decisions; that the development of educational programs is a complex interaction of institutional priorities, tasks, and people; that developing educational programs is a cooperative endeavor; that designing educational programs is a practical art; and that individuals can learn to be more effective program planners through practice. The interactive model provides the programmer with flexibility in that it can be modified to fit a specific educational situation.

Similarly, Cervero and Wilson (1994) state that good program planning includes six components: a comprehensive needs assessment, establishment of learning objectives, selection of appropriate and relevant content, identification of qualified instructors and format, management of logistics and budgets, and evaluation of results and actions. They caution that program planners are "not free agents and can not choose any course of

action they want. Nor are their actions determined only by the social and institutional structures in which they work" (p.25). Instead, Wilson and Cervero suggest that planners bring to the table their own interests and programs are negoiated within organizational settings.

Negotiation is a complex process involving considerable thought and dialogue among stakeholders. Without negotiation, program planning is less effective in facilitating learning and change. Caffarella (1994) notes that the end result of all programs should be change. She outlines five purposes for adult education programs, which include: to encourage ongoing growth and development of individuals, to assist people in responding to practical problems and issues of adult life, to prepare people for current and future work opportunities, to assist organizations in achieving desired results and adapting to change, and to provide opportunities to examine community and societal issues.

As part of the process of program planning, the development of learning intents is an important phase. Learning objectives need to reflect the needs of the participants and the nature of the course content. Wlodkowski (1999) suggests that the learning objective should be measurable by the learner. He emphasizes that competence is a priority and motivator for adult learners and that the sooner they experience it, the deeper their learning and subsequent motivation will be. Percival (1993) suggests that although intents should be defined prior to the event, adults bring their own set of objectives to a learning situation. Educators, therefore, need to remain flexible in the learning program so that the student can incorporate individual objectives where appropriate. According to Cervero and Wilson (1994), an educational program is never constructed by a single planner acting outside an institutional and social context.

> Programs are constructed by people with multiple interests working in specific institutional contexts that profoundly affect their content and form. As educators construct programs, their actions are structured by the power relationships and interests of all the people who have a stake in the program. (p. 28)

Cervero and Wilson (1996) suggest that if program planners are ethically responsible for the consequences of their work, then all people affected by the program should be involved in the decisions of constructing the program. These planners include many different people with various interests, needs, and wants.

Donaldson and Kozoll (1999) emphasize the use of collaboration as a strategy in the development and delivery of adult education programs. They believe that for collaboration to be successful in program planning it must be "characterized by transcendent values and norms. These include both the process norms of equity, trust, and reciprocity, but also shared values and norms that lead to a vision and goals for the collaborative effort" (p. 10). The need for collaborative planning is especially important in distance education. According to Moore and Kearsley (1996), "One of the key characteristics of most successful distance education courses is that they are designed by course teams in which many specialists work together" (p. 9). They suggest that program planning decisions should be made by the experts or specialists in that area. Program experts include: content specialists, graphic designers, media specialists, producers, and instructional designers.

Adult educational programs are planned and coordinated by many kinds of people. The concept of collaboration (working together with others) is a central theme of continuing professional education. Percival (1993) describes the process of developing programs as requiring continuing educators to work with the participants, content experts,

outside organizations, and groups interested in specific education outcomes. She states that "program development requires an understanding of adult learners and how adult learning can be facilitated" (p .74).

Cervero and Wilson (1996) observe that responsible planners involve all people who are affected by the program, all of whom should be directly involved in major decision making. Similarly, Brockett (1988) recommends that several parties be involved in making decisions, including the program planner, content experts, stakeholders, and representatives of the learners for whom the program is intended. Donaldson and Kozoll (1999) suggest that the leadership role is critical in collaborative relationships and programming. They identify the leadership roles as convener, product champion, and strategy maker. Leadership, according to Donaldson and Kozoll, is both subtle and powerful: "This form of leadership facilitates the group striking the necessary balance between having a vision and constructing one" (p. 140). Clearly, leadership and vision are critical elements in collaborative relationships and programming. Leadership is an essential requirement in program planning to ensure that all personal and organizational interests are being addressed.

As program planners, it is necessary to work within the constraints of one's institution, with available resources, and with educators who have an interest in the process and outcomes to ensure quality adult education programs. Ensuring quality outcomes also requires ensuring that program evaluation is not simply an afterthought.

Evaluating Programs

Scriven (1999), describes the discipline of evaluation as being devoted to the systematic determination of merit, worth, or significance. Program evaluation, one aspect

of evaluation, is a dual process, including the evaluation of the participant's learning and the evaluation of the program processes. Moore and Kearsley (1996) recommend that evaluation research experts plan how to evaluate individual student learning as well as the effectiveness of all aspects of the course in order to ensure that students' needs are being met. The evaluation determines whether the design and delivery of a program were effective and whether program outcomes were achieved.

Formative evaluation, Fenwick and Parsons (2000) point out, occurs during a learning activity. It can be used to give feedback to learners about their progress and growth, and feedback to educators about methods and activities. Caffarella (1994) believes that "the heart of program evaluation is judging the value or worth of an educational program" (p.120). She describes evaluation that is intended to judge the value or the worth of a program as summative evaluation.

Fenwick and Parsons (2000) describe two important approaches to program evaluation. The first, quantitative evaluation, is concerned with numbers and measurements that translate human endeavors into quantities. These quantities can be depicted with charts and graphs. Qualitative evaluation, on the other hand, is usually conveyed through words that explore human qualities and meanings. Qualitative information can be gathered from methods such as focus group interviews. Qualitative techniques, such as direct observation, can be combined with quantitative techniques such as questionnaires in order to increase the validity of the findings. Fenwick and Parsons (2000), and Dootson (1995) agree that using multiple methods for evaluation helps educators meet the diverse needs and preferences of the adult learner, thereby developing a rich, holistic understanding of the learner.

Vella, Berardinelli, and Burrow (1998) suggest that careful planning and design of evaluation is necessary in order to complete an effective evaluation of an educational program. Because there are so many possible outcomes and elements to include in the evaluation, they promote the use of a planning document to help organize an evaluation. They emphasize the importance of making several initial decisions before beginning the accountability planner. "These include two of the seven steps of planning, who and why: Who needs the education, and why do they need it" (p. 34).

Brookfield (1991) emphasizes the threat of learner evaluation to adults' fragile egos, and the responsibility of the evaluator to be sensitive to adult learners' feelings. This issue is supported by many evaluation researchers. For instance, Fenwick and Parsons (2000) observe that adults often react to evaluators' criticism with defensiveness when put into a new learning situation, because these adults consider themselves self-reliant, competent, and self-directed. They conclude that adults are, by nature, wary of evaluation:

> A good instructor can help alleviate anxiety by creating an atmosphere where honest evaluation is welcomed as an aid, instead of a threat, where evaluation is ongoing rather than a fearful one-shot event, and where the flow of evaluation is not uni-directional. (p. 33)

Evaluation that is not uni-directional is especially important in distance education, where feedback is rarely interactive.

Research Instruments

The Steering Committee decided early in the planning phase of the study to include qualitative focus group interviews and questionnaires in order to identify the learning needs, expectations, and requirements of working adult nurses related to technology. According to Marshall and Rossman (1995), many qualitative studies combine several data

collection methods over the course of the study. I briefly discuss two methods of data collection in the following section: focus groups and questionnaires.

Focus groups tend to obtain responses that would be difficult to obtain using other techniques. According to Krueger (1994), "A focus group is a carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, nonthreatening environment" (p. 6). Focus groups, which usually consist of 6-10 participants who share common interest, are conducted by a moderator who uses open-ended questions to encourage sharing of their experience or opinion on a particular topic. Jackson (1999) notes that the rationale of focus groups is "that they provide a dynamic in which participants learn from one another and develop ideas together" (p. 135). He suggests that the moderator is able to determine if there is consensus of the group on a point or if it is limited to one or two individuals. He also notes that spontaneous responses may lead to unanticipated issues. Krueger (1994), and Marshal and Rossman (1995) agree with these findings and also recommend using open-ended questions to encourage self-disclosure, which allow participants to spontaneously deal with the issues rather than being directed. Similarly, Polit and Hungler (1999) recommend that the moderator guide the discussion with a predetermined set of questions and topics. The moderator's function is one of encouraging participants to talk openly about all topics.

Advantages of focus group interviews include a safe, socially oriented environment; flexibility of moderator to explore unanticipated issues; relatively low cost; and high face validity (Krueger, 1994). Although Krueger agrees that focus groups provide an excellent method to collect qualitative data about perceptions, attitudes, and experiences, he cautions programmers to be aware of the disadvantages. He notes that

focus groups can be very time consuming method because of the large amounts of data to analyze. This method also requires a highly trained moderator who has the ability to think quickly, be an excellent listener, and give full attention to the group. In addition, Jackson (1999) adds that one persistent difficulty of focus group work is to limit the influence of strong-willed individuals who may dominate the group discussion and control the direction the discussion takes. According to Krueger, focus groups can be helpful after the program has been completed. He notes that this might occur as a summative evaluation to determine its success.

Questionnaires provide one way to gather data from large groups of people, with relatively little cost. According to Marshall and Rossman (1995), "Researchers administer questionnaires to participants to learn about the distribution of characteristics, attitudes, or beliefs" (p. 95). Polit and Hungler (1995) suggest that questionnaires differ from interviews in that they are self-administered. "Since respondents differ considerably in their reading levels and in their ability to communicate in writing, great care must be taken in the development of a questionnaire to word questions clearly, simply, and unambiguously" (p. 188). Similarly, Jackson (1999) presents a list of general guidelines that should be used in developing a questionnaire. The first guideline is to be respectful of the respondent. The respondents should feel that they can express themselves openly and that their opinions are valued. The questionnaire should be short and simple with an introduction to the study. The introduction should inform the respondent who is administering the questionnaire and what the study is about. The introduction legitimizes the study, according to Jackson.

Marshall and Rossman (1995) recommend that questionnaires contain several questions that have structured responses and some questions that are open-ended. Jackson

(1999) agrees with these findings and suggests that if researchers want to provide a qualitative dimension to the study then they should include some open-ended questions to provide opinions and quotations for the reports. He cautions researchers to minimize the number of open-ended questions because respondents often leave these questions blank. Marshall and Rossman (1995) note that "Questionnaires usually are tested through administration to small groups to determine their usefulness, and perhaps reliability" (p. 96). Similarly, Jackson (1999) recommends pre-testing the questionnaire before finalizing the wording. He also suggests that the researcher stay with the respondents during the pre-test to facilitate clarification of confusing questions.

The response rate of questionnaires, notes Polit and Hungler (1995), can be affected by the manner in which the questionnaires are designed and mailed. The physical appearance, clarity, and length are influencing factors. Questionnaires should include a cover letter and a stamped, addressed return envelope. Failure to do so could result in a poor response rate. Jackson (1999) agrees with these findings and recommends that in order to have a high completion rate, the questionnaire should not be an imposition to the respondent but rather an invitation to contribute significantly to the study.

Distance Education and Continuing Professional Education

Distance education is a movement to extend the traditional university and to overcome its inherent problems of immobility and exclusivity. Today, in addition to serving the learner who lives far from the campus, distance education is aimed at part-time students, time-strapped adult learners, many of whom are professionals trying to work full time while earning degrees. Distance education is directed not at the young university student, but rather at disciplined adult learners. Distance education and distance learning

are accepted ways for adult learners to meet their educational needs. Commenting on the typical distance learners, Moore and Kearsley (1996) note that "around the world, most distance education students are adults between the ages of 25-50" (p.153). They go further to encourage finding out more about the typical adult learner because they believe, "the more one understands the nature of adult learning, the better one can understand the nature of distance learning" (p. 153).

Continuing Professional Education

Continuing professional education is the responsibility of all professionals, including practicing nurses. Constant updating and growth are essential for any professional to keep abreast of scientific and technologic changes within their profession. Eisen (1998) suggests that one of the most important objectives in adult education is to engage professionals in the development of lifelong learning skills. For example, the constant advances in nursing science and health-care knowledge require that students develop into health professionals who take responsibility for their learning and who are not dependent on an expert to decide what they should learn. According to Mastrian and McGonigle (1997), the keys to promoting lifelong learning are to get students actively engaged in the learning process, increase their excitement about their learning, and give them ownership of the content and problems in a supportive environment. Most professions recognize the importance of ongoing education and the experience of empowerment as a result of attaining an expanding body of knowledge.

Continuing professional education is a long-standing expectation within the nursing profession. The nursing profession recognizes the multitude of settings and needs of the adult learner and seeks to provide them with various approaches and opportunities

to address their individual needs. Baden (2000) suggests that because adult learners have diverse learning styles a variety of formats should be utilized in continuing professional education to accommodate their individual learning needs.

Many professionals see their career as a commitment to lifelong work and learning. In support of this, Yonder-Wise (1999) suggests that education is a lifelong process and empowering force that enables an individual to achieve higher goals. "The continuing development of one's professional skills and knowledge is an empowering experience, preparing the nurse to make decisions with the support of an expanding body of knowledge" (p. 422). Tappen, Weiss, and Whitehead (1998) agree that continuing to develop leadership and client-care skills through further education is the key to professional growth.

Continuing professional education has undergone tremendous growth and diversification over the past three decades. Cervero (1992) suggests that although the main focus has been in providing more and better services, careful consideration needs to be given to the problems and prospects that continuing professional educators' face, in order to determine the directions they must take in the future. There are ever-increasing ways to choose to offer continuing professional education, some of which are designed for nurses who are not located in densely populated geographic or technically rich areas.

Cervero (1989) stresses that there is a great deal of evidence to indicate that most professions embrace the importance of lifelong professional education. This is demonstrated in the numerous continuing education programs that exist today in most professions. Nurses, for instance, fulfill their professional responsibility by keeping abreast

of rapid advances in the technology of delivering care, so that they can translate new information into practical application (Devney, 1998). According to Devney,

> Continuing education was one of the key factors seen as a means of improving nurses' research utilization by enhancing communication between nurse-colleagues and accessibility to research findings and reports, conferences, and in-service training. With the decreasing availability of health-care dollars, providers at all levels are urged to foster research and continuing education in creative ways including collaborative relationships. (p.174)

Devney emphasizes that "new technologies permeate traditional delivery instruction. No longer are nurses limited to passive delivery of information using lectures, correspondence courses or videotapes. Now multimedia are preferred" (p.175).

Garrison (1998) holds that there is a need for the application of various distance education technologies in continuing professional education in order to collaborate with businesses and professional associations in developing relevant, accessible programs for working professionals. There are many technologies available to deliver instruction to individuals, groups, locally or at a distant site. Educational technology is changing day-by-day, but it is wise for educators to keep in mind that individuals with different learning styles respond to various types of technology differently.

Distance Education Strategies

According to Verduin and Clark (1991), adult lifelong education "can occur in many different places and can involve a variety of emphases in terms of programs" (p. 5). They suggest that distance education serves the growing, nontraditional student population with convenient ways to learn: at home, on the job, at their own pace, and on their own schedule. Distance education employs media in many forms and to varying extents. These media include mail, radio, television, satellite broadcasts, videotapes,

teleconferencing, and (most recently) the Internet. However, Verduin and Clark caution that "before any propositions or designs can be advanced for effective distance education, recent research on what is known about adults, their learning styles, their motivations, and other qualities needs to be reviewed and analyzed" (p. 21).

Moore and Kearsley (1996) describe distance education as a system consisting of several components such as learning, teaching, communication, design, and management. They explain that learning "normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements" (p. 2). Moore and Kearsley caution educators to view the total picture and to understand that what happens in one part will influence the others.

Trentin (1999) explores the many uses of the Internet in distance education, for example, as a way of accessing information, a communication vehicle, as a way of sharing information and knowledge, as a means of engaging in educational activities, and as a vehicle for transmitting inservice training modules. According to Trentin, these educational uses can be achieved through networking, but only if the educator has the technical ability and support to introduce information and communication technology services to distance students. He recognizes that information and communication technology is regarded as an indispensable tool and a prerequisite for implementing on-line education.

Wagner (1995) stresses the importance of anticipating and supporting the needs of users of technologies, programs, and services in distance education. She emphasizes that

to be successful in distance education programs one must be aware of the many issues to be accommodated in communication systems and program planning. According to Wagner, one of the greatest challenges and strengths of distance education comes from inter-institutional partnerships. An important design consideration in distance education is the selection of the media or technologies. Percival (1993) suggests that distance educators should not become preoccupied with the technology but rather should view the technology as a vehicle for course delivery, with emphases on the learner and course content.

Care (1996) describes the transactional approach to distance education as one that is learner-centered with purposeful interaction between student and teacher. He suggests that the role of the teacher in distance education is one of facilitator of learning not dispenser of knowledge. Care recommends two strategies to assist in adult educators' teaching approaches to overcome the distance factor. The first is dialogue, which can vary depending on the kind of medium of instruction employed, and the second is structure, which includes examining the course design and allowing for varying degrees of flexibility. Care believes that by implementing these transactional strategies in distance, distance education can improve the quality of learning and decrease attrition rates.

Women in Distance Education

Distance education provides women the opportunity to study in their spare moments between employment, domestic and childcare roles. According to Rose (1996), women are more likely than men to stop studying after they have started due to the many demands placed upon them. She suggests that gaining an education can, in fact, empower women, but access must be improved, and programs should be constructed in such a way

to allow for growth and development. To accomplish this goal, adult educators must recognize the need for student support, interaction, and engagement presented by the course and instructor.

Hayes and Flannery (2000) suggest that because of the current growth in the number of adult women returning to formal education programs, adult educators must recognize the increasing importance of improving learning opportunities for women. Hayes and Flannery describe women's learning as being shaped by their access and concentration of study. Women returning to formal education are faced with the conflict of serving the needs of others while attempting to meet their own educational needs. This point is supported by Joseph (1999), who notes that women face many challenges in overcoming barriers to participation in continuing education, in particular, the difficulties of balancing the demands of work, family, and education. As a way of addressing these barriers, she explores the use of Web-based instruction in distance adult education and suggests that a single-gender Web environment might provide better learning opportunities, more support, and less stress than mixed-gender environments.

Menzies (1998) agrees that women do not receive the necessary attention in a mix-gender environment.

> Relying on mixed-gender facilities can also turn nominal access for women into de-facto exclusion through reluctance to compete with others (often male teenagers) and an inability to get the kind of assistance they need from the (often male) staff running the facility. (p. 14)

Regardless of the barriers women face when pursuing continuing education, Joseph (1999) suggests that a more imaginative approach to course design and development is required to work within the context of women's lives. Similarly, May (1994) acknowledges that

distance education has provided increased access for women to study from the convenience of their homes and personal schedules, but recommends that institutes of higher learning find new and better ways to serve the needs and interests of women learners.

Distance education is not usually the first choice of learners who are able to attend university classes and can afford the time and money to do so. Pym (1992) suggests that women, who have had their education interrupted by childbearing and child rearing, often choose distance education as an option for resuming their studies or upgrading their education while working and raising families. She argues that, although distance education has provided access to educational programs for these women, courses are often designed without considering the needs, interests, and learning styles of women. Most women, emphasizes Pym, carry the major burden of domestic responsibilities that challenges the multitude of roles they assume: mother, spouse, worker, caregiver of elderly parents, and student. Distance education provides opportunities to access a wider range of knowledge, thereby maintaining professional competence and encouraging lifelong learning. For many women, given their life circumstances, distance education may be the only way.

Distance Nursing Education

The American Association of Colleges of Nursing (AACN) (2000) reports that distance education helps to counter the nation's nursing shortage by bringing nursing education to people who would not otherwise follow that path because they lack access to a campus, or because work, family, or financial considerations preclude a full-time, on-site education. They also suggest that distance education for nurses in rural areas encourages nurses to remain and practice in their communities, thereby increasing the number of

qualified nurses with advanced degrees. The AACN recognizes that technological advances have been a significant factor in increasing opportunities to improve the quality of and access to nursing education. Technology affords increased collaboration among nursing faculties in teaching, practice, and research.

> Careful use of technology in education may well enhance the profession's ability to educate nurses for practice, prepare future nurse educators, and advance nursing science in an era when the number of nurses, qualified nurse faculty member, and nurse researchers is well below national need. (p. 1)

Similarly, Dirksen, Hoeksel, and Holloway (1993) believe that distance education can improve geographic access to baccalaureate nursing education for nurses unable to leave their communities. They emphasize the need for distance learning and outreach programs to meet this demand for increased access and availability to baccalaureate nursing programs and examine the use of technology as a viable delivery format. They conclude that although the electronic classroom does not significantly alter learning outcomes or perceptions of teaching effectiveness, it does promote quality higher education in rural communities.

As an example, the increased demand for highly educated nurses in rural hospitals in New Mexico led to the utilization of technology in the delivery of nursing education programs to rural nurses. Shoemaker and Fairbanks (1997) describe the outcomes of a 7-year study using satellite delivery of distance education to nurses in rural areas in the state. Students reported five barriers to returning to school. These barriers included: cost, articulation, accessibility, scheduling, and credit for prior course work and experience. The University of New Mexico addressed all these issues and proposed a new paradigm in education for rural nurses. The new paradigm included an interactive television satellite

delivery system to eight communities. Shoemaker and Fairbanks examined the level of quality and student retention by evaluating the demographic and grade performances of 106 off-campus and on-campus graduates. The results indicated that off-campus students performed as well, if not better, than their on-campus peers.

Tag and Arreola (1996) agree that distance education is an excellent mode of delivery for nursing education programs. Because of the success with the baccalaureate programs, a master's degree with a focus in public health nursing using interactive video was developed and delivered by a distance format. According to Tag and Arreola, this delivery format was so successful that they currently deliver five master's programs in nursing by distance. In the next section I review interactive technology in greater detail.

Multimedia Technology in Nursing Education

In this section I first review the literature in multimedia and learning in general. I then examine the need for multimedia technology in nursing education as well as review the meta-analysis of studies on the use of multimedia technology in nursing education. Finally, I discuss the concepts of cognitive achievement and learning, attitudes and satisfaction with the use of multimedia technology.

Multimedia and Learning

The prevailing assumption across various disciplines is that multimedia facilitates learning (Burge & Roberts, 1998). In terms of assessing or acknowledging the impact of multimedia on the learning experience, however, one must first examine the actual components and functionality of multimedia as well as various theories of learning.

McLuhan (1964) defined media as any extension of humans that allows communication in the absence of a face-to-face presence. This broad definition naturally

encompasses print, audio (telephone, audio-conferencing), and computer-mediated communications; however, it could also include roads and vehicles, which also allow for communication. In contrast, Najjar (1996) defines multimedia more conventionally as the use of text, graphics, animation, pictures, video, and sound to present information.

Various types of new media may utilize a single type of analog or digital media (e.g., interactive videodisc, digital video, or audio-conferencing), whereas others employ a combination of media (such as Internet delivery, supported with print resources and video-conferencing). This is an important distinction, because it is the combination of media that educators and researchers tend to focus on when evaluating the relative effects of media on learning, and it is also the combination of media that instructional designers promote as meeting a multiplicity of learners' needs and learning styles (Burge & Roberts, 1998).

Burge and Roberts (1998) advocate that networked learning technologies offer key opportunities and strengths for learning. They describe networked learning as "learning that happens when learners and instructors use computers to exchange messages, engage in dialogue and access resources as part of a learning endeavor" (p. 89). They observe three administrative and logistical factors that can influence one's choice of technology: human resources, physical facilities, and cost. Human resources include: content expert, technical support staff, instructional designer, coordinators, and student support personnel. Physical facilities, including technical equipment and environment, must be appropriate to meet students' needs and must be supported where they are geographically located. Burge and Roberts caution that costs vary depending on the geographic location and include equipment, renovations, service contracts, replacement, and operational costs.

Haughey and Anderson (1998) suggest that networked learning meets adult learners' needs and learning styles because of its flexibility. They identify a number of advantages associated with this technology; for example, it enables learners to work independently, to contact professor or peers, to go into chat or discussion rooms, and to work with groups. Students have the flexibility to follow the sequenced program or to diverge to optional links. Burge and Roberts (1998) note that in order to realize the benefits of networked learning, sufficient time must be allowed for students to become familiar with their new technology. As Bates (1995) observes, each type of media has specific advantages and limitations associated with its use. When selecting a particular media the designer/educator needs to be aware of these advantages and disadvantages in order to decide how each media best serves identified educational goals and learner needs. Some of the advantages include the ability to present information using both low and high levels of symbolic representation; to integrate tutorial dialogue into the program; to use simulation and modeling of specific activities; to develop testing sequences; to have learners self-pace their study activities and master the materials; to select pathways; to adapt to various learning styles; to foster learner motivation through use of a computer to learn material; and to customize learning materials, if possible. The limitations include the necessity of accessing the appropriate equipment; the potential for poor teaching strategies to be incorporated into the application; the lack of flexibility for individualizing unique learner responses; the high cost of development; and the isolation for both the institution and the learner. Bates and Escamilla de los Santos (1997) point out that new interactive technologies offer the possibility of global access to education and "could empower

individual learners on a global basis by making education more focused on their needs rather than those of the local providers of education" (p. 49).

Based on an extensive review of the literature, Najjar (1996) reports a number of factors other than the use of multimedia itself as potentially having an impact on learning. These factors include improved instructional design as a result of developing the multimedia interface, increased interactivity between student and information creating more opportunity for students to integrate information, opportunity for self-pacing inherent with multimedia applications, and more frequent learner interaction with the content as a result of the novelty of the program or learning experience.

Learning experiences involve communication between the student and either the multimedia environment or another individual or group. Learning involves the acquisition of new knowledge or skill, acquired through an interaction with the precipitating event, person(s), or thing. Romiszowski (1988) describes how communication and learning are closely related, and stresses the role of feedback in the learning experience:

> The process of instruction itself is therefore a two-way communication process, in which: (a) the teacher transmits a variety of messages (information to be understood and learnt, information to do in order to learn, etc.), and then the learner, by performing certain tasks, (b) communicates to the teacher that learning is progressing (or not progressing) towards the pre-set goals -- this information is, in turn, interpreted by the teacher, who decides whether any corrective or other action should be taken, and this decision is translated into...(c) feedback information to the learner. (p. 6)

Need for Multimedia in Nursing Education

The role multimedia plays in the delivery of nursing education and student learning is examined in this section. Nurses today are challenged, suggests Devney (1998), to seek, analyze, refine, and critically evaluate the application of new knowledge in the clinical

area. In nursing education, an intense interest in assessing critical thinking has emerged due to an increasing number of educators who are realizing the profound need to improve students' skills in critical thinking and clinical judgement so that they will be better prepared for the demands of practice. Fonteyn (1995) explains,

> Educators are realizing that the amount of clinical knowledge and information is increasing too rapidly to expect that students can possibly remember all the information that they will need for practice. Moreover, possessing an encyclopedic memory of facts and concepts will not ensure effective clinical reasoning. (p. 67)

Rath et al. (1996) point out, "Nurses have a responsibility to patients, a professional responsibility to organizations, and an individual responsibility to maintain a high level of current and relevant knowledge and skill" (p.12). Tappen, Weiss, and Whitehead (1998) agree that if nurses are to be recognized as community leaders in the 21st century they must view nursing as a profession with a systematic body of knowledge, formal college-based education, standards of practice, professional accountability, professional culture, and community commitment.

According to Zerwikh and Claborn (2000), future nursing programs will need to be flexible to meet the learning needs of nurses involved in continuing professional education. These nurses are part of a growing population of nontraditional students--individuals who are making midlife career changes due, in part, to job displacement or job dissatisfaction. Zerwikh and Claborn describe the student population as being "older, married, and with families. There is a growing number of students choosing to attend school part-time" (p. 100).

Worrell, McGinn, Black, Holloway, and Ney (1996) describe the adult students in the baccalaureate program as adults who balance jobs and families as well as their

education. Many of them belong to specialty nursing organizations, are certified in their specialties, and have entered the ranks of middle management. These students show perseverance in pursuing the baccalaureate degree despite heavy workloads and the stress of uncertainty in today's job market. From their research, Dirksen, Hoeksel, and Holloway (1993) recommend that with the diverse needs of our adult learners, increased geographic access to baccalaureate nursing education through distance learning is a must. This highlights the significance of addressing the need for access and availability to a baccalaureate nursing degree through varied delivery formats.

Nurse educators have to identify and respect the needs of the adult learner. More programs will be needed that permit part-time study and allow students to work while attending school. The diversity in the student population, suggests Zerwikh and Claborn (2000), means diversity in learning rates, which might be addressed with more self-paced learning modules. They emphasize that because a growing number of individuals in health care are seeking more education, the issue is not one of entry into practice, but rather of how best to facilitate the return of these individuals to institutions of higher learning for educational advancement.

Worrell et al. (1996) believe that there is also a need for changes in nursing education in order to respond to changes in the health care system. They view the shift from the behavioral model to one of liberation and empowerment. "Nursing education must reemphasize the practice setting, one which is expanded not only to include institutions, but also the homes and communities where people live and work" (p. 128). Approaches to nursing education are changing at a rapid rate. Nursing curriculum designers in the mid 1980s began a curriculum revolution movement involving a new

paradigm of nursing education (Bevis & Watson, 1989). One of the most notable features of these changes has involved revamping of the curriculum. In their book, Toward a Caring Curriculum: A New Pedagogy for Nursing, Bevis and Watson advocate a major curriculum turn, with a vision toward a "more humanistic, society-responsive, caring, intelligent nursing care by improving the way nurses are taught to nurse" (p. 19). The major changes include a shift in educational philosophy from behaviorism to humanism along with emphasis on adult education principles. This emphasis includes an increase in access to higher education and an increase in the number of ways the curriculum is taught.

Tomlin (1997) suggests that adult nursing students are "all-across- the-board in terms of ability, need, desire, and sophistication to learn" (p. 20). What is constant is change. He recommends that as the curriculum changes so must delivery modes.

Meta-Analysis of the Use of Multimedia Technology in Nursing

This section analyzes and summarizes the available findings on the use of multimedia technology in nursing education. Two major sources of literature are used: (a) general education research literature that examines use of multimedia technology in a variety of educational settings and (b) health professional literature that examines the use of technology in nursing education.

Numerous studies examining multimedia instruction in nursing education have been reported in the literature in the past 25 years; however, little has been done to summarize the results quantitatively or qualitatively. In schools of health professions, educators have made widespread use of computer-enriched instruction including simulations, videodisc, interactive video, and expert systems. Dozens of studies comparing computer-enhanced instruction and traditional teaching in health professional programs

have been reported, with many indicating positive effects of computerized instruction (e.g., Belfry & Winne, 1988; Chang, 1986; Clark, 1983; Napholz & McCanse, 1994). Some reviews have attempted to quantify the evaluative impact of computer-enhanced instruction; however, they have included only a minority of the comparative studies in this area. An exception to this is the integrated literature review by Cohen and Dacanay (1994). They concluded a comprehensive meta-analysis on the computer-based instruction literature in nursing education to determine the overall magnitude of achievement effects, as well as what features correlated with the size of the effect. Additional outcomes such as long-term retention; time to learn; and attitudes toward content, instructional method, and computers were reviewed.

Cohen and Dacaney (1994) judged 29 of 100 studies to be appropriate for analysis on the basis of several criteria: (a) the studies had to measure student outcomes in both computer-based instruction and conventional teaching formats in nursing education, and (b) the studies had to be free from major methodological flaws. The individual study was used as the unit of analysis, and one effect size was calculated for each available outcome. Analysis of variance and multiple regression analysis were used to study the relationship between study features and achievement effect size. Results of the meta-analysis indicates that in terms of overall achievement measured by course examinations, 22 of the 29 studies showed students who were receiving computer-based instruction had a higher examination average. The achievement difference between computer-based instruction and conventionally taught students was statistically significant in six studies, with all six favoring computer-based instruction (CBI). The average effect size in the 26 studies was

0.45, with a standard error of 0.13. Cohen (1988) describes effects of this magnitude as medium in size.

From their review of the existing studies, Cohen and Decanay (1994) concluded that on average, computer-assisted instruction and conventional instruction required the same amount of time to learn. Only one study, which was an instructor-paced implementation of computer-based instruction, showed computer-based instruction required substantially more time than conventional teaching (Day & Payne, 1987).

Cohen and Decanay (1994) also examined studies on attitudes toward subject matter, instructional method, and the computer. No statistically significant differences were noted in attitudes toward the subject. Four studies compared student attitude toward method of instruction. Students in computer-assisted instruction students had more positive attitudes toward their instructional method than students taught conventionally. The average effect size was 0.46, with a standard error of 0.11. Six studies compared attitudes toward computers in computer-assisted learning and conventional classes. Generally, computer-assisted learning students had significantly more positive attitudes toward the computer than students taught conventionally. The average effect size for the six studies was 0.34 with a standard error of 0.27. In brief, Cohen and Dacanay conclude that computer-based instruction does make a difference in nursing education.

In contrast to the meta-analytic evidence produced by Cohen and Dacanay (1994), Clark (1994) suggests that media do not influence learning. Initially, Clark's (1983, 1985) meta-analytic reviews of media research produced evidence for the positive learning benefits of research with various media, particularly computers. These analyses report an approximate 20 % increase in final exam scores following computer-based instruction

when compared to traditional forms of instruction (generally live instructions). However, Clark (1994) suggests that it is the teaching method built into computer-assisted learning that accounts for the learning gains in meta-analytic reviews. For example, in a reanalysis of a 30% sample of the studies reviewed by Kulik, Kulik, and Cohen (1980), Clark found that when the same instructional design group produced computer-assisted learning and presented the live instruction with which it is compared, there was no achievement difference between the computer-assisted learning and live conditions. In brief, Clark claims that media and their attributes have important influences on the cost or speed of learning, but only the use of adequate instructional methods (method is any way to shape information that activates the cognitive processes necessary for achievement) will influence learning.

It appears the meta-analysis literature on learning effectiveness of multimedia and computer-assisted technology, based on student achievement gains, is not conclusive, and additional research is warranted. Nevertheless, the original research studies do provide provocative findings. I review these in the next subsection.

Cognitive Achievement Using Multimedia in Nursing Education

A number of studies have attempted to test the influence of multimedia technology on learning effectiveness. Most often, learning effectiveness is measured by achievement gains in a pre-test-post-test situation. The effect of interactive video technology on cognitive achievement and learning was tested by Schare et al. (1991) using an experimental design comparing traditional lecture versus interactive videodisc programs; 83 third-year baccalaureate nursing students at a major urban university served as subjects and were randomly assigned to either a control group (traditional lecture, n = 41) or an

experimental group (interactive video, n = 42). There was no significant difference in the cognitive achievement scores between those students taught by an interactive videodisc program compared to those students taught by a traditional lecture method. This finding lends support to the claims made by Clark (1994) that media does not influence learning. A limitation of Schare et al. is the short duration of the treatment. One period of 90 minutes may have been too short to produce a desired treatment effect in cognitive achievement. Another limitation of the study was the inequality of time given to each group to learn the material. The control group heard the lecture in a specific 90-minute session, whereas the experimental group completed the videodisc at any time in a 3-week period depending upon hardware availability. Possibly the duration of the treatment in this study was too short to detect a statistically significant result.

Ward (1992) explored the educational theory and justification underlying the use of interactive video technology (IVT) in nursing education. IVT is based on educational principles, which view the student as an active participant in the learning process. Ward suggests that interactive computer technology such as interactive video fits with an educational ethos in which the learner is perceived as an individual, who works at her/his own pace to respond to unique needs and objectives. A variety of attempts have been made to evaluate the educational usefulness of interactive video technology (Bolwell, 1990, 1991; Eaton, 1990; Jones et al., 1990). The extent to which learners become involved with IVT has been a significant feature of research in this area. Wishart (1988) has shown a directly attributable increase in learning gain as an effect of involvement. Several of the studies showed that learning objectives have been achieved more quickly with IVT than with traditional lecture or discussion techniques (Eaton; Ward). Ward

concludes that any one learning strategy is unlikely to be most suitable for all learners. This conclusion is supported by the work of VanReenan (1990), who used evidence from studies of brain dominance to conclude that IVT was most effective with right hemisphere dominant subjects, whereas those with left hemisphere dominance learned more quickly and effectively with traditional teaching approaches such as lecture and demonstration techniques.

Others have investigated the effect of factors such as student personality on success with interactive technology. For instance, Hoffman and Waters (1982) studied the relationship among personality types and student performances in a self-paced, computer-assisted instructional program. The Myers-Briggs Type Indicator (MBTI), a personality inventory, was administered to 155 students to determine: (a) if certain personality types completed computer assisted instruction learning tasks earlier, and (b) if a relationship existed between personality type and attrition rate from the instructional program. Statistical relationships were examined among the MBTI types for both the attrition rate and the time of completion for the computer-paced program. Results indicate that personality type correlated highly with the early completion of tasks rate and the attrition rate. All sensing types completed the computer-assisted portion of the program much sooner than the intuitive types. A much higher than expected attrition rate was found among those described as extroverted, intuitive, and perceiving. This study suggests that learning by means of a computer-assisted instructional program seems to favor those who quietly concentrate, pay attention to details, have an affinity for memorizing facts, and can focus on a single task until completion. This study contributes to educators' understanding

of the effect of personality factors on learning styles and has implications for matching curricula with learning styles.

Napholz and McCanse (1994) tested the impact of interactive technology on learning and retention in a baccalaureate nursing education program. A pre-test, post-test, re-test, control group design was used on two comparison groups of 65 subjects to determine if interactive technologies could significantly enhance nursing students abilities to meet course objectives in a therapeutic communication course. The study was conducted over two, 18–week semesters on two campuses of a large, midwestern, urban university school of nursing. All participants were pre-tested with the study instrument during a first course meeting to assess baseline knowledge about therapeutic communication and to establish that the intervention and control groups were homogeneous, because participants were not randomly assigned to intervention or control groups. Two locations were chosen to control for contamination with students enrolled in other courses. The intervention group viewed and used the therapeutic communication interactive videodisc, at their convenience, for a period of 4 weeks after pre-testing. Both the intervention and control groups were post-tested at the end of the 4-week intervention period. Six weeks after the post-testing, the intervention and the control groups were re-tested using the therapeutic communication instrument.

Results indicate no significant differences between the intervention and control groups on the variables age, sex, ethnicity, and hours of computer use per month. A comparison of pre-test, post-test, and re-test scores revealed a significantly greater improvement in pre-to post-test scores in the intervention group as compared to the control group. However, there was no significant difference in post- to re-test scores for

both groups. Although the pre- to re-test scores showed greater improvement in the intervention group than the control group, the difference was not significant. This study is highly relevant because it has implications for the efficient use of teacher and student time and effort. Results suggest that interactive video technology can significantly help nursing students meet therapeutic communication course objectives more efficiently. Both groups met course objectives equally well and at a high level by the end of the semester; however, the intervention group achieved the objectives at a higher level than the control group within the first month of the semester. These results support the findings of others who purport that interactive technology can improve efficiency of learning and reduce the time students need to learn specific content (e.g., Cohen & Dacanay, 1994; Miller, 1990; Rambo, 1994).

Differences in cognitive learning were assessed in learners registered for a module on professional nursing functions by Neil (1985). Two groups of second semester baccalaureate nursing students, one given the opportunity to learn the required content by computer-assisted instruction only (experimental group) and the other given the opportunity to learn the required content from written text materials only (control group) were tested on cognitive achievement. A teacher-constructed criterion referenced test consisting of 20 multiple-choice items was used to measure cognitive knowledge on both a pre- and post-test basis. A computer-assisted instructional module was developed, including computer-controlled audiovisual components and terminal-displayed text. A concerted effort was made in adapting the material for use as a computer-assisted module to assure that the content was the same as that in the printed version.

Results indicate that group membership did not account for a significant amount of difference in amount of learning. Although the mean score on the cognitive measure for the experimental group rose from 13.88 to 17.13 and for the control group from 14.40 to 16.90, indicating that subjects in both groups increased their cognitive knowledge, the amount of learning was not significant when subjected to paired t-testing. These findings are consistent with other studies in which both groups increased knowledge of the required content with the experimental group members scoring slightly better than the control (Clarke 1983, 1994; Schare et al., 1991). It appears that research studies on effect of multimedia technology on student cognitive achievement present conflicting findings. The ambiguity of findings on cognitive achievement results and the studyed increased use of technology in nursing education programs support the need for further exploration of this relationship.

Attitude and Learner Satisfaction With Multimedia Technology

A number of studies have focused on the effects on learning and attitude toward instructional media when used with varied modes of instruction. Attitude, as addressed in the nursing education literature, refers to the reaction or response of the learner to an experience or object such as computer instruction (Brudenell & Carpenter, 1990; Calderone, 1994). Attitude is considered a learned predisposition to react to a person, object, or idea in a consistent way, favorably or unfavorably. Attitude can be influenced by social interaction and group membership (Calderone).

A relationship is suggested between cognitive learning and attitude toward instructional media. Clark (1983, 1985b) suggests that positive attitude enhances learning. Clark expands on claims presented by Bloom (1971) that the method of instruction

affected attitude toward learning and outcome. It appears attitude is significant to the learning process because of its influence on learning rate, retention, application, and motivation (Calderone, 1994).

A number of studies have reported that multimedia and computer technology have positive effects on attitude, although sample sizes are often limited and statistical significance is not always reported (Brudenell & Carpenter, 1990). Neil (1985) studied attitude toward computer-assisted instruction in a group of 32 generic baccalaureate-nursing students who were randomly assigned to either an experimental or control group for nursing instruction. The experimental group learned the required content by computer-assisted instruction only and the control group by written text materials only. Student attitude toward method of instruction was measured by the affective measures scale (Huckabay et al., 1979), a 10-item, Likert type rating scale with responses ranging from 0 (indicating unfavorable responses) to 10 (indicating favorable responses) to instruction. An eleventh item asked subjects about their preferences for method of instruction and was scored and analyzed separately. Results indicate that the mean score on the affective measures scale for the experimental group was 83.56; for the control group 77.25, an insignificant difference when subjected to non-directional t-testing. The majority of subjects in both groups reported a strong preference for computer-assisted instruction over reading (item 11 of the affective measures scale).

Additional t-testing was done to determine whether there were significant differences between responses of subjects in the two groups to specific items on the affective measures scale. A significant difference existed between groups in response to positive reinforcement potential of computer-assisted instruction ($t = 2.7$, $p < .01$) and

ability of method to stimulate and challenge ($t = 4.38$, $p < .0001$). Findings of this study indicate that students in both groups expressed satisfaction with the instructional methods; the experimental group members scored higher on the Affective Measures Scale than control group members, but not significantly so.

Research findings vary regarding the effect of computer instruction and technology on learning and attitude. Schare et al. (1991) report that in a sample of 83 third-year students learning nursing content by interactive video technology, a significantly more positive attitude toward learning was reported by the interactive video group than by those learning content through the traditional lecture method. Attitude was measured by an adapted version of the attitude toward computer assisted instruction scale, a semantic differential tool consisting of 14 bipolar adjectives. Internal consistency reliability for this scale was .853 for undergraduate nursing students (Allen, 1986). Schare et al.'s pre-test-post-test control group design was used. Multivariate and univariate analysis of data were performed. The univariate F for the affective measure was significant ($p = .000$, $df = 2, 72$) indicating that the students learning by interactive video possessed a more positive attitude toward learning than those learning nursing content by traditional lecture instruction. This research suggests that students respond favorably to interactive media technology. The format for learning with interactive videodiscs encourages students to learn at their own pace, go back over material they are questioning, and choose the time where they are most ready to learn. Schare et al. cautions that these results may in part reflect a novelty effect with interactive video learning, because it is a relatively new medium in nursing education.

Literature findings imply that the effectiveness of computer instruction on learning and attitude vary (Haughey & Anderson, 1998). This is despite the fact that individual research studies that supports the use of computer-assisted and multimedia technology in nursing education based on gains in student achievement, student retention of computer-taught content, decreased time for learning, and positive attitude toward computer-assisted learning. Although there is much agreement that interactive multimedia technology has tremendous potential for enhancing nursing education, further investigation ought to be conducted to determine its usefulness for applying knowledge gained to practice situations. How faculty member integrate this new technology into their instructional repertoire, as an integral part of lecture, as an adjunct, in place of lecture, or a combination of all the above, has not yet been widely reported in the literature.

Learner satisfaction with multimedia technology in education also has not been widely reported in the literature. Few studies cite criteria that can be used for evaluation of multimedia technology in learning. Decisions about adoption or continuing use of technology in teaching and learning are limited without student input. Student satisfaction with educational technologies (computer-assisted instruction, CD-ROMs, interactive videodiscs, etc.) should be a major criterion in the evaluation and adoption process. Recent studies present an unclear picture of student input in assessing technology in nursing education. Hamilton (1997) suggests that learner satisfaction with educational experiences is a critical factor in the learners' persistence, overall attitude, and commitment to a course or program. The determination of learner satisfaction with educational technology can provide educators with important information on how learners perceive their learning experiences.

Student satisfaction with integration of educational technology in the teaching-learning interaction should be a major criterion in the evaluation and adoption process (Baldwin, Johnson, & Hill, 1994). Using learner satisfaction for programming decisions is consistent with Knowles, the acclaimed adult educator supports the notion that learning is collaborative and should include active involvement of the learner. His model of education requires a climate of openness, collaboration, competence, creativity, and ultimately success. Baldwin et al. suggests that allowing learners to participate in the selection and evaluation of instructional media and technology contribute to the creation of an academic environment that is open, egalitarian, and student-oriented.

As computer-assisted instruction, interactive videodisc, and CD-ROM technology become alternative instructional strategies in nursing education, computer anxiety as well as concern over issues of privacy, confidentiality, and information security become influential issues (Rambo, 1994). A number of studies indicate positive student attitudes toward computer-assisted instruction although no clear preference is inferred. Lowdermilk and Fishel (1991) report that the majority of senior baccalaureate nursing students who used computer-assisted instruction in nursing practice courses perceived the method to be enjoyable and stated they were interested in future computer-assisted instruction learning experiences.

In contrast, Koch et al. (1990) report some criticism of computer-assisted instruction. They surveyed 110 senior diploma-program-nursing students following the completion of a computer-assisted learning program to determine their preferences for this learning approach. Students were positive in their orientation to computer-assisted learning, but highlighted (a) the need for prior knowledge of computer usage, (b) the lack

of alternative explanation available when using computer-assisted learning programs versus professor interaction; and (c) programs which had poor quality graphics. Day and Payne (1987) report that first-year baccalaureate nursing students using computer-assisted instruction for a health assessment course were generally dissatisfied with the method. The students indicated that computer-assisted instruction was less useful, less satisfying, less stimulating, more frustrating, and generally less enjoyable than traditional strategies. It appears the literature on student satisfaction with computer-assisted instruction contains both positive and negative findings, although no clear preference emerges. Postman (1993) agrees with these findings and suggests that computer technology functions more as a mode of transportation than as a means of communication, and that without quality course content, programs will be unsuccessful. He cautions that technology can be an invaluable instrument for future endeavors as long as it is placed within the context of human goals and social values, and not applied indiscriminately to human affairs.

Adult educators Kasworm and Londoner (2000) also raise questions about the use of technology in education. They note that while technology has the potential to aid in the teaching and learning process, its use sometimes limits authentic human interaction and meaning-making. They suggest that technology can be used effectively in the educational process if its use is critically and continuously examined. By bringing a critical lens to bear on the use of technology, adult educators can help guard against the potential dehumanization of the learning process, especially when learners are separated from each other and from the educator, as in a distance education context. Drawing on an example of technology used as a delivery mechanism (e.g., CD-ROM technology), Kasworm and Londoner illustrate how flexibility and creativity can be integrated into the educational

process so that distance education technologies engage learners, rather than isolate and dehumanize them. Ultimately, the awareness and expertise of the adult educator in integrating technology has a significant effect on the quality of the learning experience.

King and Kenny (1996) explored the reactions to CD-ROM technology of a small group of 20 health-care professional students registered in a full-time information technology course. This qualitative study used group observation followed by structured interviews to observe students using CD-ROM databases. Prior to the observation, all students had been given an introductory talk on the nature of CD-ROM and databases, and practice on the computer-based library catalogue system, which had a simple menu-driven search facility. The class was then divided into four subgroups, and introduced in turn to the hardware and software and given a demonstration of the facilities available using CD-ROM. Analysis of observations of the students as they used the CD-ROM enabled the researchers to conclude that students were developing a relationship with the computer. King and Kenny do not argue that students accepted the CD-ROM without reservation but they argue that if learning is to take place successfully then teachers need to take into account the affective aspects of learning, as well as the cognitive. Furthermore, King and Kenny acknowledge that inanimate objects such as CD-ROM technology or computer assisted instruction, which form part of the learning situation, can be perceived by learners as having human characteristics. If these characteristics are seen as unfriendly, this will impede motivation and learning.

Summary of the Literature

A rich and varied literature base exists on adult learning, especially within the contexts of continuing professional education and lifelong learning. Adult educators'

perspectives on how and why adults learn influence both their theory and practice. Principles of adult learning provide a useful framework for planning adult education programs in order to meet the diversity of educational needs and learning methods preferred by adult learners. Adult learners bring a vast amount of experience and knowledge to each learning experience and participate in learning for a variety of reasons and purposes. It is the responsibility of adult educators to provide a diverse, flexible set of programs to accommodate individual and group needs.

Program planning involves adult educators at all levels. Program planning often includes the following components: a comprehensive needs assessment, learning objectives, appropriate and relevant content, qualified instructors and format, management of logistics and budgets, and evaluation of actions and results. Collaboration in program planning is an essential element of continuing professional education. Responsible planners include all people who are affected by the program and program outcomes. Evaluation, one component of program planning, is a dual process that includes both the participants and the program processes. There are multiple methods of evaluation, which include formative and summative means. As well, evaluation can encompass the collection of quantitative and qualitative data. Adults are generally very sensitive to evaluation and become defensive if the process is not ongoing and uni-directional.

Distance education provides access to quality education for the non-traditional student in varying geographic locations. Students can learn at home, on the job, at their own pace, and on their own schedule. The use of new technologies in distance education is crucial to its success but technology needs to be viewed as a tool for course delivery with the emphases on course content. Women face many barriers in continuing

professional education: balancing demands of work, family, and education. Web-based environments can provide less stress for women than a mixed gender classroom environment. Distance education has provided diploma nurses with the access to baccalaureate education in the comfort of their homes without leaving their communities and or leaving the local work force.

A major role of multimedia in the delivery of nursing education is its ability to respond to the diverse learning needs of a changing student population. These non-traditional students are making mid-life career changes while balancing job, family, and educational responsibilities. Multimedia addresses the need for increased access to baccalaureate nursing education and responds to diversity in learning rates and styles.

Individuals in health-care often are recognized as community leaders and have the responsibility to maintain a high level of current and relevant knowledge and skill. Multimedia technology facilitates learning by providing access to communication in the absence of a face-to-face presence. Access can include: print, audio, video, and computer-mediated communications. Various types of new media utilize videodisc, Internet delivery, digital video, or audio conferencing. New learners of multimedia technology often feel anxious when faced with software and hardware but realize that the ability to use technology is critical in remaining current and knowledgeable in their profession. The critical component in selecting a particular medium is in identifying the adult learner's needs and goals. Factors that have an impact on adult learning include: improved instructional design, increased interactivity between student and course content, and opportunity for self-pacing and easy access.

This review examined the literature on adult learning. The process of program planning and evaluation emphasized the need to take into consideration the unique needs and characteristics of adult learners in the design and implementation of programs and evaluation. The use of distance education strategies in continuing professional education and nursing education were discussed. Finally, the use of multimedia technology in nursing education was examined including a discussion of variables such as learner satisfaction; student attitude toward use of multimedia in nursing education, and the impact of multimedia technology in cognitive achievement. The literature review suggests the need to explore further the influence of multimedia technology in distance nursing education.

CHAPTER 3

DESCRIPTION OF THE STUDY

In this chapter I describe the process I undertook to develop, implement, and evaluate the pilot study in which CD-ROM technology was introduced into a distance course in nursing. I discuss each step of the study including: the design process, response to marketing, needs assessment, focus group process, perceptions of learners' experiences, and the main findings.

The Planning Process

In October 1996, I was part of a Steering Committee in the Extension and Nursing Department at St. Francis Xavier University that successfully submitted a proposal to the Office of Learning and Technology within the Department of Human Resource Canada, with a matching grant from the university. This proposal provided the framework for the pilot study of the use of multimedia in a nursing course within the university distance nursing education program. As the coordinator of the post RN-BScN program, I was the staff person in the Continuing Education department who had primary responsibility for the study. In this section I describe the aspects of the planning process, including Steering Committee building, exploration of existing resources, design process, marketing activities and resources, and needs assessment.

Steering Committee Building

In February 1997, following notification that the funding proposal submitted to the Office of Learning and Technology was successful, the Director of Continuing Education, my supervisor, convened the initial meeting for the CD-ROM study. This initial meeting

was to formalize the composition of the Steering Committee, revise the terms of reference for the committee, and select a chairperson. The meeting was co-chaired by the Chair of the Nursing Department and the Director of Continuing Education; subsequent meetings were chaired by the Chief Technology Office of the university. After the initial meeting, the Steering Committee comprised seven members, drawn from the Extension Department, the Nursing Department, and the Technology Support Group of the university (see Figure 1).

The Steering Committee members were (a) me, as coordinator of the distance nursing program; I was responsible for the overall management of the study including logistics relating to student and faculty member participation in the study; I was directly involved in the stages of sample identification, data collection, data analysis, report writing, and dissemination of results; (b) the Chair of the Nursing Department, who was the primary researcher, (c) the Instructional Design Coordinator, who was responsible for all technological requirements including product refinement and orientation of students to the technology; (d) the Coordinator of the Certificate in Continuing Care Program; (e) the Senior Advisor for Technology, who was also the chair of the study's Steering Committee. Each of these persons liaised with other members of her or his department or group. Also, as can be seen from the Figure 1, communications occurred across departments as well. Clarifying roles and responsibilities of Steering Committee members early in the study fostered a sense of Steering Committee spirit and cooperation and resulted in less conflict over who was expected to do what.

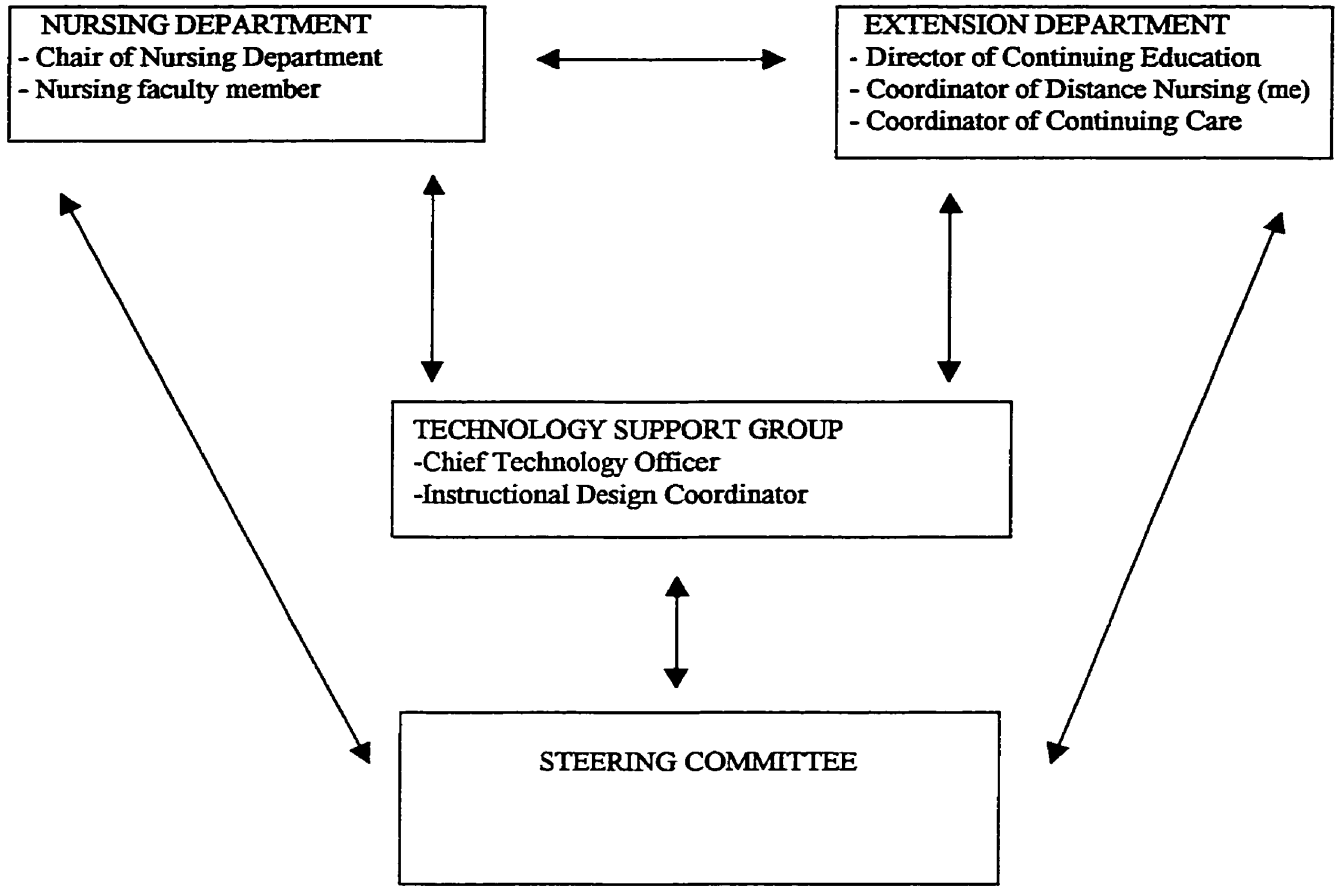

Figure 1: ***Study Steering Committee Composition.*** **The arrows denote lines of communication. The Steering Committee is comprised of seven members drawn from each of these three departments.**

Other members participating in the study included a content expert who was a faculty member of the nursing department, with expertise in the area of nursing theory and experience delivering the course; students taking the course; and technical support members involved in CD-ROM production. All members of the Steering Committee were employed by the university on a full-time basis and had a variety of other responsibilities beyond this committee. Therefore, this study was considered overload and constituted a major time commitment. Initially, the committee met biweekly for task distribution and

information updates. There was a great deal of discussion surrounding the nature of recruitment for students to participate in the study. As a Steering Committee, we decided that the best time to start the first nursing course was November 1997; we would deliver it as a three-credit course to run for 13 weeks.

The Steering Committee dynamics were complex. We worked within a model of cooperation, negotiating interests and working collaboratively. Nevertheless, conflicts occurred, especially over time-lines and deadlines, both because faculty members were doing this work as overload and because multimedia delivery was new ground for many members. For example, I found scheduling meetings to include all members difficult at times due to their previous work commitments; this often delayed the completion of action items. The committee's agreed upon policy that all decisions regarding the study be Steering Committee decisions had both advantages and disadvantages. Although it was helpful to get creative feedback from Steering Committee members, waiting for the feedback delayed the decision process. Such delay created significant obstacles because both students and faculty member were on a rigid time line to complete the course. A delay in one course could influence the students' progress through subsequent parts of the degree program because of the sequenced nature of the nursing curriculum. Conflicts within the steering committee were addressed through discussion at the committee level and resolved with majority decisions by Steering Committee members. A content expert, who was a faculty member of the nursing department, was selected to ensure decisions of content.

The Steering Committee continued to meet biweekly to problem solve, provide progress reports, and to distribute tasks, with formal meetings occurring quarterly.

Routine agenda items included reports on research, technology development, program coordination, and contract management. I circulated the minutes in hard copy and posted them on a Web-board that was developed for the study. These meetings were valuable in measuring our progress to date, providing insight and experience to difficult tasks, and providing time-lines in order to remain on schedule. Steering Committee members perceived this study as a positive experience as evidenced by faculty member comments in the minutes. Strong anecdotal evidence of the positive contributions the study made on online course development was also noted by professors who worked on additional online courses following the completion of the CD-ROM study. For example, the development of online courses such as; Biology 105 and 115, and Nursing 483 and 491. Professors commented how excited they were to deliver courses in this manner. One quotation from a nursing professor stated "the interactivity of the CDROM provided my distance students with access to their peers and to the course professor through group discussions in the chat rooms, and e-mail messages". Another professor commented that the animation and video clips brought a personal aspect to the course, " students studying at a distance could see and hear my voice, I felt a closer connection with them and they with me".

The Steering Committee delegated action items or tasks at each meeting. Items identified for me as program coordinator included changing the program application form and devising a questionnaire that could be used to do a formal assessment of learners' needs and knowledge related to computer access and technology. I also developed an informed consent form for students to sign if they wanted to be involved in the research study. I developed an insert for the program brochure describing the research study and a contract for the students to sign and return. The graphics for the inserts were designed by

the technology department of the university and approved by me as program coordinator for the distance Bachelor of Science in Nursing Program.

Student Support Services

Students taking part in the study were new to the degree program, the university, distance education, and computer technology. The course itself was only 10 weeks in length, it was their first university course, and the CD-ROM component was ready for delivery only a week before the course started. This did not allow the students time to feel comfortable with this new technology nor benefit from the group dynamics of their Resource Center. Students initially required a lot of encouragement and hand-holding via the toll-free telephone line. The support services offered by the BScN Program are an important part of the infra-structure for distance adult learners to ensure success. If the study had begun later in the degree program, students would not have had to deal with these added stresses and would have been more comfortable with the distance format.

Contact with students and consultants was limited to mail-outs, e-mail, and telephone exchanges. As program coordinator I had to deal with lost mail, voice mail, changes of address, and lack of response from participants. Much of my time at the Program Office was spent attempting to contact students and updating information/data for their files and for the research records. Student data were gathered through questionnaires designed for the study, program applications, research consent forms, and telephone conversations. When mail was late or lost, and when students could not be tracked down, it became very frustrating for students, program staff, and researchers. Maintaining student information and collecting data were very costly and time consuming processes, especially when I was working within specific time constraints.

Selecting the Content Expert

An early decision by the Steering Committee was that we needed to select a faculty member to revise and deliver the course content. The chair of the nursing department was delegated to assign a faculty member as a content expert, who would work closely with the technical group. The content expert was to provide consultation services and to advise the graphic designers and technology support group who worked on the actual production of the CD-ROM. The nursing department chair approached a faculty member who was currently teaching the nursing course on-campus to both post-diploma and generic Bachelor of Science in Nursing students. This faculty member worked in a traditional classroom setting and was considered an expert in the specific nursing content of the course.

The faculty member agreed to participate in the study in the role of content expert. This provided her with an opportunity to learn about new options for using such technology to enhance her own teaching repertoire on campus. It also provided her with access to the new CD-ROM product for use with her on-campus students after this study was completed. The faculty member in return met periodically (monthly, then weekly as the study drew to completion) with the technology Steering Committee to review the work on the CD-ROM and assess it for accuracy, relevance, appropriateness, and congruency of content with the multimedia use of technology. Hence, it was a mutually beneficial exchange for all parties. The faculty member saw this as her professional role in extending access to an underserved population of her peers and colleagues. She also benefited from being provided access to the finished product for use with her own students in subsequent years of the degree program. She collaborated closely with the

technology group in the design process. Content expertise was a critical component in order to ensure that the multimedia resources had academic credibility, as well as to ensure that course content was translated in a way that maximized student comprehension and learning.

Design Process

During the early meetings, the coordinator of the technology development group had three areas of concern: working with new technical personnel, ensuring that all members of the study had appropriate computer resources capable of using the CD-ROM technology, and securing computer rentals for 40 students in the study. To remain within the budget restraints of the study it was necessary to examine all avenues of funding and support for securing these computers. The Steering Committee recommended securing laptop computers for the students to provide portability and Internet access. The Steering Committee also recommended that computer rental expenses should not be incurred by the student participants. Thus, the university assumed responsibility for the major cost of the rental equipment and also for Internet access through a local provider for each student.

The technical team developed a Web-board to enhance communications and eventually be part of the course itself. A demonstration, by the technical team, was given to all Steering Committee members, study members, and program secretaries. The Web-board allowed anyone involved with the study to post messages, contact individual members, and send e-mail. It was a fast, accurate means of communication.

The nursing content for the course was developed and revised prior to the technical development of the CD-ROM. Course content and evaluation for both print-based delivery and CD-ROM delivery were identical. The technology team studied general

design issues such as video/audio inclusions, Internet connections, and e-mail and database features. They worked content into this format. The technology team provided the necessary expertise and skills to maintain the production schedule with respect to the architecture, the structural design of the CD-ROM. One of the primary philosophies for the CD-ROM was the ease of use. Given the average computer literacy levels and the fact that the students would be using these computers off-site, it was critical that the CD-ROM be user-friendly. The CD-ROM was developed using standard courseware development tools such as authoring, graphics and interface design, web browser, and video production.

The technical support team designed the system architecture to be modular (like the print-based version) and extensible to accommodate development of future courses in the nursing program. An attempt was made by the technical team to maximize the functionality of the CD-ROM version while maintaining similar content to the printed version and keeping the system simple to use. Student login procedure allowed for personal student information to be stored on the local file system. The course was developed in modules with each module given a separate system file. Within each module were text sections, lessons, video clips, and tests. Students could get instant feedback when they clicked on the score button of their display screen. There were sections for research by accessing the Internet and nursing databases, providing readings with reference lists, and a section providing feedback on the students' progress through each lesson. The journal section provided students with the ability to record and print notes electronically. Messages were communicated via e-mail which had the capacity to send individual mail or newsgroup messages. When sending e-mail the students could also

transmit Internet pages, disc files, and attachments. The design of the CD-ROM was developed to ensure that the system could make use of the existing Internet standards and the rich multimedia environment.

Marketing Activities and Responses

The Steering Committee decided that the target for sending out initial student recruitment materials was early February. Recruitment planning at this point in the study took a great deal of my time. With clerical support, I made mass mail-outs throughout Nova Scotia and Prince Edward Island to all acute and long-term health care facilities. I did on-site presentations, presented abstracts, and placed advertisements in nursing journals and major newspapers. I updated our home page to include information describing our study, instructions on using computer technology, the program brochure, an application form as another mode of advertising via the Internet/Web site.

In order to meet these deadlines, I realized that planning and marketing had to begin immediately. Much of my time as program coordinator was involved in marketing and promoting of the part-time BSCN Program. I began recruitment March 1997, with an aim of enrolling 100 students for the research study. Because I was primarily responsible for identifying and recruiting both participants into the study and students into the program, I suggested that we develop incentives for students coming into the degree program and research study. Steering Committee members were supportive of this. Ideas included providing free textbooks and providing personal computers for students' use during the course of the study and changing our generic program brochure to promote our new delivery format. I was then charged with the task of securing promotional materials and free textbooks, as well as with preparing the new program brochure.

As a result of my recruitment efforts, 300 potential students requested application forms. One hundred completed applications were returned and accepted. Some of the students enrolled in the degree program did not want to take part in the study, stating that they were concerned about doing their first university course and did not want any extra stress. Finally, the two study groups that took part in the pilot study were composed of 40 students each.

Geographically, the students were distributed throughout the rural areas of Nova Scotia and Prince Edward Island. Eighty students consented to be part of the research study but our Steering Committee made the choice of which group they would be assigned. Students' computer expertise was determined by a self-assessment of computer proficiency in the pre-program questionnaire, which I evaluated in order to assign groups with equal technical abilities. Eight regional resource centers and consultants were assigned with 10 students in each. In this study, the Steering Committee wished to test the efficacy of the CD-ROM in comparison to the traditional print-based mode of delivering the course. Consequently, four groups of students were assigned to the media group and four groups of students were assigned to the print-based group.

Assessing the Students' Technology Needs

An existing pre-program questionnaire used in the print-based program was modified for the study and was included in each student's application package. The modified pre-program questionnaire consisted of questions about the students' personal demographics, work site information, and computer knowledge. It contained 40 questions requiring the learner to fill in the blank, check off the correct answer, or write short answers. As the applications came in, students were accepted and data collected.

As program coordinator, I grouped students according to their geographical location and work sites. Students in the distance program come from a number of geographical regions and they traditionally have been assigned an educational consultant with whom they meet on a regular basis at a local resource center. Because of this regional grouping of students, it was inappropriate to randomly assign students to either a CD-ROM or a print-based group. Rather than have some students in each geographical locale receive the course in one way, and others in another way, I assessed all the students in each locale to one media group or the other. I measured the computer experience of each person within each of the resource center groups and rank-ordered the groups from highest to lowest. Some information was obtained from the program application and questionnaire, but the remaining data was collected by contacting students individually by telephone, sometimes several times, to receive sufficient data to satisfy the measurements. Questions included: (a) Do you have your own computer? (b) What name brand is it? (c) Does it have a CD-ROM drive? (d) How much experience do you have using the computer? Students often did not know the type of personal computer they owned, its Internet capabilities, nor its CD-ROM speed, so they needed to find out this information and call back with the information.

I assigned the eight groups to either the CD-ROM or print classes. The two groups highest in computer experience were randomly assigned to a treatment, followed by the next two groups, until all groups were assigned to a group. All members within a group received the same treatment and the course professor did not know which students were in which group. This was important to protect the integrity of what we were

attempting to evaluate with the use of the CD-ROM and the print-based versions of the course.

Students who did not own their own computer or who did not have a CD-ROM drive with the capability of running the CD were issued a personal computer for the 13-week interval.

Implementation Phase

In this section of the thesis I describe three components of the implementation process. First, I describe the student participants and demographic details. Next, I describe the two orientations scheduled for the study participants. Finally, I describe the implementation of the course, briefly outlining student activities during the course.

Participants

Eighty students, all of whom had completed a 2 or 3 year diploma nursing program with a minimum of 1-year clinical experience, registered for the distance version of the introductory nursing course. Students were geographically located in rural communities across Nova Scotia and Prince Edward Island. All students were female, between the ages of 25 and 45; 68% were married; 54% had dependent children; 80% were employed full-time while 14% were part-time; and 76% of students had two or more university courses to their credit coming into the program, whereas 60% had never taken a university course by distance. All participants were sent consent forms on which they were asked to indicate their willingness to participate in the study. Of these, 40 were assigned to the CD-ROM group and 40 to the print-based group.

Orientation Process

As coordinator of the distance nursing program, I asked all 80 nurses who were admitted into the program to come to the university campus for an on-site orientation to the university, faculty members and program staff, and nursing program. The orientation was a required event for all new participants into the degree program and was scheduled one month prior to the start date of the introductory nursing course. It was the only time in the program that it was mandatory for students to visit the university campus. Of these, 80 students registered and arrived for the orientation. I was responsible for organizing the 2-day orientation and acted as the chair for the event. The orientation included workshops, presentations by faculty members and program staff, tours, and social gatherings. Students were unaware at this time as to which research group they would be placed in. During the on-campus orientation all students were treated as one generic group. Pre-testing was conducted during the orientation session and students were informed of their group assignment on completion of the orientation.

A technical orientation was conducted a week before the course start date by two staff members for all students and their educational consultants in the CD-ROM group. The technical support person provided the expertise for questions about software and a continuing education staff member from the distance nursing program conducted the overall orientation session. Since this was a mandatory session for students in the CD-ROM group the technical orientation was conducted at several geographical locations to accommodate them. Each session was approximately 30-60 minutes in length. The orientation included use of the desktop computer, Internet, and CD-ROM. Two members of the technical group set up workshops for the students to become familiar with their new

computer and the CD- ROM program. All students were taken into the session in pairs; a complete computer system was set up and fully connected to demonstrate its equipment, connections, and process. Following this demonstration, students were introduced to the actual content of the CD-ROM. Students who did not have a computer received a desktop computer to take home for the 13-week interval and all students received Internet accounts for the same time frame.

Once the orientation was complete, the students were given a toll-free number to contact a person for any technical difficulties and another toll-free number to contact the Program coordinator and course professor with any program and course questions. I also gave them a handbook detailing hardware and software use. Students were guaranteed a response time of 12 to 24 hours to all calls to avoid anxiety resulting from technical glitches. As coordinator of the program, I knew that with only 13 weeks to complete the course, students would not appreciate being held up in accessing their computer because of a technical problem.

Flow of Activities for the Course

One week prior to the course commencement I mailed the course manuals to all students in the print-based group and sent CDs to the CD-ROM group. Both the manual and the CD contained the same course content, required readings, student activities, and evaluation component (see Table 1). Students in the CD-ROM group had the same maximum of 13 weeks to complete the course as those in the print-based group. The introduction to the course contained the course description, objectives, evaluation component, and the weekly schedule. From their first day the students were aware of the course assignments, timelines, exam dates, times the professor was available to students

via the toll-free telephone line, and toll-free telephone numbers for the program office or technical assistance.

Initially, the telephone lines were busy with student concerns regarding their first assignment. Concerns from both groups included using APA format, writing papers, accessing the library, and managing the stress of being back in school and working. The CD-ROM group also called regarding difficulties emailing their assignments, and accessing their Internet account, as well as other technical glitches. Later in the course, student concerns included examination anxiety, examination dates, and scheduling proctors. Students from both groups wrote their exams under the supervision of their consultant or proctor and consultants sent examinations to the program office for the course professor. Assignments were either mailed to the program office or emailed to the course professor.

The course professor had office hours twice a week via the toll-free telephone line. Students could call her at specified times and if these times were unsuitable for the student, the program office would arrange a time for the professor to contact the student. Office hours, which were 2 hours every week, were always busy and the professor often had to return calls to students who were unable to reach her because the telephone line was busy. Students in the CD-ROM group could also leave emails and post messages on the Web-board.

Students in both groups met with their consultants as a group at pre-arranged times. Following the first meeting, the consultant would determine the students' needs, and when and how often they would like to meet. As an example, most consultants had a group meeting early in the course to discuss writing scholarly papers and using APA

format. The assignment for this nursing course involved two parts: a written section to be marked by the course professor, and a group discussion facilitated and marked by the consultant at the local resource centers.

During the 13-week course, 9 students withdrew prior to completion for personal reasons, and therefore were removed from the study. A total of 71 students completed the course. Of these, 37 were assigned to the CD-ROM group and 34 to the print-based group. The course ran very smoothly with the normal amount of activity at the program office. Because this was the first course in the degree program, students needed a great deal of handholding and reassuring, which was usual for this course in past offerings. At the end of the term, all students completed a generic summative evaluation of the course, their consultant, the professor, and the program office support. Following completion of the course, the CD-ROM group were post-tested on attitude toward, and satisfaction with, the CD-ROM method of learning. The post-tests were mailed to the students at local resource centers, completed individually and returned to the program office. The consultants administered the cognitive achievement tests to both groups one week following completion of the course in their local resource centers and returned them to the program office by registered mail. As a Steering Committee we decided to have a group evaluation conducted at the regional sites using focus group interviews. Five student focus groups were conducted. Each focus group consisted of 6-12 students and interviews lasted approximately one and one-half hours.

Table 1

Nursing 105, Conceptual Model for Nursing, Daily Schedule

WEEK	DATE	LESSONS	ASSIGNMENT/ QUIZ
1.	November17-22	Lesson 1.1-1.2	
2.	November 24-29	Lesson 1.3 & 2.1	
3.	December 1-6	Lesson 2.2 & 2.3	
4.	December 8-13	Lesson 2.3 & 2.4	
5.	December 15- 20	**STUDY**	**MID-TERM**
6.	December 22-27		**XMAS BREAK**
7.	December 29-3	Lesson 3.1 & 3.2	
8.	January 5-10	Lesson 3.3 & 3.4	
9.	January 12-17	Lesson 3.5 – 4.1	**CONFERENCE & ASSIGNMENT DUE**
10.	January 19-24	Lesson 4.2 & 4.3	
11.	January 26-31	Lesson 4.4 & 4.5	**FINAL EXAM**

OFFICE HOURS
WEDNESDAY 7-9 PM
THURSDAY 10-12 NOON

Evaluation Process

The evaluation component of the study included pre- and post-tests, focus group interviews, and generic summative course evaluations. Data were gathered from written tests, audiotape transcriptions, and summative evaluation forms.

The Pre-test, Post-test Design

A pre-test and post-test experimental design was used for the quantitative part of the study. Three instruments were used to measure the variables of cognitive achievement, attitude towards learning, and satisfaction with the learning method. The instruments were issued from the program office and administered by myself or research assistants selected by the Steering Committee. Cognitive achievement was measured by a paper and pencil objective test developed by the course professor based on the learning objectives for the course. The course professor constructed test items for the test. Once the items were constructed, the professor circulated the items and the course learning objectives to two other professors who had taught the course previously, to determine if each item was relevant to the objectives and to the print-based and CD-ROM version of the course. Only those items having 100% agreement were used in the cognitive test.

Immediately following the completion of the course, both groups (CD-ROM and print-based) received post-tests which I mailed directly to the students. They were returned in self-addressed stamped envelopes to the Program Office. The print-based group was tested on attitude and satisfaction with the traditional method of learning and the media group was tested on attitude toward and satisfaction with the CD-ROM method of learning. Both groups were given cognitive achievement tests by their local educational consultants, who were registered nurses with a Master of Nursing degree. They acted as

the students' mentors and resource contact. All students were pre-tested prior to the start date of the course.

Instruments

Our Steering Committee decided to measure attitude towards learning by adapting Allen's (1986) Attitude Toward Computer Assisted Instruction Scale to reflect items specific to CD-ROM technology. This semantic differential scale consists of 14 bipolar adjectives each measured on a 9-point scale under a title computer-assisted instruction. All adjective pairs were used but the title was adapted to reflect CD-ROM instruction for the experimental group and print-based instruction for the control group.

The satisfaction with learning method was measured by the total score from the satisfaction scale of the Learning at a Distance Questionnaire developed by the research Steering Committee for this study. The satisfaction scale measures the learner's level of satisfaction with the opportunities for learner autonomy, critical thinking and decision making, self-pacing of content, reinforcement of learning, and interactivity in the learning process. During the on-campus orientation I administered the pre-test to all students in a very relaxed non-threatening environment. Students were aware from the start that the test results did not influence their course mark in any way.

The print-based and CD-ROM groups were compared on each of the dependent variables: cognitive achievement, attitude toward learning, and satisfaction with the teaching method. Following the orientation, the students were notified as to the group they were placed in for the research study. The print-based group received a manual, a print-based version of the course, while the CD-ROM group received only the CD, which contained the same course content. Many students and consultants were disappointed that

they were not included in the CD-ROM group but were reassured that future courses would be offered by CD-ROM.

The Focus Group Process

I organized a focus group in five regional sites. Each focus group consisted of 6 to 12 members. The facilitator was a registered nurse with a Master of Nursing degree, who had been hired by the Steering Committee to conduct the focus group interviews. She had previous experience in conducting and facilitating focus groups. She used an interview guide (see Appendix A) developed by members of the Steering Committee to assist her in facilitating the group process, but insofar as possible she sought to allow the questions to emerge from the group discussions. Some probes were used. She traveled to the regional sites to accommodate learners. The interviews lasted approximately 11/2 hours. The main objective here was to determine the perspectives of students not only the CD-ROM, but also on their experience of returning to school. Two of the five focus groups were from the print-based group for comparison purposes. All focus group sessions were audio taped to ensure we received all the students' perceptions of their experience with either CD-ROM technology or print medium.

Findings from the Study

Findings from the focus group interviews and pre- and post-test will be discussed in this next section. I will discuss the findings from the focus group interviews first, and findings from the pre- and post-tests later. Qualitative data from the CD-ROM and print-based focus groups were subjected to content analysis. A content analysis was undertaken by defining content units. Twenty-one thematic content units were defined by collating the

protocol with the information found in the interview transcripts.A number of major themes emerged from the analysis.

Themes About Transition as an Adult Learner

The focus group interviews provided an opportunity for student interaction on a number of topics, and an opportunity for participants to learn from one another and develop ideas together. Some general themes emerged from the interviews about life as an adult learner, transition from one demanding role to another, the value of baccalaureate education, empowerment, and the development of new technological skills.

The participants were asked to describe their experience as students over the past 13 weeks. Most of them talked about the many and competing demands on their time as adult learners (a topic in all focus groups). For example, one person commented:

> It was difficult to juggle the family life, and a full-time job. You have to set up new rules for yourself, and program yourself; I found time a really big issue. Trying to work full-time and do a course and find time for everything else in your life and trying to fit things in, I think the most difficult was my own battle, getting back into the books, disciplining yourself, It takes a lot of discipline to set time aside to do it. That is a big drawback for me because I haven't quite organized myself very well yet.

As adult learners with multiple roles, these participants found self-direction, self-discipline and reorganization of their time essential to their ability to proceed in the course regardless of the group to which they were assigned. Time became a highly valued commodity for them. They reported they had to set priorities among the many competing demands in their lives, and added to that was the new role of learner. This created an additional burden in their already taxed existences. Clearly, the changes were about more than the introduction to technology in learning.

The theme of transition from one demanding role to another is illustrated by another person's comment:

> I was starting this course, I was starting a new job, and I also have a private business; My mom was sick and just a lot of that stuff that is hard to deal with and then to do the school work on top of that, plus deal with my whole family. I'm at the stage where you have to look after your parents.

A period of time to adjust to the new demands and role of student life was necessary in all five groups. All women in the course spoke about their husbands, children, full-time jobs, as well as various other social and community commitments. Learning to study again after extended periods of time out of a school environment was a major commitment they took on. They spoke of a transition period, in which they learned to juggle time among family, friends, work, and study. They saw themselves as responsible for their own actions and learning, and wanted to be involved in planning and directing their activities.

The value of the baccalaureate program was something that served as a motivation for most of them to continue their education. Illustrative comments from two participants were: "I just want to open my mind. I really felt that my mind was going to waste. I wasn't learning"; "I mean, you learn new skills or new procedures, or whatever, at work, but you don't learn anything that makes you think." It became evident to the students very early in the degree program just how valuable a baccalaureate education really was to them. They spoke of understanding why they do something, and not just how to do something. It gave them a greater sense of professionalism and a broader knowledge of nursing.

A sense of pride and accomplishment was evident in the interview comments from both the print-based groups and the media groups: "It is really quite satisfying-- it makes

you feel good"; "It helps you grow--education is always a good thing"; "I found it stimulating, you know to me it was something that opened my mind."

To go back to school after being out in the work force for so long and to do well gave the participants a feeling of empowerment and accomplishment. The empowerment theme was prevalent in both groups but particularly strong in the CD-ROM group, who in addition to learning new nursing content also felt liberated from their fears of computers by learning to master this new technology during the course process.

Adult learners often seek out new skills in order to meet their goals and solve real life problems. This theme was dominant in the interviews. A comment supportive of this theme was:

> So I guess my skills have changed in that sense, because I was a good listener in class. I retained a lot in class, whereas now I do more reading. Before I didn't feel I had to because I could just listen to the faculty member. Now I need to develop my reading skills and work on my retention.

In both the print-based and the CD-ROM groups, the participants spoke about the need to develop new ways of learning and knowing in nursing, although the skills thought to be important varied somewhat by group. The switch from classroom learning to distance learning, in addition to being away from formal study for as long as 20 years for some, resulted in changes in the way that they studied. One noted change was switching from audio to visual learning, which entailed developing the ability to selectively identify important concepts from reading the required material. For those students who were in the CD-ROM group, there was an extra sense of accomplishment from learning a new skill related to the use of computer technology.

I conclude from these data that this group of post-diploma students are intrinsically motivated to continue their education through distance education. Although both were presented with common nursing content in different formats, the skills required to learn this information varied somewhat depending upon the group to which they were assigned. Some skill development was commonly identified by both groups. Educators in developing their learning materials, whether they be print-based or technology-based, should be cognizant of the skill set that is required of adult learners.

Factors That Supported Learning

Students in both the CD-ROM and print-based groups identified factors that were beneficial to their learning. Some of these factors were similar, whereas other factors were identified only by the CD-ROM group. The factors that were similar included social support and family support. The user-friendly manual was identified by the print-based group whereas, a sense of connection to campus, novelty of computer, enhanced learning due to computer stimulus and resource access, and the focus for learning created by the computer were identified by the CD-ROM group.

Social and family support. A major theme that emerged from the interviews was the idea of social support. Student responses included:

> You bounced ideas off people or got ideas from people about how they interpreted the question. I found that helpful; I really feel kind of separated and having the group meetings really makes me feel connected; I find like I'm in a little cocoon or pocket and I really enjoyed being in a group.

The distance nursing program is structured such that much of the learning is done on an individual basis and supported with regularly scheduled group meetings. The group meetings that occurred were found to be very helpful to all groups. The participants found

that coming together in a group allowed them to validate and also challenge their ideas and beliefs and promoted a sense of connection. These meetings provided face-to-face interaction of the participants with their peers, which CD-ROM and print-based distance formats did not accommodate. The group meetings, which were optional, provided a source of social support for the participants where they could engage in a reciprocal process that provided encouragement, and comfort. The groups tended to affirm each other and helped individuals realize their own strengths and potential.

Family support and encouragement. This was an issue of great importance for participants. An example or quotation supportive of this theme included: " I got a lot of encouragement from my family to do it. They thought it was a great thing; my family has been terrific. Even my little one told me when it was time to study."

The majority of participants referred to strong family support from immediate family and friends in the interviews. The support was shown through words of praise and encouragement, sensitivity to the needs of the mother or spouse, offers of help and assistance with household tasks, as well as academic support from older children in university. Participants in both the CD-ROM and print-based groups noted that because of studying independently the need for motivation and encouragement from co-workers, friends and family was important for course completion because in almost all cases; job, or family considerations take priority over course requirements.

A sense of being connected to the university. A feeling of being connected was noted by the three CD-ROM focus groups. The students in these groups had a chance to actually hear their professor's voice and see her image on the video clips. They could see

and hear her point out key points of the content, which increased their identity as university students. Comments from these students included:

> Watching the video clips made you feel like you were part of it, because we are not on campus everyday I do not have that feeling of being a university student but watching the videos sort of made me feel like I was actually a student, and I really am part of the university family.

Interestingly, the print-based group, in a somewhat similar manner, felt like they were hearing the professor's voice in the written manual content. Student remarks included: "I found that the way it was written I could hear the person talking to me; they are very easy to read and understand." This created for the student a sense of connection with the professor.

Novelty of the computer. Novelty was an important factor for the CD-ROM group. One student's comment was; "The CD-ROM inspired me to go to the computer a lot more than I would go to my print-based material because there was a novelty; there was a visual impact. I thought it was a really neat concept, and we were part of a research study"; "Yeah, the CD was definitely more fun. It was something to play with; it is just more interesting than doing print." "It sort of intrigues you right from the start; I think I was more inspired to go and work at my computer because it was something that was different." The students in this group felt that the computer technology enhanced their learning and interest in learning. They felt a sense of enjoyment, adventure, and accomplishment of working and studying on a computer, which added an incentive to study.

The CD-ROM group indicated that their learning was reinforced because the computer offered both audio and visual stimulation. The computer had the capacity to

provide the course content in a variety of methods, which met their varied learning needs. They read the information, saw the information, and heard the information. Then they would type the key points in their electronic journal, providing more reinforcement of their learning. The computer provided more flexibility. Students worked at their own pace and used which- ever methods met their individual needs. Responses from students in the focus groups included: "People aren't visual learners, and some people are auditory learners. With the computer program you had all of that together"; "I'm a slow reader, and with the computer, I found it easier to grasp things because not only were you reading but also they read things to you"; "You ended up learning better because you were exposed to it more."

Access to learning resources. Access was a theme that emerged from the CD-ROM group. Two illustrative student comments were: "Our computer was returned to campus after the first course, but as soon as I started the new course I was thinking I want to get on the Internet, because I can learn so much more on the Internet, and I don't have it of course - - I really miss it"; "Just that awareness that all that information is out there and I don't have access to it anymore." Students from the CD-ROM group commented on their access to the Internet availability and how they used this newly learned technology in their current courses. Other students reported missing their computers once they returned them at the completion of the course and feeling they were lacking in resources without them. Some participants from the CD-ROM group continued to use their Internet access for work and study.

A focus for learning versus portability for the computer. Having a computer at home created a focus for learning for many of the participants in the CD-ROM groups.

They commented that the computer environment provided support and enhanced their learning by helping them focus on their course content with fewer distractions. It was too easy to put the bookwork away, but the computer encouraged them to spend long, uninterrupted hours of study. For some students the computer provided a comfortable, secure location to work. Some student responses included: "You had to just sit down and put a couple of hours on it and now [with the new course] it is easier to just put it off"; "You tended to sit down and do a couple of hours of good quality studying as opposed to broken up time"; "I found it was more concentrated, too."

However, some students in the CD-ROM group found the computer created problems in terms of portability. An illustrative comment was: "One thing that I didn't like about the CD-ROM version was its lack of portability. I couldn't take it to work with me and it took me until exactly one week before the exam that I realized that I could print off the material." The participants of this group were issued personal desktop computers that were set-up in their homes and were not easily moved to other locations, such as work or parents' home. Portability might be an important factor for the special needs of a broader range of students than those who reported concerns in this study.

A sense of pride and accomplishment. This was another theme of the focus group interviews. When asked what the highlights were of being a distance student, students responded with personal observations. Students commented on their feelings of empowerment and accomplishment in completing new nursing content and mastering the new CD-ROM technology during the course process. One participant reported that she was filled with a sense of pride, like a child learning to ride a bike. Another respondent claimed, "Realizing that I could actually complete and pass a university course" was her

highlight. Students admitted that at times they felt overwhelmed with learning this new technology while learning new nursing content, but the pride they felt on completion was worth the effort. Similarly, Wlodkowski (1999) agrees and suggests that competence is a priority and a motivator of adult learners and the sooner they experience competence, the deeper their learning and motivation will be.

Although many of the factors that facilitated learning were common to both the print-based and CD-ROM groups, others were exclusive to the media used to present the course.

Factors That Deterred Learning

Participants in the focus group interviews commented on deterrents to learning at a distance. Most of these comments were from the CD-ROM media group and related to the computers themselves. The print-based groups identified few deterrents to learning.

Low initial user-friendliness of the computer. User friendliness was a theme discussed by all three CD-ROM groups. It was frustrating for the participants initially to become comfortable with the computer and the software applications, sometimes because of their sense of time pressure. Students not only had to learn to use new technology; they had to master new nursing content at the same time. One student's response was:

> At first I found that I would read through things 4 times and realize that, Oh my God I'm so in tune with the idea that I'm on a computer and have to push a little button here, and you know, my concentration was actually on working the computer and making the mouse go where I wanted it to. I wasn't actually taking in what I was reading at first, then everything started to make sense, and I felt I'm learning something here. And I'm enjoying this.

Other students' comments included: "I loved it [computer and CD-ROM] by the end of the course, but that first month was very traumatic. You think that you are going to ruin

the whole thing. You learn very quickly that almost anything you are going to do can be undone"; "The intimidation factor goes away once you internalize that belief"; "I was not only learning for the first time in 20 years, but I was also learning how to use the computer, which we already had in our home, but never touched."

Lack of control. The sense of lack of control of their learning environment was expressed by the CD-ROM groups. They feared missing important information or resources, or erasing content. In contrast to the members of the print-based group who could browse through their manuals to see the full extent of the course content, the CD-ROM group did not feel this same sense of overall control. Student comments included: "I was always wondering if I clicked somewhere else would something else come up that I did not know was there"; "Is Barb reading something that I've never seen because I don't know where to click?" "It took me a long time to learn where things were."

Technological problems and malfunctions. Problems with the technology or equipment were dominant themes in the CD-ROM focus group interviews. Student comments included: "We had problems with e-mail. We never got around to e-mailing anybody; I e-mailed people who never received their e-mail because apparently they had no e-mail"; "I really wasn't overly interested in it because I knew we didn't need it and I had enough on my plate as it was." The problems were related primarily to their e-mail system and use of the Internet. Some students did not attempt to address these technology problems when they realized they could complete the course without these services.

I realized from these responses that assessing the learners for specific entry competencies related to computer use before introducing such media may help to reduce some of the technical deterrents to the learning process. The initial analysis of learner

competencies, the reinforcement of correct applications of the technology by the learner, and the final evaluation of chosen media in aiding the learner's attainment of course objectives are important steps to consider in dealing with the deterrents to learning. When learners are well prepared to use technology they are more active participants in the learning process, capable of taking advantage of the full scope of the technology's capabilities, and more likely to see the full relevance of the technology to their learning. Although the comments from the focus groups suggest that things were bumpy at first, their sense of accomplishment was increased by having to work out the glitches and struggle with something that was intimidating and strange. So in the end, the students may have possibly benefited from not having been so well prepared.

Perceptions and Suggestions for Learning Improvements

Participants in both the print-based and CD-ROM groups described their learning experiences in very positive terms. However, participants from both groups, but especially the CD-ROM group, offered suggestions for improvement. Students' comments included: "Man, I would love to see every course on a CD-ROM. I really would"; "I really enjoyed the CD-ROM program. I did. I felt that to me it was the way I would like to do it all"; I was surprised because I really thought I'm going to hate every minute of this, and I didn't at all." Students were actively engaged in their learning and challenged by the course regardless of the treatment group assignment. The perception of a successful course experience emerged as a dominant theme in the five focus groups. Both print-based and CD-ROM groups recommended their respective experiences as distance adult learners to their peers. Both groups believed the course as they experienced it was better or comparable in quality to classroom-based courses.

Students were satisfied with the educational experience but offered some suggestions to create a more supportive learning situation. The major issues they raised related to the CD-ROM technology. Their suggestions included use of laptop computers, integration of more interactivity into the course design, enhancement of computer capability to run several screens so that one can alternate between activities simultaneously, inclusion of a click and drag function so that the text can be dragged onto a notebook or some sort of journal function, inclusion of more audio visual or video clips, and provision of both the CD-ROM and the print-based manual to students at the beginning of the course. Process-oriented suggestions included a hands-on training session with the computer and CD-ROM prior to course initiation, receipt and use of the computer several months prior to the start date of the course, and availability of a technical support person in each community where students are located.

Students perceived that their learning was positively influenced by the computer technology as well as by the print-based delivery of course content. Both media groups of students were motivated, challenged, and surprised by the amount of learning that occurred. The majority of multimedia students became obsessed with mastering the computer and its applications; some continued to believe the computer interfered with their learning, although there was a general trend to increased competence as the course proceeded. Learning was slowed at first for most students until their computer literacy skills improved. The most frequently cited advantages to the CD-ROM technology included repetition and reinforcement of material, variety in approach, self-pacing of learning, increased interaction, expanded learning resources, and novelty. The most

frequently cited disadvantages were initial anxiety, fear that information would be lost, and additional time required to learn about the technology.

Summary of Pre-Test and Post-Test Outcomes

The pre-test, post-test results suggest that students were positively affected in both the CD-ROM and print-based groups. The findings showed a trend favoring the CD-ROM group in terms of slightly higher performance levels but there was no significant difference in the cognitive achievement scores between the two groups. This is consistent with the findings of meta-analysis in the literature that there are no statistically significant differences in achievement levels between the CD-ROM and print-based groups.

However, course satisfaction data favored the CD-ROM group. In both, the course format issues and course functionality issues, the CD-ROM group scored slightly higher, although these differences were not statistically significant. Students in both groups responded positively to questions regarding recommending distance education courses to their peers and taking more distance education courses themselves. The CD-ROM group was also positive about registering for more multimedia-based courses.

In testing the difference in student attitude toward learning, the print-based group had significantly higher scores. The two indicators tested were comfort and functionality. The CD-ROM group was less comfortable with this format initially, because they were learning two new concepts simultaneously: computer technology and nursing content.

In summary, participants in both the print-based and CD-ROM groups described their learning experiences in very positive terms. Students were actively engaged in their learning and challenged by the course regardless of the treatment and demonstrated in the pre- and post-tests that they had effectively mastered the course content. The perception

of a successful course experience emerged as a dominant theme in both the quantitative pre-test, post-test results and the qualitative focus group perceptions.

CHAPTER 4

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

I undertook this study in order to examine the usefulness of multimedia opportunities in distance nursing education. I used a pilot program at St. Francis Xavier University to examine the implications that the introduction of multimedia had for a selected course that was offered simultaneously in the traditional print format. In this chapter I discuss the findings from the pilot program in light of the broader adult education and nursing literature.

In the first section I examine the influence of my role as coordinator in the study. Then I discuss the effectiveness of the planning process in introducing technology in a nursing program. Next, I discuss the facilitation and evaluation processes of the study, focusing on the data collected from the pre-program questionnaire and student focus groups. In the fourth section, I discuss the supports and barriers to using multimedia technology in the delivery of nursing education. In the fifth section, I discuss the broader implications this study has for continuing nursing education, for the use of distance methods, and for women as learners. Following these discussion sections, I draw conclusions and offer recommendations for other nurse educators interested in multimedia technologies in distance education.

Examining My Role

My participation in the study had two interrelated components: as the overall manager of the process logistics and as a member of the Steering Committee. I also

promoted the study within the university and served as co-researcher on the Steering Committee.

The first action I took was to immerse myself in the literature in order to research what other adult educators were doing that might be applicable to my study. My immediate attention to my own learning needs is consistent with Merriam and Caffarella's (1999) explanation that adults (including adult educators) are often motivated to learn because of the need to solve immediate problems. Furthermore, the literature that I uncovered on adult learning and the use of multimedia in distance education contributed to the overall quality of the study. For example, because our students were adult learners with years of experience and knowledge in nursing, I felt it was important to incorporate the principles of adult learning early in the planning process of the study. This is consistent with Burge and Roberts' (1998) recommendation that because the principles of adult learning are interrelated and demonstrate a holistic approach to understanding adult learning, it is essential to recognize learning needs, prior experience, and personal knowledge in order to assist adults to become productive and responsible learners.

I represented the participating students in the study at Steering Committee meetings by being their advocate and spokesperson. Knowles (1980) agrees that the starting point in program planning is always the adults' interests and needs; when these are addressed, a thriving program can be produced. All decisions and directives were negotiated at Steering Committee meetings that made management of this study very time intensive. Attaining consensus or agreement on all action items took many telephone calls, e-mails, and memos. Faculty members had prior student commitments and responsibilities that often took precedence over issues relating to the CD-ROM study. The Steering

Committee worked within a model of cooperation, negotiating interests, and working collaboratively. Clearly, my leadership, as program coordinator, was a critical element in the collaborative process of this study in order to accomplish the many demands and deadlines set by the Steering Committee. This is consistent with Donaldson and Kozoll's (1999) observation that leadership is a critical element in collaborative relationships and programming. They view leadership as the glue that holds the collaborators together as the program is planned and delivered. Comments from the Steering Committee members made it clear that they valued my leadership. One member indicated that having someone coordinating all aspects of study was critical to its success. Another commented "I do not know how you keep everything straight, there are so many critical issues to remember".

Usefulness of the Planning Process

I realized from the beginning that the planning process we used could influence the decisions we made. Thus, I decided to consciously adopt and apply a planning model in my contribution to Steering Committee leadership. The models I examined included: Brookfield (1986), Caffarella (1994), Cervero and Wilson (1994), and Vella (1994). I decided to use Caffarella's model because it provided me with structure and flexibility while emphasizing the importance of collaboration. I believe my decision to use Caffarella's model was a good one because the interactive nature of this model provided me with the necessary structure and flexibility I needed in the planning process. In this section I discuss how the ideas of collaboration and flexibility helped make the planning process useful.

Usefulness of Collaboration

The Steering Committee included experts in multimedia technology, technical design, program development and delivery, management and administration, nursing content and research. For example, the Steering Committee considered several options for the main menu of the CD-ROM before both the nursing content expert and technology expert agreed that the nursing content could be conveyed successfully. This Steering Committee approach is consistent with Moore and Kearsley's (1996) observation that a key factor in the success of distance education courses is that they are designed by course Steering Committees in which specialists work together to create a quality product. Donaldson and Kozoll (1999) also agree that collaboration is an important strategy in the development and delivery of adult education programs.

We worked within a model of cooperation to negotiate interests and accomplish tasks. Our Steering Committee dynamics were complex; for example, when the nursing content expert who was revising the content for the CD-ROM course requested specific graphics, the technical expert responded that he did not think they were visual enough. He replaced them with leading edge graphics. When the nursing expert previewed the CD and saw the new graphics, she wanted them replaced because they did not reflect the nursing concepts that were intended. Other members that were involved included the principal researcher, who had to maintain equality between the print-based version of the course and CD-ROM version; the program coordinator, who was attempting to maintain the production schedule; and the technical expert who had to be concerned with the visual effects of the CD-ROM. This complexity is consistent with Wilson and Cervero's (1996) suggestion that if program planners are responsible for the consequences of their work,

then all people affected by the program should be involved in the decisions of constructing the program. Although this study was considered to be a work overload for faculty members, all Steering Committee members gave generously of their time and expertise.

My role, as coordinator of the post-RN Bachelor of Science in Nursing program, put me in an interesting position in this research. Although I was coordinator, I was not the designated leader or chair of the committee. Although I carried out the committee's decisions, maintained daily contacts with students in the study, and made routine decisions in the program office, I was not identified as the leader. Yet, I assumed that role on many occasions. I believe that my years of experience as the program coordinator and my success in running the program made it possible for the Steering Committee to affirm my work and my unofficial leadership status in the group. This complex web of relationships confirms Cervero and Wilson's (1994) observations that no planning situation is devoid of power dynamics and that they must be acknowledged and negotiated if the planning process is to meet with success.

Usefulness of Flexibility

As program coordinator, I represented the students' interests on the Steering Committee through interacting personally with them, and by collecting data from pre-program questionnaires, pre and post-tests, focus group interviews, and written evaluations. Such data were very valuable in the evaluation process of the study that I address later in more detail. Occasionally, conflicts occurred related to timelines. When a university course is scheduled to start, deadlines have to be met, and there were many deadlines to meet during the study. Although these deadlines may not have appeared extremely important to all Steering Committee members, it was my responsibility as

program coordinator to coordinate events in order to stay on track and avoid delays. For example, the technical team could not begin the CD-ROM development until the content expert had selected the textbook and graphics, and revised the nursing content. One of the major stresses dealt with the completion of the disc. I wanted the students to have the CD-ROM course and technical orientation at least 2 weeks before the course started but even with constant negotiating I was fortunate to have the CD's sent to the students for the start date. This was a real concern for me knowing that the students were anxious about this new technology and they had no time to become familiar with it before they began their first nursing course. This is consistent with Burge and Roberts' (1998) recommendation that in order to realize the benefits of multimedia technology sufficient time must be allowed for students to become familiar with their new technology.

Facilitating Program Evaluation

In this section I discuss the facilitation and evaluation processes. I acknowledge the importance of both but focus on the influence the evaluation process may have had on findings. Evaluation began early in the study with the pre-program questionnaire collected from all students registered in the nursing course. Summative evaluations relied on post-tests, focus group interviews, and written course evaluations. This evaluative approach was consistent with Fenwick and Parsons' (2000) suggestion that using multiple methods for evaluation helps educators to develop a holistic understanding of the learner and the learning process.

Usefulness of the Focus Groups for Identifying Themes

The study Steering Committee decided to use focus group interviews as the main tool for gathering qualitative data. I organized the focus groups in local resource centers

to provide an opportunity for students to engage in open discussion in a safe, non-stressful environment. The focus groups consisted of 6-12 students with interviews lasting approximately one and one-half hours. The themes resulting from the interviews included: life as an adult learner, transition from one demanding role to another, the value of baccalaureate education, empowerment, and development of new skills. Although the intent of the study was to determine the effectiveness of the CD-ROM, it was impossible for the facilitator of the students to focus only on this dimension of the learning. This is consistent with Hayes and Flannery's (2000) discussion of women as holistic learners.

The richness of the data from the focus groups leads me to agree with Fenwick and Parsons (2000) and Krueger (1994) that focus group interviews are an effective means of gathering qualitative information. The focus group interviews were audiotaped and transcribed to prevent any misinterpretations by the researcher. The main objective of the interviews was to determine the learning needs of adult students using multimedia as the means of delivering a course by distance. My daily contacts with nursing students over a 20 year period made me insist that it was essential to involve the nursing students in the evaluation process since they were major stakeholders and this gave them an opportunity to discuss openly their felt needs. It is common practice in the distance nursing program to use student evaluations to revise current courses and to develop new ones. The value of using this data is evidenced by the overall success of the degree nursing program.

There is a growing population of nontraditional students who are making mid-life career changes due, in part, to job displacement or job dissatisfaction. Zerwikh and Claborn (2000) recommend that future nursing programs will need to be flexible to meet the learning needs of a changing population. The students in my study were experienced

nurses aged 35-50 years. Most did not have access to a traditional university because of being employed and living in rural communities. They were typically female with young families and aging parents. This is consistent with Worrell et al.'s (1996) findings that adult students in baccalaureate programs typically balance jobs and families, as well as their education. This description describes the adult nursing students in my study. Dirksen et al. (1993) agree with this profile and recommend that with the diverse needs of our adult learners, increased geographic access to baccalaureate nursing education is a must.

Students described in the focus group interviews how their demographics influenced their learning as adults. They felt that because they lived in rural communities, worked full-time, and were raising young families they did not have the opportunity to further their formal education but participated in continuing professional education through hospital based courses to keep abreast of health issues and advances in medicine. At no time did they feel capable of travelling to a university to begin a degree in nursing. Many of the participants expressed their gratitude for having access to the university while staying at home and continuing their employment. They felt that it had been frustrating to have the motivation to learn but not the access nor financial means. These nurses, who graduated from the diploma school of nursing 10-20 years earlier, had little experience writing research papers, giving presentations, writing exams, and using the computer for research and typing papers, all of which was part of the degree program curriculum. Shoemaker and Fairbanks (1997) cite these same barriers that adult learners face and acknowledge how considerable they are. In my study, I needed to be aware of all the barriers to learning the students faced, not only those regarding technology.

The students' feedback during the focus group interviews indicates that the CD-ROM media participants appreciated its capacity to present course content in a variety of methods, and that different methods met their diverse needs. For example, having read, seen, and heard the information, they could then type key points into their electronic journal, which they said provided more reinforcement of their learning. This is consistent with Tomlin's (1997) suggestion that adult students are "all-across-the-board in terms of ability, need, desire, and sophistication to learn" (p. 20). He recommends that as we educators develop our curricula we must determine our delivery modes and plan our courses with the constant of change as our focus.

A major theme that emerged from the focus group interviews was the idea of social support, especially in view of the fears and frustrations that technology caused. The distance nursing program is structured so as to provide student support services encouraging interactivity and security. Students are assigned to local resource centers where their group can meet for presentations, videos, and examinations. Each student group has an educational consultant who acts as their mentor and who organizes group meetings or provides individual academic counseling. Students commented that being able to have face-to-face discussions with their peers and with the consultant promoted a sense of connection and provided a source of social support. Their feedback underscores the importance of these current local resource centers, and indicates that the program planner cannot eliminate the local centers and expect the interactivity of the multimedia to suffice, especially for the initial courses. This is consistent with the findings of Daines et al. (1993) who suggest that people learn best when they are in a safe, secure learning environment and when they receive encouragement, respect, and validation.

Students discussed family support as being vital to their returning to formal education programs. For example, comments from both print-based and CD-ROM groups referred to support from family and friends in terms of encouragement, praise, and help with household responsibilities. This is consistent with Hayes and Flannery's (2000) findings that women's difficulties in the social organization of family and education are related to the extent to which women's time is controlled by the demands of others. They suggest that women who respond successfully to these conflicts, seek their partner's and family's support emotionally and in daily domestic tasks. Joseph (1999) agrees that women face many challenges to participation in formal education and suggests that adult educators provide better learning opportunities for this population. In light of these student comments and emphasis on support, St. Francis Xavier University will encourage family involvement and support by inviting family members to the on-campus and technical orientation sessions for new students. This will include the family from the start and they would have a clearer picture of the program and student responsibilities.

The focus groups identified several important themes, which provided the evaluators with a richness of detail in their examination of the qualities and characteristics of the degree program. This portion of the evaluation provided us with a sense of validation. The Steering Committee felt secure that our program goals and objectives were met and that our support systems provided the students with the necessary assistance for a great educational experience. Although we felt we had developed a successful program, it was reassuring to hear it from the students. Fenwick and Parsons (2000) agree that focus group interviews provide a valid method of qualitative evaluation because participants are able to convey information in that language.

Supports and Barriers to Using Multimedia Technology

In this section I analyze and interpret student feedback about challenges and barriers in returning to institutions of higher learning. In particular, I examine the role multimedia plays as a support for or barrier to the delivery of nursing education and student learning.

Supports to Using Multimedia Technology

Participants in the study reported that multimedia technology reinforced learning. Students spoke about their ability to go back over material two and three times by clicking on a button or listening to their professor on a video clip. Najjar (1996) similarly claims that the impact of multimedia technology on learning is related to the degree of interactivity between student and information, and the opportunity for self-pacing inherent with multimedia applications. Students remarked how diverse their learning needs were as adults and that the flexibility of multimedia technology provided them with options to meet their individual needs. Some students were content to work independently, whereas others required the support of peers and professor. Haughey and Anderson (1998) agree that there are several advantages in using multimedia for adult learners. They note that students have the flexibility to follow the sequenced program or diverge to optional electronic links.

Participants in the study commented how important it was to receive feedback from their professor in a timely fashion. Students could e-mail assignments to the professor, discuss questions with peers or the professor on-line, or talk directly to the professor on a toll-free line. A positive feature of the CD-ROM was the ability to do self-assessment and immediately apply new learning in the unit test incorporated at the

conclusion of each learning unit. For these adult learners, this was less intimidating than the classroom environment, which typically consisted of 18-20 year olds in a classroom-based nursing course. Students in this study reported that communication and interactivity increased with the use of the multimedia delivery format. This is consistent with the findings of Romiszowski (1988) who suggests that the role of communication and learning be closely related, stressing the role of feedback in the learning experience.

Students spoke of the sense of empowerment they felt with learning a new skill. The computer gave them access to a world of information through the Internet. They also referred to multimedia technology as a tool that stimulated their learning, and encouraged creativity, critical thinking, and decision-making skills. For example, one student commented, "This particular program allows you make more of your own decisions. You know, you don't have a lecturer standing in front of you telling you what to think." As professionals, students spoke of using this new skill in the clinical area to research data for the benefit of their clients and that the CD-ROM program encouraged them to make their own decisions, and to form their own ideas and opinions. As well, 85% of the participants reported on their pre-test needs assessment that this was the first exposure they had to the Internet; thus, the multimedia in the course provided an opportunity for them to develop Internet research skills. Devney (1998) agrees that nurses today are challenged to seek, analyze, and critically evaluate the application of new knowledge in the clinical area and that adult educators are realizing the profound need to improve students' skill in critical thinking and clinical judgement. Nurses should be skilled at using the Internet because it can provide a rich source of current developments and knowledge in health and medicine to help guide in clinical assessments and interventions.

The novelty of the computer was another theme from the student focus interviews. Students expressed their excitement in using this new technology. They described it as more interesting than print, fun to explore its capabilities, and stimulating. They expressed an interest in doing more course work through the CD-ROM format. This is consistent with Najjar's (1996) suggestion that learners' interactivity with the content increases as a result of the novelty of the learning experience.

Paticipants in the study spoke about the sense of connection that they felt to the university campus. Watching the video clips on the CD and having the opportunity to see and hear their professor highlight key points of each lesson enhanced their identify as a university student. Burge and Roberts (1998) agree with these findings and suggest that a key motivator for adult learners is the need to feel connected and to have supportive relationships.

Barriers to Using Multimedia Technology

Participants expressed initial anxiety about using computers, yet indicated enthusiastic interest about learning more about them. The new users felt anxious when faced with hardware and software that at first seemed foreign to them even though they had received a technical orientation. They expressed initial concern about missing or accidentally erasing vital information and their frustration in attempting to keep up with course content while trying to master this new technology. Students suggested that the receipt of computers and technical orientation several months before the course start date would alleviate this anxiety and provide a better learning experience than the technical orientation provided them one week prior to the start of the course. I had anticipated this adult learning need during the planning process of my study but budgetary constraints did

not allow for the additional time or expense. This is consistent with Burge and Roberts' (1998) recommendation that for students to realize the benefits of technology in their learning sufficient time must be provided for them to become familiar with their new equipment. This preparation time might also help mitigate some of the dehumanizing effects of technology on learners.

In the focus group interviews, participants spoke of the need for technical support in their local areas because of technological glitches and malfunctions in the CD-ROM program. Problems were primarily limited to the e-mail system and Internet access. Although students had access to technical support via a toll-free telephone number, most did not feel this was sufficient support for new users of this technology. This is consistent with the Burge and Roberts' (1998) findings that suggest that physical facilities, including technical equipment and environment, must be appropriate to meet student needs and supported where the learners are geographically located to facilitate learning.

Facilitating Continuing Nursing Education Through Distance Education

In this section, I discuss the issue of distance education as a strategy for increasing access to learning opportunities for nurses. Specifically, I discuss the need to extend the university to adult women who are attempting to earn degrees while working full-time.

Participants in the CD-ROM study spoke of the benefits of the distance delivery format for their first baccalaureate nursing course and how it met their immediate need for access to higher level nursing education and additional learning resources through the Internet. Research results suggested that students from both the CD-ROM and print-based groups were positively affected by their experience of learning nursing through a distance format. Although both groups met course objectives at a high level, there was not a

significant difference in cognitive achievement between the CD-ROM and print-based groups. However, the qualitative interviews suggest that multimedia CD-ROM technology may benefit other aspects of learning such as enhanced stimulation and retention of information.

Most of these adult learners were juggling multiple roles as mother, wife, employee, and student. Joseph (1999) agrees that women face many challenges in overcoming barriers to participation in continuing professional education, in particular, the difficulties of balancing the demands of work, family, and education, Thus, this distance program is one way to help these women respond to the Canadian Nurses Association resolution that the minimal educational requirement for the beginning nurse by the year 2000 be a baccalaureate degree in nursing. Similarly, Dirksen et al. (1993) agree that increased access to baccalaureate nursing education through distance education is a must in order to accommodate the diverse needs of our adult learners. Hayes and Flannery (2000) concur with these findings and suggest that because of the current growth in the number of adult women returning to formal education programs, adult educators, in general, must recognize the increasing importance of improving learning opportunities for women. The CD-ROM delivery format not only provided students with access to higher education, it also provided easy access to support materials, library, and course professor without leaving their home.

The theme of transition from one demanding role to another was paramount in the lives of these adult learners. A period of time to adjust to the new demands and role of student life was necessary. Students' felt that the distance education delivery format provided them with the flexibility they required to meet all their life commitments. This is

consistent with Rose's (1996) suggestion that women are more likely than men to stop studying at a distance because of the demands placed upon them and that access must be improved to allow for growth and development. Students spoke of the time they saved not having to travel to the university and the easy accessibility of distance educators' methods, enabling one to do the course work in their kitchen, at work, or while on vacation. As working nurses, the flexibility of distance education provided them with the access and delivery format to meet their learning needs. May (1994) acknowledges that distance education has provided increased access for women to study from the convenience of their homes and personal schedule but cautions adult educators to find new and better ways to serve the needs and interests of women. Distance education programs are increasingly using technology as their delivery format. According to Burge and Roberts (1998), adults have two key motivators that drive their actions: the need to feel competent, and the need to feel connected. Providing nursing students with a CD-ROM course not only brings them access to higher education but also keeps them connected with technology advances in their communities. This is one way to help women get on board with technology.

The value of the baccalaureate program was something that served as a motivator for students to continue their education in the degree program. Students expressed how this nursing course gave them a greater sense of professionalism and a broader knowledge of nursing. They realized how this program had opened their minds and they found this both exciting and challenging. I think a great surprise to most of the students in the study was realizing that this one nursing course was already changing the way they viewed nursing and life in general. Students felt that they were encouraged and supported in their learning through the student support services of the program and this provided them with

the opportunity to participate in setting their own learning objectives and goals. This is consistent with Mastrian and McGonigle's (1997) recommendation that the keys to promoting lifelong learning are to get students actively engaged in their learning process, get them excited about their learning, and give them ownership of the content and problems in a supportive environment. The use of the CD-ROM stimulated their learning and had them excited about the possibilities of learning new ideas.

During the focus group interviews students commented on the value of having their minds opened to new ideas and the need to question their actions. They acknowledged that their idea of professionalism had increased and that they were more aware of their own professional responsibility and accountability. Students indicated that even after one course they had become more assertive and contributed more in the decision-making process of their clients' care. They felt fortunate to be part of this learning experience while remaining in their homes and places of work. The American Association of Colleges of Nursing (2000) report similar findings suggesting that technological advances are increasing opportunities to improve the quality of and access to nursing education and that technology in education may well enhance the profession's ability to educate nurses for practice, prepare future nurse educators, and advance nursing science. It suggests that access to distance education for nurses in rural areas encourages nurses to remain in their communities thereby increasing the numbers of qualified nurses with advanced degrees. The use of the CD-ROM as a support to distance materials is very important because it shows how technology can be carefully and critically integrated in a nursing education program. Our study also indicated that participants valued being able to remain in their communities.

Conclusions

The factors that influenced student learning and satisfaction in distance learning situations are complex. Consequently, the focus group evaluations needed to address many factors influencing learning, including demands of multiple responsibilities, at home and at work. Evaluating the effectiveness of the CD-ROM alone could not be done in isolation from a discussion of multiple influences on learning.

This study identified some technological needs, expectations, and perspectives of working nurses related to using multimedia in distance courses. The research findings were communicated to policy makers regionally and nationally through nursing journal articles, conference abstracts, and presentations at meetings and conferences. From these findings I have drawn several conclusions:

1. The development of effective Steering Committee work was established early in the planning stage of the study. The Steering Committee was characterized by shared leadership, vision, open-ended discussions, joint decision-making, and an action orientation. Steering Committee members were from various segments of the university; each person contributed to the study with her or his specialty and expertise. This was perceived as a very positive experience by Steering Committee members as evidenced by positive dialogue during Steering Committee meetings and even following the completion of the study.

2. Focus group interviews are useful as an evaluation tool with adult learners in identifying the major topics of concern. In this study, the focus group interviews provided the participants with an opportunity to discuss their concerns in detail and to speak freely. The usage of focus group interviews in the evaluation process provided the

students, as stakeholders, with an opportunity to help to change or improve the course design. The data collected from these interviews was very constructive and helpful in the evaluation process.

3. The CD-ROM produced during this study has significant potential to impact learning positively in a critical area of education. Although it did not increase cognitive achievement, it did result in a positive attitude, increased interest, and enhanced learning. The qualitative interviews suggest that multimedia technology may benefit other aspects of learning such as enhanced stimulation and retention of information. This CD-ROM can provide greater access to a quality university nursing program for a larger population.

4. The study has provided a model for the use of technology that other adult educators can look to for guidance and support. This model, based on a solid foundation of adult principles and practices, can be an effective tool in the development of future courses delivered through the multimedia format.

5. Participation in the study has provided nursing students with enhanced workforce preparation. Nursing students were excited to transfer their newly acquired knowledge of multimedia technology to their workplace. Nurses must be prepared to be faced with leading-edge technologies in their hospitals, communities, and continuing education. Multimedia technology will be used increasingly to support and enhance teaching and learning that occur in these communities.

6. Students in both the print-based and CD-ROM groups had successful learning experiences. They were actively engaged in their learning and challenged by their course experience. Students enjoyed studying nursing at a distance, felt empowered, and

were successful in completing their first course with above average evaluation. Students from the CD-ROM treatment felt an additional achievement in their mastering the computer technology at the same time.

7. Logistical details are an essential part of the planning and implementation process of any new technology. Attending to the details was a critical element in the CD-ROM study that required a considerable investment of time, energy, and expertise. The investment, however, paid off extensively in the delivery of a quality product and student satisfaction in the learning process.

8. Evaluating the effect of the CD-ROM alone can not be done in isolation. While it is important to identify the cognitive achievement, attitude, and satisfaction differences between the two groups of learners (CD-ROM and print-based), even with random assignment to groups, one must recognize that there are multiple influences affecting the learning process. It was impossible to control for the multiplicity of factors that impact on the learning process and confound the outcomes of the evaluation of the effectiveness of the CD-ROM on learning.

9. The insights gained from this study suggest that the assumptions were accurate. For instance, my assumption that the majority of students would be excited about the possibility of participating in a research study as part of their contribution to the program was confirmed during the study. This level of student interest facilitated the assignment of participants to groups. Although a few individuals expressed a desire not to participate in the CD-ROM group, this small number did not affect implementation of the study.

The capacity of the educational technology to enrich the learning process for students from varied learning backgrounds was supported by the findings. Students commented in the focus group interviews that "learning was continually reinforced when you could see the content, hear the content, and read the content."

Finally, although a number of students expressed initial anxiety over technology, they quickly learned to cope with it and by the completion of the course they expressed a desire to do future courses using technology. The majority of students in both groups verbalized concern about their ability to do university level course work. This continued even after completion of the first course.

Recommendations

Students commented on how much they enjoyed using computer technology while completing a distance nursing course, but felt too much pressure learning new nursing concepts and learning new technology simultaneously. I offer six recommendations for other adult educators.

1. I recommend that students doing their first course using the multimedia format should have training in the use of multimedia before they become immersed in course content. A move in this direction requires that adult educators be prepared to meet the challenges that follow. Introducing novices to technology and supporting them during the learning process is paramount. Nursing students in the focus groups suggested that they should have been given computers several months prior to the start date of the nursing course. This would have provided time to become familiar with the computer and the software applications and would have avoided their frustration with this new computer technology during the course delivery.

2. Opportunities for access to higher education are becoming more available as universities move in the direction of distance education and interactive multimedia applications. For increased access to the post-diploma baccalaureate degree in nursing, I recommend that the complete degree program be offered through the multimedia format. Students would have increased access to resources, more sense of connection to the university, and a sense of knowing the course professor. Students nationally and internationally could be linked to the university campus.

3. The print-based manual has proven to be a very successful mode of delivery of the Bachelor of Science in Nursing curriculum. I recommend the integration of print-based and CD-ROM materials together as vehicles to communicate nursing knowledge to post-diploma nurses. Both delivery methods have merits that together can provide the best learning opportunity for the student. The design of the course should not hinder the student from learning to his or her potential. Technology should not be so overwhelming that the student can not focus on the nursing content.

4. When courses are delivered by the CD-ROM format I recommend that students have access to available technical support staff in their local areas on a daily basis. This student service is necessary to avoid computer and software glitches that slow down learning and cause frustration. Without the proper infrastructure in place, multimedia delivery format could be nonfunctional. The infrastructure should also include technical preparation of faculty member and staff in order to support the student population using multimedia.

5. I recommend that adult educators use focus group interviews more extensively in their needs assessment and evaluation practices. Focus groups can provide

effective identification of the major student concerns and needs more quickly and more informally than written evaluations and questionnaires.

6. I recommend that adult educators use a committee model for their program planning. Although time consuming, committee work can increase the opportunity of meeting the needs of both adult learners and educators by directly involving all stakeholders who are affected by the program.

7. Anytime adult educators are introducing technology to a learning process, adequate resources in terms of time, skill, expertise, and financial support must be available to allow the necessary logistical planning to proceed uneventfully. These resources will contribute to the successful implementation of the study. A recommendation of this study would be the involvement of a content expert, a technology team, a researcher, a program coordinator, and a senior administrator to ensure the necessary expertise is available to provide the attention to logistical demands and complexities involved in the CD-ROM study.

8. A recommendation of this study is to use a multifaceted approach to evaluation of student learning, inclusive of both qualitative and quantitative data collection. This could include a combination of focus group interviews and survey questionnaires. This dual approach of both qualitative and quantitative data increases the likelihood of obtaining a rich description of the learning outcomes from this study.

9. A recommendation of this study is the establishment of learning support services and the inclusion of workshops that focus on generic skill building in areas such as writing, oral presentation, library skills, critical thinking, and reading. The development

and refinement of these skills can contribute to enhanced confidence in this group's ability to do university-level course work.

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APPENDIX A

Focus Group Interview Guide

A. Getting Started: Why are we here?

1. We are here to discuss your views, experiences, perceptions and concerns with respect to what it has been like for you the last 10-12 weeks as adult learners using new technology to learn at a distance. There are no right or wrong answers to any question or issue we discuss. We simply want to hear your thoughts and concerns about what this educational experience has been like for you and what issues are important for you to raise with us so that we can further enhance our educational offerings for post RN learners.

2. We are conducting approximately 5-10 focus groups across program sites with students such as you to understand your experience with distance learning and/or technology.

3. You are the experts: Your feelings, experiences, and opinions can help us more fully understand the needs of adult learners.

4. Interviews will last for about 1-1 ½ hours. Coffee, tea and snacks are available.

5. The role of facilitator/interviewer is to keep our conversation on track and to make sure we finish on time -- also to ensure that everyone has a chance to contribute and share what they wish. If you feel uncomfortable with any of the questions, please feel free to not answer.

6. Use of tape recorder (explain). Confidentiality is assured. Your names will not appear on the report.

B. First of all, let's focus on your experience of the past few weeks as an adult learner.

Let's talk about the past week. What was it like to be a student learning by a distance? What was it like to use technology (CD-ROM) to learn? Now, would you say that this week you just described was typical for you as an adult learner? If not, what was different?

Now thinking about your experience as an adult learner over the past 10 weeks:
Have there been changes in the way you learned/approached the course over the 10 weeks? Have there been changes in your learning due to the technology? If so, elaborate.

What are your feelings about using technology to learn nursing at a distance? What if anything has changed about your feelings toward technology (CD-ROM) over the past 10 weeks? Has the technology helped you to learn? If so, in what way?

Are there things you disliked about learning at a distance? Are there things you disliked about the technology? If so, what are they? The following are possible probes for each question.

- anxiety producing
- delivery problems
- costs
- interference with family
- lack of control
- not user friendly, etc.

C. **Factors that enhanced the learning process:**

Could we talk briefly about the benefits, if any, to you, of the technology and learning? Has the technology had an effect on your view of yourself as an adult learner?
Has the technology made learning easier? In what way? The following are possible probes:

- cognitive achievement
- economy of time
- retention rates
- student directed
- reinforcement
- attitude toward
- satisfaction level, etc.

What support did you have to use the technology? What support did you need to use the technology? What, if anything, could we do differently with the technology to enhance learning?

D. Factors that hinder the learning experience:

What worked against you in the learning process? The following are possible probes:

- pressure from others
- stress from family
- computer anxiety
- time pressures.

What would have to be done to enhance the learning experience for you?

Create a list of things the University should do to deal with the factors that hindered your learning experience.

E. In closing, let us create the ideal educational experience for adult learners who are studying nursing by distance education methods using technology.

Think about the things that you would have found most helpful over the past 10 weeks.
Has your attitude toward technology changed as a result of this course?
What things should we do to encourage nurses to learn this way?
What kinds of support should we provide to learners?
What should we focus on in the orientation?
Has learning by means of technology been a positive experience for you.

F. Is there anything else you would like to share with us about this experience?

Thank you so much for participating in this study.