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ABSTRACT

Community college nursing students' perceptions about computer-based instruction (CBI) were identified and examined from the standpoint of their implications for adult continuing education and program planning. Fifteen second-year nursing students, college faculty, and the nursing director were interviewed. The following were among the key findings: (1) CBI is helpful in learning and applying theory because it helps reinforce class content, provides new information and perspectives, is interactive and multisensory, and accommodates different learning styles; (2) CBI is not helpful in developing nursing skills because it lacks hands-on activities; and (3) problems associated with CBI include too many assignments, equipment malfunctions, problems related to access to the computer lab, and excessive noise and overcrowding in the computer lab. The findings indicated that CBI should be applied to appropriate content areas, make reasonable demands on students, and occur in an environment with minimal distractions. (Thirteen tables/figures are included. The bibliography contains 83 references. The following are among the items are appended: demographic information about the student nurses; the student informed consent form; the study interview guides and nursing faculty focus group questionnaire; the faculty questionnaire results; guidelines for direct observation in nursing laboratories; and codes supporting three major metapolicies.) (MN)

NORTHERN ILLINOIS UNIVERSITY

A CASE STUDY OF PERCEPTIONS OF COMPUTER-BASED INSTRUCTION BY NURSING STUDENTS IN A TWO-YEAR COLLEGE: IMPLICATIONS FOR ADULT CONTINUING EDUCATION AND PROGRAM PLANNING

A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE
DOCTOR OF EDUCATION

DEPARTMENT OF COUNSELING, ADULT AND HEALTH EDUCATION

BY

JOANNE LESKI

DEKALB, ILLINOIS

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Certification: In accordance with departmental and Graduate School policies, this dissertation is accepted in partial fulfillment of degree requirements.

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December 6, 2000

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ABSTRACT

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ABSTRACT

The purpose of this case study was to gain an understanding of computer-based instruction (CBI) from the students' perspective. The study explored student perceptions of CBI experiences that enhanced or hindered learning.

The study was conducted among second-year nursing students at a community college. Fifteen students, the nursing director, and two laboratory staff members were interviewed, using open-ended questions. A focus group was conducted among nine nursing faculty members. Interviews and the focus group were audiotaped, transcribed, and coded.

Coded responses were classified into the following categories:

1. Characteristics of CBI that enhance learning. These included program characteristics such as interactivity; reinforcement of class content; application of theory, multisensory and realistic; curriculum characteristics, such as combination of required and optional assignments; accommodation of learning styles; and environmental factors, such as helpful staff.

2. Characteristics of CBI that hinder learning. These included program characteristics such as time pressures, no hands-on, and no rationales; curriculum characteristics such as too many assignments; and environmental characteristics including noise and overcrowding in the nursing laboratory.

3. Student behaviors. Those enhancing learning included working in groups, working alone, and reviewing for exams. Behaviors that hindered learning included rushing/skipping parts and cutting corners.

4. Student suggestions for improving CBI. These were curriculum related,

such as using programs in class and fewer optional and required assignments, and environment related, such as improved access, increased privacy, and longer laboratory hours.

The number of comments made by students and faculty for each code were counted and rank ordered. Bar charts presented structured reported findings in the order of significance. Further analysis of the coded responses led to the development of three major metapolicies: (1) CBI should be applied to appropriate content areas, (2) CBI should make reasonable demands on students, and (3) CBI should occur in an environment with minimal distractions. A model was developed to help optimize the application of CBI to adult continuing education programs. This study can add to educators' understanding of how students perceive CBI and suggests ways in which CBI can be better utilized.

ACKNOWLEDGEMENTS

This study would not have been possible without support, encouragement, and assistance from a number of people. I would like to express my appreciation and acknowledge these individuals.

I would like to thank the 15 nursing students from the Class of 1999 at Forest College who agreed to be interviewed. Their perceptions and insights are the core of this study. I am thankful to the nine faculty members who participated in the focus group and two nursing laboratory staff members who were interviewed for their time and expertise, and their sharing of valuable perceptions. In addition, I owe a great deal of thanks to the director of the program, who participated in the interview process and allowed this research to be conducted within the program of nursing.

I was very fortunate to have the opportunity to work with three most knowledgeable and respected faculty members, my dissertation committee. Thank you to my chairperson, Dr. Richard Orem, and to Dr. Paul Ilsley and Dr. James Lockard for their outstanding assistance, guidance, and expertise.

Last, I would like to thank the people who have been a source of support, love, and encouragement throughout my doctoral studies: my mother, Marie, and my husband, Dan.

DEDICATION

To my husband, Dan, with love and gratitude

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PREFACE

My interest in nursing student perceptions of computer technology is an outgrowth of my own experience as both an educator and a student. I earned my baccalaureate degree in nursing from Bradley University in 1974 and my master's degree in nursing in 1978 from Governors State University. This was well before personal computers became commonplace in business, education, and the home.

By the time I began my doctoral studies in 1992, however, computer-based instruction had become part of the nursing curriculum where I taught and computer literacy was an expectation in the doctoral program in which I was a student. One of my first doctoral courses was a multimedia course in which I was required to develop an instructional program using Linkway Live! Although working with this DOS-based program was at times frustrating, I was very pleased with my program on Dysrhythmia Interpretation and received a highly positive response when I used it with students. As a result of this experience, I chose Instructional Technology as my cognate and took additional courses to learn more about graphic presentations, the Internet, and program design.

I also became more involved with computer technology in my work as professor of nursing at a community college. I increased the use of interactive videos and computer-assisted instructional programs in the modules I taught. I also developed multimedia PowerPoint presentations for several of my class sessions. This activity led to my appointment as chairperson of the Nursing Department Technology Committee. I gave presentations on the use of multimedia to my peers at a faculty retreat and at division meetings. I also organized a forum on the use of

new technologies in nursing education, which was attended by representatives from five associate degree nursing programs.

My introduction to computer technology had another benefit. I had been working as a staff nurse or nursing faculty member for more than 15 years when I first encountered the personal computer. Assuming the role of novice learner as an adult helped me to better understand the fears and frustrations experienced by my students as they begin their nursing education.

Personal experience has convinced me that computer-based instruction can play an important role in nursing education. I am equally sure that it will not reach its full potential until it is fully integrated into the curriculum along with classroom, laboratory, and clinical experiences and is better understood by the faculty who select and assign programs.

I am also convinced that there is much that students can teach us about computer-based instruction. This dissertation is an attempt to understand computer technology by listening to a group of students share their experiences with a variety of computer-based programs.

CHAPTER 1

INTRODUCTION

The computer has transformed nursing. Presently, computers are essential tools in hospitals, community health agencies, academic institutions, research centers, and other settings where nurses function. "Nursing informatics" has emerged as a new term to describe the use of computer technology in nursing and nursing information systems (Saba & McCormick, 1996).

Two national nursing organizations, the National League for Nursing (NLN) and the American Nurses Association (ANA), have recognized the need to become involved with nursing informatics. In 1991, the NLN recommended that computer technology be a part of the nursing curriculum and part of the accreditation criteria for educational institutions. In 1992, the ANA recognized nursing informatics as an approved nursing specialty (Riley, 1996). A task force was selected to identify the standards of practice for this specialty area. They developed the definition of the practice of nursing informatics as "the development and evaluation of applications, tools, processes, and structures which assist nurses with the management of data in taking care of patients or in supporting the practice of nursing" (Arnold, 1996, p. 333).

The field of nursing education has incorporated a number of computer-based technologies into its curriculum. Computer-based instruction (CBI) includes tutorials, computer-assisted instruction (CAI), interactive video instruction (IVI), and computer simulations as well as presentation graphics, which are used in support of traditional lecture (Cohen & Dacanay, 1994).

The Helene Fuld Health Trust has supported this trend through the establishment of the Fuld Institute for Technology in Nursing Education (FITNE). The purpose of this not-for-profit organization is to assist nursing educators with the integration of computer technology into the nursing curriculum. FITNE also develops educational software for nursing schools, including IVI and CD-ROM programs (Helene Fuld Health Trust, 1993).

Another factor that has encouraged the use of computers in nursing education is the change in the standardized test that nursing school graduates must pass before they receive their registered nurse's license. "Since April 1994, the National Council Licensure Examinations for Registered Nurses (NCLEX-RN) changed from paper and pencil twice yearly administration to year-round administration via online computer-based testing in selected locations in every state and United States territories" (Riley, 1996, p. 539). Most nursing schools have decided to acquaint their students with computers before they face this critical test.

Research on the effect that computer technology is having on nursing education has focused on three areas. The first and largest group of studies has compared CBI with traditional lecture. A meta-analysis of 29 studies found CBI to be moderately more effective than conventional methods of instruction (Cohen & Dacanay, 1994). Another study found that when IVI was used in combination with lecture, student knowledge and self-efficacy were significantly increased (Froman, Hence, & Neafsey, 1993).

The second area of study has investigated how student learning styles are related to the effectiveness of CBI. Yoder (1994) concluded that learners who prefer active experimenting learn better with computer-assisted interactive video instruction (CAIVI), and those who prefer reflective observing do better with linear video

presentations.

The third area investigated what impact the learning environment had on student satisfaction with CBI. Koch, Rankin, and Stewart (1990) found a strong preference for working in a group when using computer-assisted learning programs and a strong preference for faculty supervision when working alone. Van Dover and Boblin (1991) found a high interest in learning computer applications but a low level of comfort in working with computers.

Nursing education is, of course, only one discipline within community colleges and universities, and these are part of a total educational system, which exists within other social, economic, and cultural systems. However, an investigation of how computer technology has impacted nursing education can help illuminate some of the ways that current and future computer technologies have impacted and continue to impact the entire educational system and society as a whole. The context of this study is a single nursing program within a community college, but the results should contribute to the understanding of broader contexts.

Statement of Problem

While numerous studies have examined quantifiable outcomes achieved through CBI and compared them with outcomes achieved through traditional teaching strategies, student perceptions of CBI are poorly understood and adult educators lack convincing qualitative arguments for optimizing the application of CBI.

Purpose of the Study

The purpose of this study was to explore student perceptions of various CBI

experiences and to gain an understanding of how these perceptions enhance or hinder learning. Introducing CBI into nursing education has required significant investments in hardware and software. But these high costs were undoubtedly outweighed by high expectations. Here was a teaching technology that could combine multimedia capabilities with immediate feedback to the learner. CBI was expected to provide a superior learning outcome for the dollars and time being invested. Instead, most studies of CBI have found the outcomes to be equal or only slightly better than outcomes achieved through traditional lecture.

Merely measuring outcomes will not change outcomes. What is needed are studies of CBI that can provide direction for improving outcomes. In 1980, Kulik, Kulik, and Cohen conducted a meta-analysis of findings from 59 independent evaluations of college CBI. They found that most of these studies focused on quantifiable outcomes that reflected the values and interests of faculty. These included student achievement, correlations between aptitude and achievement, course completion rates, student attitudes toward the subject matter and the course, and instructional time. In 1985 and 1987, Kulik and Kulik conducted follow-up studies analyzing 101 and then 199 studies. In their 1991 meta-analysis of 254 studies, they reported that

> CBI raised examination scores in a typical study by 0.30 standard deviations, or from the 50th to the 62nd percentile. This figure is very close to the average effect size of 0.31 reported in our earlier meta-analysis of findings from 199 studies of CBI. (p. 88)

Quantitative research studies are measuring how effective CBI is in achieving instructor-defined objectives but are not increasing the effectiveness of CBI. I believe that qualitative studies that examine CBI from the students' point of view can provide insights into students' perceptions and attitudes toward CBI and the resulting student behaviors that limit effectiveness of these programs.

I am aware of only two previous studies that provide insight into nursing student perceptions of computer technology. Thede, Taft, and Coeling (1994) conducted the first study. They interviewed nursing students who had used one of four computer programs. Content analysis of these interviews revealed three overall categories of comments: "(a) the learner, (b) the learning environment, and (c) the software design, including interactive features, how the learning design uses these features to achieve learning objectives, and the content" (p. 299). Krothe, Pappas, and Adair (1996) interviewed nursing students who had used computer technology in a collaborative assignment in which they designed a community assessment tool. Content analysis of these interviews revealed an enhanced sense of ownership of the final product and a more positive group experience when computer technology was used.

Additional open-ended studies of students' perceptions of their CBI experiences with other software programs and in other learning environments are needed. Only when a variety of CBI experiences are understood from the students' point of view may the full potential of CBI be realized.

Research Questions

Five research questions emerged from this investigation:

1. How are student perceptions of CBI timebound?
2. To what extent is CBI viewed as enhancing learning?
3. To what extent is CBI viewed as hindering learning?
4. How can CBI be implemented effectively in the community college environment?
5. What are the benefits of CBI to nursing education?

Significance of the Study

The use of computers in nursing education is still a relatively new phenomenon and has been technology driven. New advances in computer hardware and software have been adapted at considerable expense as they have become available. Community colleges have made significant use of educational and clinical software applications; "about 30% of all courses use computer technology. The use of computer technology is more prevalent in nursing than other disciplines, specifically the humanities and sciences" (Carty & Rosenfeld, 1998, p. 261).

Improvements in each new generation of products are obvious. Research that measures the effectiveness of this rapidly changing technology using faculty-defined outcomes has been sufficient. The time has come, however, to focus on making better use of technology by making it a more integral part of the educational experience. But to do so, educators must have a better understanding of how students are experiencing technology and areas in which it can be best utilized as a learning tool. This study provides insights into nursing students' perceptions of their experiences using CBI as part of their education.

This study can help guide the nursing faculty at Forest College (a pseudonym) in reassessing how CBI is utilized in their nursing program. Specific recommendations on selecting individual programs, curriculum issues, and improving the learning environment are included in Chapter 5. These include suggestions made by the students who participated in this study as well as by this researcher. Educational policy at other nursing programs and other community colleges may also benefit from a reassessment of CBI from a student viewpoint. Finally, some suggestions for optimizing the application of CBI to any adult

continuing education program are provided.

Definition of Terms

To maintain consistency and provide clarification, selected terms used throughout the study are defined. These definitions began with references to such experts as Thede (1999) and Riley (1996) but have evolved over the course of this study.

Computer-based instruction (CBI): A learning activity in which a student or group of students interacts with a computer program that has been specifically designed to deliver educational content.

Computer-assisted instruction (CAI): Often used as a synonym for CBI. However, at Forest College, it refers to a specific set of software programs that are delivered via the college's network from a file server. These programs were originally delivered on floppy discs. They are characterized by a primarily textual presentation augmented with simple illustrations and still photographs. Students interact with these programs via the keyboard and occasionally by mouse.

Interactive videodisc (IAV): A set of programs delivered on 12-inch laserdiscs that use a computer linked to videodisc player and provide a presentation characterized by live action motion pictures and sound. Students use a touch-screen monitor to activate the sequences and to reply to questions.

Computer disc--read only memory (CD-ROM): Used at Forest College to refer to a set of computer programs delivered on compact disc. The presentations of these programs are characterized by rich graphics supplemented by animation, live action motion pictures, and sound.

These last three terms are commonly used at Forest College because they guide students to the appropriate shelves (in the case of laserdiscs or CD-ROMs) and workstations for each program. They also represent successive generations of technology. My attempt to discover a difference in student attitudes toward successive generations of technology was frustrating. Apparently, in the memories of these students, differences in content and program design overwhelmed the technical differences in storage media. It was as if I was asking them to name their favorite records, eight-tracks, cassettes, and CDs rather than their favorite songs. Students are apparently so accustomed to the rapid advances in computer technology that they take them for granted.

Nursing modules: Defined at Forest College as the units of content and practice that make up the total nursing curriculum. Each semester-long course is composed of three to four modules. Each module within a course has its own objectives, its own teaching team, and its own learning experiences, including specific CBI, laboratory, and clinical assignments.

Conceptual Framework

My inquiry into perceptions of CBI was guided by concepts and theories of adult education that I have internalized through my experiences as a nursing faculty member and doctoral student. I share Knowles' (1980) contention that adult learners are different from children. Adults are self-directed, they have experiences that are an important learning resource, their readiness to learn is oriented to the developmental tasks associated with their social roles, their perspective toward learning is for immediate rather than delayed application of knowledge, and they are problem-centered rather than subject-centered. Adult learners are also internally

versus externally motivated to learn (Knowles, 1984).

I believe that CBI is an excellent medium for self-directed learning. Multimedia capabilities can provide simulated experiences and opportunities for immediate application of knowledge that might not otherwise be available. Learning experiences can be structured around problem solving, and consequences of decisions can be experienced without real-world risk.

I agree with Brookfield's (1990) proposal that "the development of critical thinking [is] the underlying rationale for college teaching" (p. 20). One of the many critical-thinking strategies he proposed is simulations "which involve students in recreating within the classroom dilemmas, crises, and problems they have experienced or are experiencing outside" (p. 116). Although Brookfield defined simulations as a classroom activity, computer simulations can serve a similar function.

I also find merit in the constructivist view of learning. I agree with Rodenburg's (1998) assertion that

> knowledge is constructed by the learner, not passively received or assimilated. Meaningful knowledge is the result of active reflection and integration on the part of the learner and is best accomplished by means of tasks that bear some relationship to real-world experiences. (p. 2)

According to Thede (1999), "most educational software follows the behaviorist theory of learning, although approaches that follow a more constructivist approach are being seen" (p. 178). The ability of CBI to provide decision-making opportunities within a realistic multimedia simulation makes a constructivist approach feasible.

Constructivist educational theorists suggest that learning has three components. The first is cognition, in which the learner encounters knowledge in an active way. The second is motivation, which has two mechanisms--self-efficacy

(perceptions of competence) and personal agency (perceptions of control) (Cust, 1995). The third component is metacognition, a self-managing, conscious act of thinking about learning (Peters, 2000). The constructivist perspective influenced my investigation of CBI because it led me toward my attempt to understand how students perceive, interact with, and are motivated by the learning experience. However, I personally draw the line at embracing a constructivist world view that suggests that reality is merely a social construct that can also be deconstructed. (Readers wishing to investigate this world view are directed to Denzin and Lincoln [1994].)

The next chapter, Chapter 2, contains a review of the literature on computer technology in nursing education. Computer technology and traditional instruction, learning styles, and computer technology and student satisfaction with computer technology are the focus of this review. In Chapter 3, the research methodology is discussed. Chapter 4 discusses five themes that emerged from the research. Chapter 5 contains a discussion of three metapolicies, implications of this study for adult continuing education, and recommendations for future research.

CHAPTER 2

REVIEW OF LITERATURE

A review of the literature on the topic of computer technology in nursing education reveals three major themes: computer technology and traditional instruction in nursing education, learning styles and computer technology in nursing education, and nursing student satisfaction with computer technology. Abstracts on hundreds of other studies of CBI and other educational programs were also examined, but only a few relating to general higher education and other health care programs were deemed relevant to this study.

Computer Technology and Traditional Instruction in Nursing Education

The first area of inquiry compared computer technologies with traditional methods of instruction. Cohen and Dacanay (1994) used a meta-analysis of 29 studies concerning CBI in nursing education. The results revealed that CBI showed a moderate advantage in achievement when compared to conventional lectures. IVI applications had a larger effect than other CBI applications. Lastly, CBI was more effectively used in elective rather than required courses. "This finding may relate to motivation. Nursing students who `volunteer' for a course may be more amenable to innovative instructional methods and therefore benefit more from their application" (p. 92).

Gilbert and Kolacz (1993) compared the effectiveness of a CAI program and small-group review in teaching clinical calculations to associate degree nursing

(ADN) students. They concluded that CAI and small-group review were equally effective when used as supplemental instruction.

McNeil and Nelson (1991) used a meta-analysis of 63 studies investigating IVI and cognitive achievement. The results of their study suggest that IVI is an effective form of instruction. Another study that explored the effectiveness of IVI as a method of instruction was Napholz and McCanse (1994), who found significantly higher test scores after four weeks among students who used IVI compared with those using only traditional lecture and discussion groups. However, at the end of the semester, the final test scores did not differ between the intervention and the control group. Schare, Dunn, Clark, Soled, and Gilman (1991) found that there was no difference in cognitive achievement scores between the control (taught by lecture) and experimental (taught by IVI program) groups. However, Froman et al. (1993) did find a significant increase in knowledge scores when IVI was used in combination with traditional lectures. When either of these methods was used by itself, neither one was superior.

A study to compare the effects of two teaching methods on students' factual knowledge about blood pressure and their ability to measure blood pressure was conducted by Beeson and Kring (1999). Sophomore nursing students were randomly assigned to either a traditional lecture/linear video presentation or a CAIVI presentation. The results of the study revealed that students taught by the traditional method gained more factual knowledge than the students taught by the IVI. However, there was no significant difference on the actual skill performance of blood pressure measurement between the traditional lecture/linear group and the IVI group.

The effectiveness of CAIVI was studied by Sanford et al. (1996) in teaching rheumatology to physical and occupational therapy students. They used a CAIVI

program, HP-RHEUM, to teach the clinical finding of arthritis. The control group was taught using traditional lecture, and the experimental group was taught with the HP-RHEUM program. The results revealed that on test questions linked to slides illustrating visual rheumotologic disease concepts, the HP-RHEUM group scored significantly higher. Other than this finding, there was no significant difference between the groups.

McAlindon and Smith (1994) conducted a study to evaluate two IVI programs used to teach the concepts of quality improvement. Fifty-five registered nurses participated in the study. They were randomly assigned to view an IVI program that contained concrete examples or to view a program that contained abstract examples. The results revealed a significant increase in knowledge from their preprogram to postprogram questionnaire for both groups. Those participants who viewed the abstract program scored above the median.

Ayoub et al. (1998) examined the use of an interactive computer classroom (ICC) compared with a traditional lecture/discussion (LD) format for a nursing management course. The results of their study revealed that the examination scores and frequency of class participation were higher for the ICC group than the LD group. There was no significant difference between the groups regarding class attendance.

Cobb (1999) conducted a study to investigate the use of IVI with cooperative learning strategies. Junior-year nursing students were assigned to one of three groups: homogeneous average achievement, homogeneous high achievement, and heterogeneous mixed achievement students. The students viewed a lesson related to auscultation of heart sounds using IVDI and were videotaped during the lesson. The results revealed

> no significant differences among the groups in their interaction frequencies, cooperativeness, or achievement on group posttest completed immediately

> after viewing the lesson. Homogeneous high-achievement students scored significantly higher than the other two groups on the individual posttest given two weeks after viewing the lesson. However, all three groups had very low scores. (p. 89)

Also identified was the need for technical support for students lacking experience with IVDI.

According to White (1995), the "high fidelity" simulations provided by IVI technology have been a valuable learning tool. However, "falling costs of large hard drives on which video can be digitized and delivered directly to the computer screen and the growing capacity of CD-ROM are rapidly replacing interactive video technology" (p. 235).

Jeffries (2000) compared CD-ROM with traditional lecture method using baccalaureate nursing students. Students were randomly assigned to either the technology group, who used IVI to learn medication administration, or the traditional group, who learned medication administration through lecture and viewing videotapes on medication administration. Results of the study revealed that both groups gained knowledge. However, the technology group had significantly higher posttest scores. There was no difference in skill performance between the two groups.

Two other studies compared computer-managed instruction (CMI), in which the instructor functions as a tutor, with traditional lecture. Halloran (1995) studied the integration of keypad questions into CMI. The results of the study demonstrated that although the experimental group initially achieved lower test scores, they achieved increasingly higher test scores as the semester progressed. At the end of the semester, there was no statistical difference found in achievement between the control group taught by traditional classroom lecture (TCL) and the experimental group taught using CMI and keypad questions. The early low scores were attributed

to the phenomenon of "vampire video" in which the method of presentation initially distracted students from the content.

Another study was conducted by Schmidt, Arndt, Gaston, and Miller (1991). Students from two universities were assigned to either a CMI group in which faculty served as tutors or to the TCL group. The results of their study found no statistically significant difference between the achievement outcomes of the two groups. These two studies suggest that computer technologies are effective teaching strategies but are most effective when combined with faculty contact. This hypothesis was also addressed and supported by two other studies by Baldwin, Hill, and Hanson (1991) and Parkinson and Parkinson (1989).

Madorin and Iwasiw (1999) studied the effects of CAI on self-efficacy in caring for a surgical patient. Twenty-nine baccalaureate nursing students were assigned randomly to either a control group or experimental group. The experimental group viewed a computer simulation about a surgical patient. The self-efficacy scores of the experimental group were higher, which supports the use of CAI as a clinical teaching strategy.

Calderone (1994) presented an educational literature review regarding CAI, attitude, and modes of instruction. She concluded that

> the effectiveness of computer instruction on learning and attitude varies; limited research is available regarding the learning effectiveness of computer technology with group instruction, especially large-group instruction, and limited findings suggest that group instruction is more time efficient without loss in cognitive achievement. (p. 169)

Johnson and Johnson (1986) discussed the advantages of computer-assisted cooperative learning. In a cooperative learning situation, the students worked in groups in which there was positive interdependence among group members, shared responsibility, and individual accountability for mastering the content.

Learning Styles and Computer Technology in Nursing Education

The second theme of learning styles and computer technology has received limited attention in nursing education. Yoder (1994) concluded that learners who preferred active experimenting learned better with CAIVI; learners who preferred reflective observing learned better with linear video.

According to Khoiny (1995), the use of the Wagner Preference Inventory Scale and the Kolb and Gregorc learning-style scales can be helpful to the educator. Information about a student's learning style may help the educator select a CAI program that provides for optimal learning; however, "there is no reported nursing literature that has identified the relation of Kolb's four learning styles and CAI learning" (p. 167).

The method of presentation when using CAI can also have either a positive or negative effect on individual student learning (Wells & Higgs, 1990). According to Billings (1991), the Dunn, Dunn, and Price Productivity Environmental Preference Survey (PEPS) provides a computerized learning inventory. This program is designed to give the student and faculty information about preferences for specific learning styles so this can be better matched with teaching/learning strategies.

> The PEPS may also be used to identify students with high tactile preferences. In a recent study, students scoring high on the tactile subscale had positive attitudes toward CAIVI using a touch screen monitor. These students, therefore, can be encouraged to use touch-screen technology, and faculty may wish to assign alternate learning strategies or assist learners who are not high tactile learners to recognize that they might accommodate by focusing on the auditory and visual aspects of the CAI lesson. (p. 124)

Billings (1994) also researched the effect of preferences for studying alone or in groups on attitude and academic achievement when using IVDI. One hundred fourteen baccalaureate nursing students participated in her study. These three

instruments were used to collect the data: the Dunn, Dunn, and Price Productivity Environmental Preference Survey, Allen Attitude Toward CAI/IVDI Semantic Differential Tool, and a 10-item questionnaire. The results revealed that students who studied in a group were more comfortable with and had a more positive attitude toward using IVDI.

Lowdermilk and Fishel (1991) conducted a study to evaluate the effects of CAI simulations on the clinical decision-making skills of nursing students. The sample consisted of 64 students randomly assigned to either the control or experimental group. All students completed Kolb's Learning Style Inventory, a pre- and posttest, a research questionnaire, and a CAI simulation. The experimental group completed three additional CAI simulations over a period of seven weeks. The study found

> no difference between the students completing the full CAI series and those who did not. Students who made significant improvements in decision-making scores also earned higher clinical grades. Success in the CAI series was found to be independent of learning style. (p. 34)

Nursing Student Satisfaction with Computer Technology

The third theme was student satisfaction with computer technology. Thede et al. (1994) interviewed 12 nursing students regarding their experiences using CAI. Content analysis of these interviews revealed three main categories--the learner, learning environment, and the software design. Students expressed the need to know that the CAI would be the most efficient use of their study time. Students also identified the need for a hard copy to review information and found the variety of CAI programs appealing. Easy access to the computers, having laboratory assistants available to help with the computers, and faculty promotion of each program were important factors in increasing student satisfaction. Program features that were

given positive comments by the students were question and feedback format, simulations, color, and conciseness. Delays in the response of the program and inability to review the content were identified as negative aspects of CAI.

Computer methods of instruction tend to be positively evaluated by the nursing students in these studies. McBride and Nagle (1996) surveyed both registered nurses and nursing students and found that both groups had positive attitudes toward the use of computers. Classroom experience with computers helped to reduce the anxiety that is commonly experienced when working with a new technology.

Goodman and Blake (1996) surveyed recent graduates regarding their perception of the benefits of faculty-developed computer courseware. Eighty-two percent of the respondents indicated that the courseware benefited them by reducing computer anxiety during the NCLEX-RN examination, which is now administered by computer.

Koch, Rankin, and Stewart (1990) reported that the majority of the students surveyed preferred to work in groups rather than working alone. Over half of the students indicated a preference for supervision when viewing a program in case questions arose or there was a need for clarification or explanation of information presented in the program. Van Dover and Boblin (1991) surveyed students and found they were interested in learning about computer applications for clinical nursing practice and less interested in learning about those for education and nursing administration. However, 68% stated that they were uncomfortable with computer work due to a lack of computer skills.

A study of 373 Finnish nursing students conducted by Saranto, Leino-Kilpi, and Isoaho (1997) revealed a high degree of dissatisfaction with the current learning environment in which information technology was presented. Students

recommended that information technology be expanded within the nursing curriculum. Baldwin, Johnson, and Hill (1994) undertook a study to determine student satisfaction with classroom or CAI presentations. Thirty-nine sophomore nursing students were surveyed using a questionnaire with a qualitative section that asked students to write their thoughts regarding what teaching strategies were helpful or not helpful. Overall, the students were dissatisfied with CAI. Seventy-two percent of the students preferred faculty demonstration of psychomotor skills when learning to perform basic nursing skills.

Additional studies of CBI have been conducted among students in other health care disciplines. Williams, Agho, and McCloy (1996) investigated the attitudes and perceptions of computer applications among physical therapy students. One hundred and six physical therapy students were interviewed using three instruments. The students reported positive opinions about computers and a strong desire to increase their knowledge about computer applications.

Lang (1995) investigated the knowledge, opinions, and experiences regarding dental informatics and computers among first-year dental students (D1) and fourth-year dental students (D4). The results of the survey revealed an overall lack of experience with dental informatics. However, the 1993 (D4) students had more computing knowledge and experience than the 1990 (D4) students did. Kilmon (1996) discussed the use of a personal computer program, NP Clinic, which is a set of computer patient-management problems. This program was used to teach pediatric and family nurse practitioners. The overall response to the program was highly positive. These clinical case studies provide feedback and help to promote critical-thinking skills by encouraging analysis of similarities and differences between the cases.

Summary of Literature Review

Computer-based instruction in nursing education has been found to be as effective as other methods of instruction when measured by cognitive achievement. Second, CBI has been found to meet various learning-style needs of nursing students. Last, nursing students have been found to be satisfied with use of CBI.

One major limitation I found in my literature review was that all but two studies involved baccalaureate nursing students, although a majority of registered nurses are educated in associate degree programs (Nursing Datasource, 1997). This is probably because faculty at four-year colleges are encouraged to conduct research.

The second major limitation was a lack of qualitative studies that could guide nursing educators in an analysis of their use of CBI. Only one study by Thede et al. (1994) explored the perceptions of students regarding the use of CBI during their course of study in a nursing program. The majority of studies were quantitative, utilizing surveys or questionnaires to examine either the effectiveness of or attitudes toward CBI. These methods did not explore the reasons behind positive or negative responses by students. Intervening variables such as environmental factors or faculty contributions to the experience of CBI were not addressed.

This qualitative study was designed to explore the perceptions and behaviors of students using CBI within their course of study and other consequences of using CBI. This information can broaden the scope of knowledge regarding CBI in nursing education and other disciplines. In the next chapter, the qualitative research methods of in-depth interviewing, conducting a focus group, direct observation, and document analysis are discussed. The coding procedure and categorization scheme used in this study are also explained.

CHAPTER 3

METHODOLOGY

This study of students' perceptions of computer technology utilized a qualitative research approach. I was interested in the full breadth of students' experiences and their perceptions within a natural setting. This required a holistic approach to questions, a focus on human experience, and in-depth interviews (Notter & Hott, 1994; Tuckerman, 1994). I conducted a case study using a variety of qualitative methods, including in-depth interviewing, a focus group, reflective journaling, direct observation of students, and document analysis (Talbot, 1995).

Case Study

Merriam and Simpson (1995) stated, "The case study is an intensive description and analysis of a phenomenon or social event such as an individual, group institution, or community" (p. 108). A case study is further defined by Yin (1994) as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 13).

A case study is a bounded system that is researched during a designated time and place (Creswell, 1998). According to Rossman and Rallis (1998), the case study method seeks "to understand a larger phenomenon through the close examination of a specific case and, therefore, focus on the particular" (p. 70).

Case studies are descriptive, heuristic, and particularistic. "Descriptive means that the end product of a case study is a rich, `thick' description of the

phenomenon under study. Thick description means, the complete, literal description of the incident or entity being investigated" (Merriam, 1998, p. 29-30). "Heuristic means that case studies illuminate the reader's understanding of the phenomenon under study. They can bring about the discovery of new meaning, extend the reader's experience, or confirm what is known" (Merriam, 1998, p. 30). Case studies are particularistic, meaning that the researcher can focus on a "particular situation, event, program, or phenomenon" (Merriam, 1998, p. 30).

Context and Setting

The context or setting of my case study is the associate degree nursing program at Forest College. Forest College is a two-year public college. The Forest College district "encompasses 23 communities in the suburbs of Chicago with an area of about 200 square miles and a population of 516,000. The College's enrollment stands at approximately 24,000" (Forest College Self-Study Report, 1997, p. 3).

The associate degree nursing department personnel consists of one director/assistant dean, 12 full-time and 12 part-time faculty, and two part-time laboratory staff members. There are approximately 100 students enrolled in each of the two levels or years of the program. The nursing curriculum has two levels, each containing two semesters. A single 9- or 10-hour nursing course composed of three or four modules is offered each semester for each level.

Nursing theory sessions are held in standard classrooms that are shared with other disciplines. Clinical sessions occur off campus at a variety of hospitals, extended-care facilities, and other community agencies. The nursing department has its own laboratory, a room approximately 58 feet wide and 42 feet long with an adjoining storage room approximately 20 feet by 12 feet (see Figure 1). Three

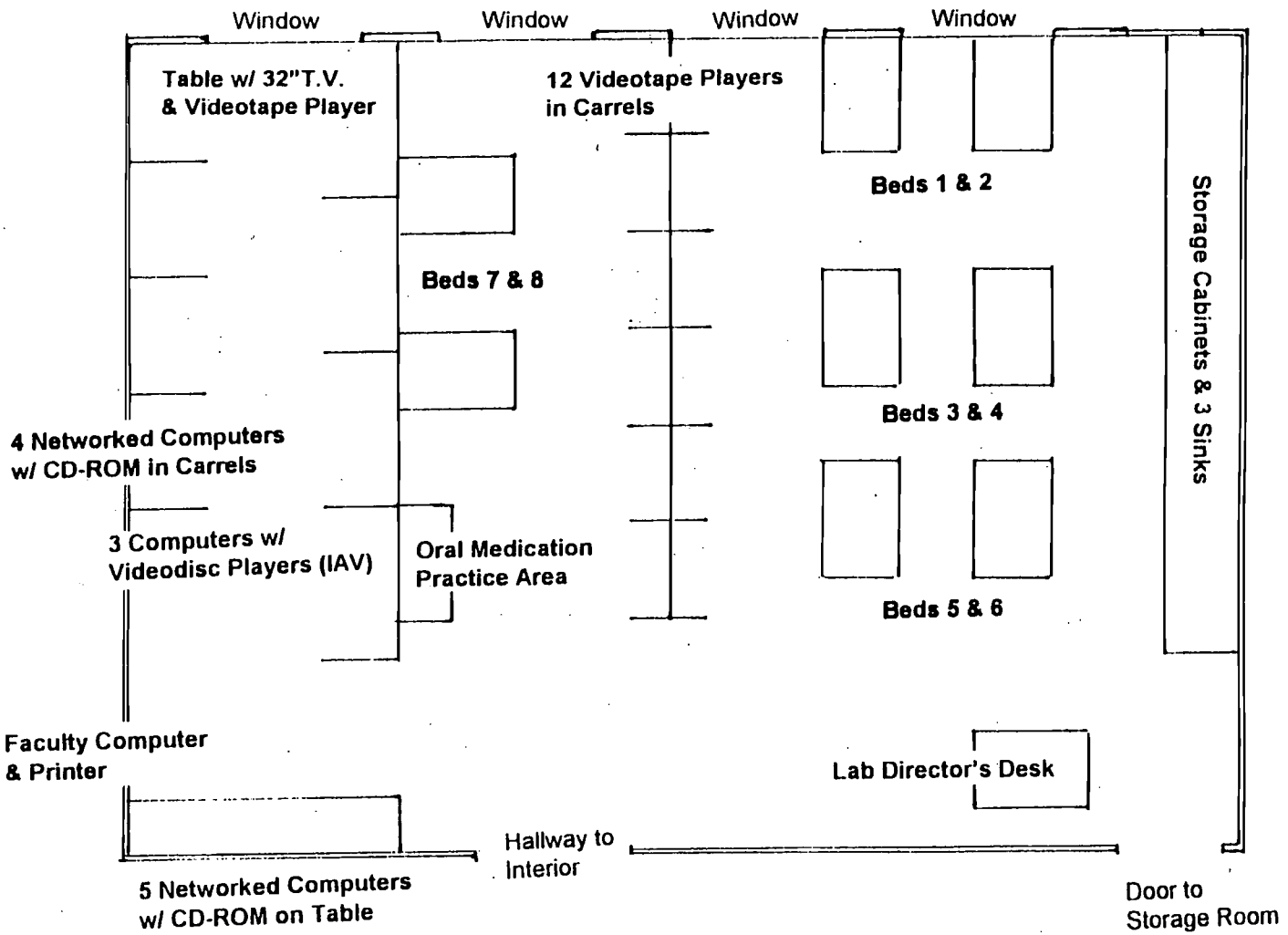

Figure 1. Floor Plan of Nursing Laboratory at Forest Community College

quarters of the room are used for nursing laboratory sessions and individual practice sessions. The remainder serves as a computer laboratory with 13 personal computers on which most nursing students view the CBI programs. Three of the computers are linked to videodisc players for viewing IVI programs. The other 10 are linked to the college network, allowing access to a server for CAI programs, and have CD-ROM drives. The main part of the lab is filled with eight hospital beds, intravenous pumps, and other functioning hospital equipment. Most beds contain life-size mannequins, many of which have specialized functions that allow realistic simulation of nursing procedures. An example is an arm with artificial veins beneath the skin into which an intravenous needle and catheter can be inserted. The computer area contains two rows of four carrels, each separated with five-foot-high partitions, but all carrels open at the back toward each other. Five additional computers are located on tables along the wall perpendicular to the carrels. Videotape machines are located in two rows of six carrels located near the center of the main laboratory area. The nursing laboratory is open Monday to Thursday from 1 p.m. to 6 p.m., Fridays from 10 a.m. to 2 p.m., and every other Saturday from 9 a.m. to 1 p.m.

Sample Selection

Within my case study, I used "nonprobabilistic or purposeful sampling which is based on the assumption that one wants to discover, understand, gain insight. Since generalization in a statistical sense is not a goal of qualitative research, probabilistic sampling is not necessary" (Merriam, 1998, p. 61). I interviewed 15 nursing students from a total class of 110 based on the following criteria. The students I interviewed were all second-level nursing students who had two years of experience with CBI within the nursing program. Students with varied ethnic and

racial backgrounds and from different age groups were selected to reflect the diversity of the student body. I also included students with varying degrees of academic ability. The demographic information of the students interviewed is listed in Appendix A. I interviewed only female students due to the small number of male students in this class. Two of the students who were asked to participate in this study declined, and another who agreed to participate was unable to keep her appointment due to a schedule conflict.

Data Collection

I used a variety of data collection methods to produce multiple sources of evidence and triangulation of data. "Triangulation is a qualitative cross-validation. It assesses the sufficiency of the data according to the convergence of multiple data sources or multiple data-collection procedures" (Wiersma, 1995, p. 264). The purpose of triangulation is to "confirm information, thereby increasing credibility" (Breitmayer, Ayres, & Knafl, 1993, p. 239).

For this study I conducted 15 student interviews. For triangulation of data, I also interviewed the director of the program and two nursing laboratory staff and conducted a focus group with nine full-time nursing faculty members. Similar questions were asked of students and faculty in order to ascertain whether or not there were significant differences in faculty expectations and student perceptions and behaviors. The few differences found are discussed in Chapter 4. Other sources of data collection included viewing CBI programs that the students discussed during the interviews and observing students as they utilized these programs in the nursing laboratory. From the beginning of my data collection, I also kept a journal, which contains my field notes and impressions.

Student Interviews

My primary data collection technique consisted of interviews with the second-level nursing students. This was also my first step in gathering data. Before I began interviewing, I obtained permission from the program director and division dean and provided them with information regarding the purpose and intent of my research. I also obtained prior consent from the students who I interviewed. The informed consent form is included in Appendix B, and the student interview guide is in Appendix C.

All interviews were conducted in an office or a reserved classroom to maintain privacy. I used a semistructured, open-ended interview. This type of interview "is neither an open conversation nor a highly structured questionnaire" (Kvale, 1996, p. 27). This format allowed me to obtain similar information from each respondent. It also allowed me to explore new thoughts or ideas that arose from the early interviews. I audiotaped the interviews with each student and took anecdotal notes throughout the conversations. I believe that preparing well-defined questions and then actively listening to the respondents was crucial. At the conclusion of the 15th interview, I believed that I was no longer obtaining new data and that saturation of the data had been reached.

Nursing Faculty Focus Group

My second data collection technique was conducting a focus group with nine full-time nursing faculty at Forest College. "Focus groups usually include 4 to 12 participants. Groups this size allow everyone to participate while still eliciting a range of responses" (Kingry, Tiedje, & Friedman, 1990, p. 124). This research technique allowed me to gather faculty perceptions and expectations of CBI to

compare with those of the students. An advantage to using this method is that a focus group is "a socially oriented research procedure. Focus groups place people in natural, real-life situations as opposed to the controlled experimental situations typical of quantitative studies" (Krueger, 1994, p. 34). The focus group interview guide is included in Appendix D.

I conducted this focus group in the division faculty conference room, which was comfortable and allowed for privacy. I provided refreshments because this helps to facilitate conversation and provides a warm and relaxing environment conducive to conversation. "Conducting a focus group in a neutral but familiar setting easily located by targeted participants is preferred. Familiarity also leads to a certain degree of comfort, which can enhance group interaction" (Dilorio, Hockenberry-Eaton, Maibach, & Rivero, 1994, p. 178).

The nursing faculty completed a preinterview questionnaire covering demographic information and previous experience with computers before the focus-group session. I began the session with a welcome and thanked them for their participation (Morrison & Peoples, 1999). The focus group guide identified the purpose of the session and the desired information to be obtained (Lederman, 1990). The faculty focus-group questionnaire is included in Appendix E, and the nursing faculty questionnaire results are in Appendix F.

The session was audiotaped with the permission of the nursing faculty. I have rapport with the faculty and believe that a trusting relationship was established. During the session, I did not take extensive notes but tried to direct my attention to the responses of the faculty. As moderator, I remained a neutral leader and tried to be open to all responses. I was aware that a focus group has certain limitations. These include the possibility that one person may dominate the group or that the group composition may make individual expression difficult for certain individuals

(Fontana & Frey, 1994). I was aware of these potential problems and made sure that the discussion included comments from all group members.

Interviews of Nursing Laboratory Staff and Nursing Administration

My third data collection step was conducting interviews with the two members of the nursing laboratory staff to obtain their view of the CBI experience and with the director of nursing to obtain her view on the role of CBI within the nursing curriculum. A list of questions was developed prior to these interviews. The interview guide for the laboratory staff is included in Appendix G. The interview guide for the director is in Appendix H.

Direct Observation

After interviews and the focus group were completed, I made direct observations of students in the nursing computer laboratory as they utilized a variety of CBI programs. "Observation enables the researcher to view the society objectively and assists in validating and interpreting information provided by participants" (Morse & Field, 1995, p. 107). This helped me to understand the student comments regarding hardware, software, and the overall computer laboratory environment. Specific student and faculty comments about equipment breakdowns, distractions from other laboratory activities, and the availability/responsiveness of support personnel were verified by my own observations. These observations are included in Chapter 4. The observational guidelines are included in Appendix I.

Document Analysis

Finally, I examined documents pertinent to computer usage at Forest College--in particular, a list of all CBI programs included in the nursing curriculum. I also viewed several CAI, IAV, and CD-ROM programs after conducting the interviews, looking for characteristics of the programs that students had cited during the interviews as being most helpful and least helpful. These observations are included in Chapter 4.

Documentation of Observations

Throughout the data collection process, I kept a journal containing my fieldnotes on all the interviews and other activities in order to maintain a chain of evidence and increase the reliability of the information. "Fieldnotes are a written account of the things that the researcher hears, sees, experiences, and thinks in the course of collecting or reflecting on data in a qualitative study. Detailed, accurate, and extensive fieldnotes are necessary for a successful qualitative study" (Morse & Field, 1995, p. 112). These notes were valuable sources of information as I analyzed and reported the research findings and developed the metapolicies.

Data Analysis

I personally transcribed the audiotapes of all interviews with nursing students and faculty members as well as the focus group. Although this took considerable time, I believe it enhanced the accuracy of these transcriptions and greatly increased my familiarity with the interviews. This made coding and other analyses a much easier task.

> I began analyzing the transcripts by using the editing analysis style. The researcher using the editing style acts as an interpreter who reads through the data in search of meaningful segments and units. Once these

> segments are identified and reviewed, the interpreter develops a categorization scheme and corresponding codes that can be used to sort and organize the data. The researcher then searches for the patterns and structure that connect the thematic categories. (Polit & Hungler, 1997, p. 378)

The data analysis for this study began with line-by-line coding of the student interviews and writing short phrases in the margins of the transcriptions that described the essence of each comment or response. After the initial coding of all 15 student interviews, 157 different codes were identified. These codes were then clustered into three major categories, with two or three subcategories in each. The categorization scheme that resulted is shown in Figure 2.

FACTORS THAT ENHANCE LEARNING	FACTORS THAT HINDER LEARNING
I. Positive Characteristics of CBI Program Curriculum Environment	I. Negative Characteristics of CBI Program Curriculum Environment
II. Student Behaviors with CBI that Enhance Learning	II. Student Behaviors with CBI that Hinder Learning
III. Student Suggestions for Improving CBI Curriculum Environment	

Figure 2. Categorization Scheme

After developing the categorization scheme, I began to combine similar codes, reducing their number from 157 to 51. I also created a color scheme for each major category and used color highlighters to identify the phrases and sentences within each transcript that corresponded to each code and category. I then applied these codes and color schemes to the faculty interviews and faculty focus-group transcriptions. This color coding, combined with the next step, made retrieval of direct quotations much easier.

I next created a quote-retrieval grid for each code within the categorization scheme. These grids contained a box for each student or faculty interview. I then went through each transcription, entering a page number for each coded response, and circled the page number of any response that was especially significant or articulate. This grid system was created as an alternative to approaches in which coded responses are placed on index cards or lists. I developed this approach because it allowed coded responses to be reexamined in their original context. A sample of the quote-retrieval grid is included in Appendix J.

The next step used content analysis, which involved counting the number of comments made by students and faculty for each code and the number of students or faculty who made a comment. This information was entered into Excel, which was used to rank order the responses by frequency of student response and to create bar charts (presented in Chapter 4) that illustrated this rank order.

Merriam (1998) stated that although content analysis is one of the less commonly used data techniques in qualitative research, it is "used implicitly in any inductive analysis of qualitative data" (p. 160). She continued,

> In one sense, all qualitative data analysis is content analysis in that it is the content of interviews, field notes, and documents that is analyzed. Although this content can be analyzed qualitatively for themes and recurring patterns of meaning, content analysis historically has been very quantitative in nature. The units of measurement in this form of content analysis center on communication, especially the frequency and variety of messages. (p. 161)

According to Miles and Huberman (1994),

> A lot of counting goes on in the background when judgments of qualities are being made. When we identify a theme or a pattern, we're isolating something that (a) happens a number of times and (b) consistently happens in a specific way. The "number of times" and "consistency" judgments are based on counting. When we make a generalization, we amass a swarm of particulars and decide, almost unconsciously, which particulars are there more often, matter more than others, go together, and so on. When we say something is "important" or "significant" or "recurrent," we have come to that estimate, in part, by making counts, comparisons, and weights. (p. 253)

After the initial counting and charting, several smaller frequency codes were collapsed into higher frequency codes, reducing the total number from 51 to the final 42 codes. Codes were renamed at each step in the analysis. Counting and bar charts gave structure to the findings by giving more significance to more frequently mentioned responses. In Chapter 4, the results of this analysis of the data are presented and interpreted.

CHAPTER 4

THEMATIC ANALYSIS OF PERCEPTIONS

This chapter contains a discussion of the five themes that emerged from the analysis of the responses to my interview guides and multiple other data sources.

Theme 1: Student Recollections of CBI Are Timebound

To begin this investigation, six interview questions asked students to recall their most recent and most memorable experiences with CBI. In effect, two questions were repeated three times, changing the focus to one of the three computer technologies used in the nursing curriculum at Forest College. "What is your most recent experience using interactive videos? What is your most recent experience using CD-ROM programs? What is your most recent experience using computer-assisted instructional (CAI) programs?" A follow-up question was asked for each technology: "Are there any other programs (of this type) that stand out in your memory?"

Most Recent Experience

The recent IAV experience identified most frequently by the students was an IAV program, "Managing the Experience of Labor and Delivery." This program was mentioned by 5 of the 15 students interviewed. Another IAV program, "Nursing the Elderly with Chronic Obstructive Pulmonary Disease (COPD)," was mentioned by four students. There were no other IAV programs assigned during the

second year of the nursing program. One student stated that she could not recall any specific program. Five students could not distinguish between the three different media and mentioned programs that were actually CD-ROM or CAI programs (see Figure 3).

The recent CD-ROM experience identified most frequently by the students was a CD-ROM program, "Essentials of Cardiac Rhythm Recognition," which was mentioned by 4 of the 15 students interviewed. Two students mentioned another CD-ROM program, "Auscultation of Normal Breath Sounds." There were three other CD-ROM programs assigned during the second year of the nursing program that received no mentions. Six students stated that they never viewed any of these programs. One student stated that she could not recall any specific program. Two students could not distinguish between the different media and mentioned programs that were actually CAI programs.

The CAI experience identified most frequently by the students was a CAI program on psychiatric nursing. This program was mentioned by 10 of the 15 students. There were six other CAI programs assigned during the second year of the nursing program that received no mentions. Three students stated they never viewed any of these programs. One student recalled using CAI programs for reviewing for the NCLEX-RN exam. One student stated that she could not recall any specific program.

Responses to this question reflected the time period in which the question was asked. The high responses to the CAI psychiatric nursing program was due to the fact (learned in the faculty focus group) that turning in a printout from this program was a module requirement.

Programs That Stood Out in Students' Memories

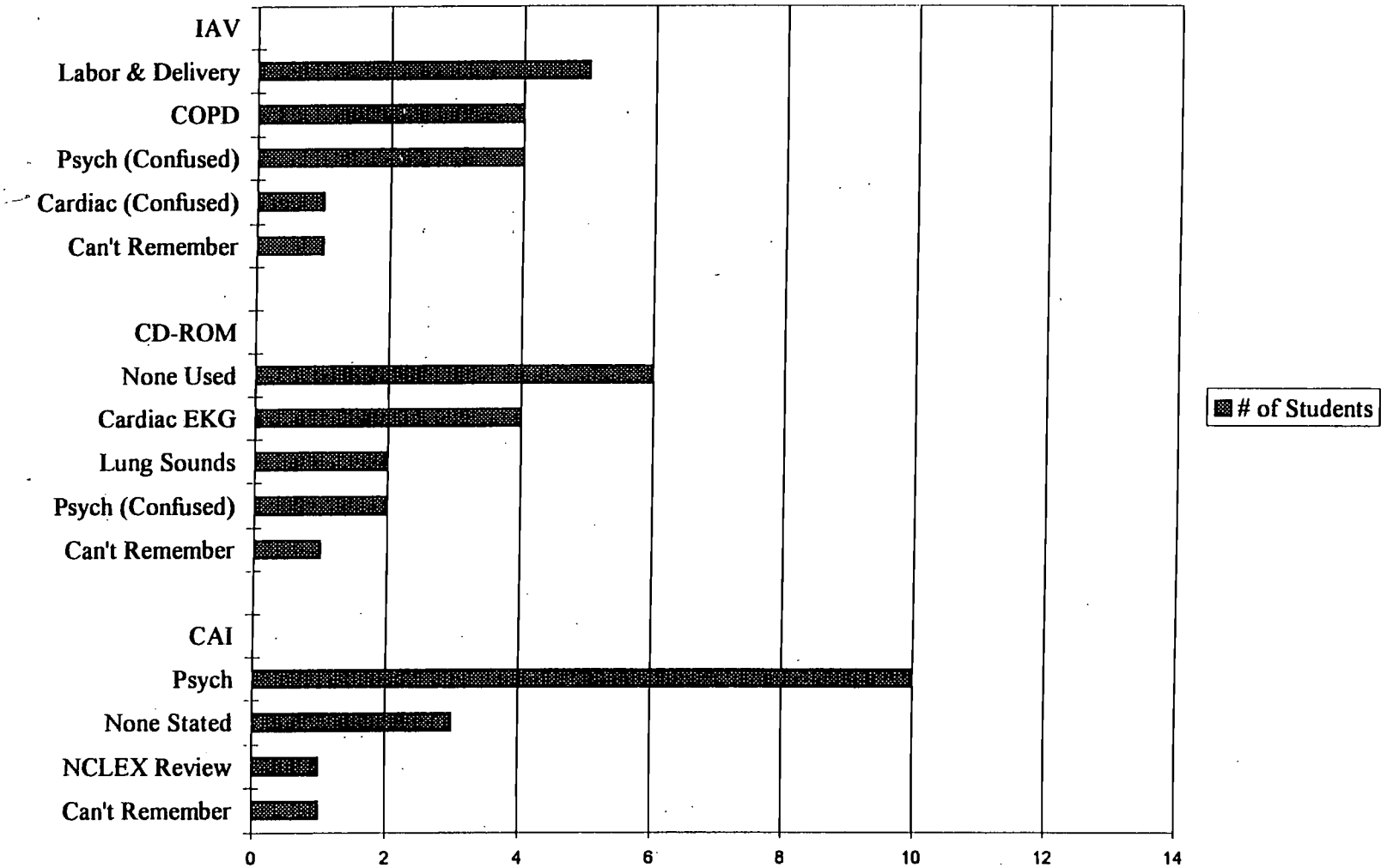

Figure 3. Most Recent Experience with CBI

included an interactive video "Managing the Experience of Labor and Delivery" with seven mentions and another on "Nursing the Elderly with Chronic Obstructive Pulmonary Disease (COPD)" with two mentions. Four students could not recall any interactive videos that stood out in their memory. Two students mentioned a program that was actually a CAI program (see Figure 4).

CD-ROM programs that stood out in students' memories included five mentions of the "Essentials of Cardiac Rhythm Recognition" program and two mentions about the "Auscultation of Normal Breath Sounds" program. Six students stated that they could not recall any specific program that stood out in their memory. Two students could not distinguish between the different media and mentioned programs that were actually CAI programs.

The CAI experience that stood out in the students' memories was the CAI program on psychiatric nursing. This program was mentioned by 10 of the 15 students. Five students stated they never viewed any of these programs.

Students' responses to these opening questions and the amount of clarification and coaching needed to elicit these responses suggest that students had difficulty differentiating between the three types on CBI technology in use at Forest College. Students could recall programs by content and discuss other characteristics of specific programs but could not remember the specific medium through which the program was delivered. Although there are obvious physical differences among the three media and some significant technical advantages, once a program is up and running, the learning experiences provided by interactive video, CD-ROM, and CAI are not much different. As mentioned in the definitions in Chapter 1, in students' recollections of CBI, content, and program design overwhelmed the technical differences among the three media used at Forest College. In addition, students tended to recollect the most recent programs

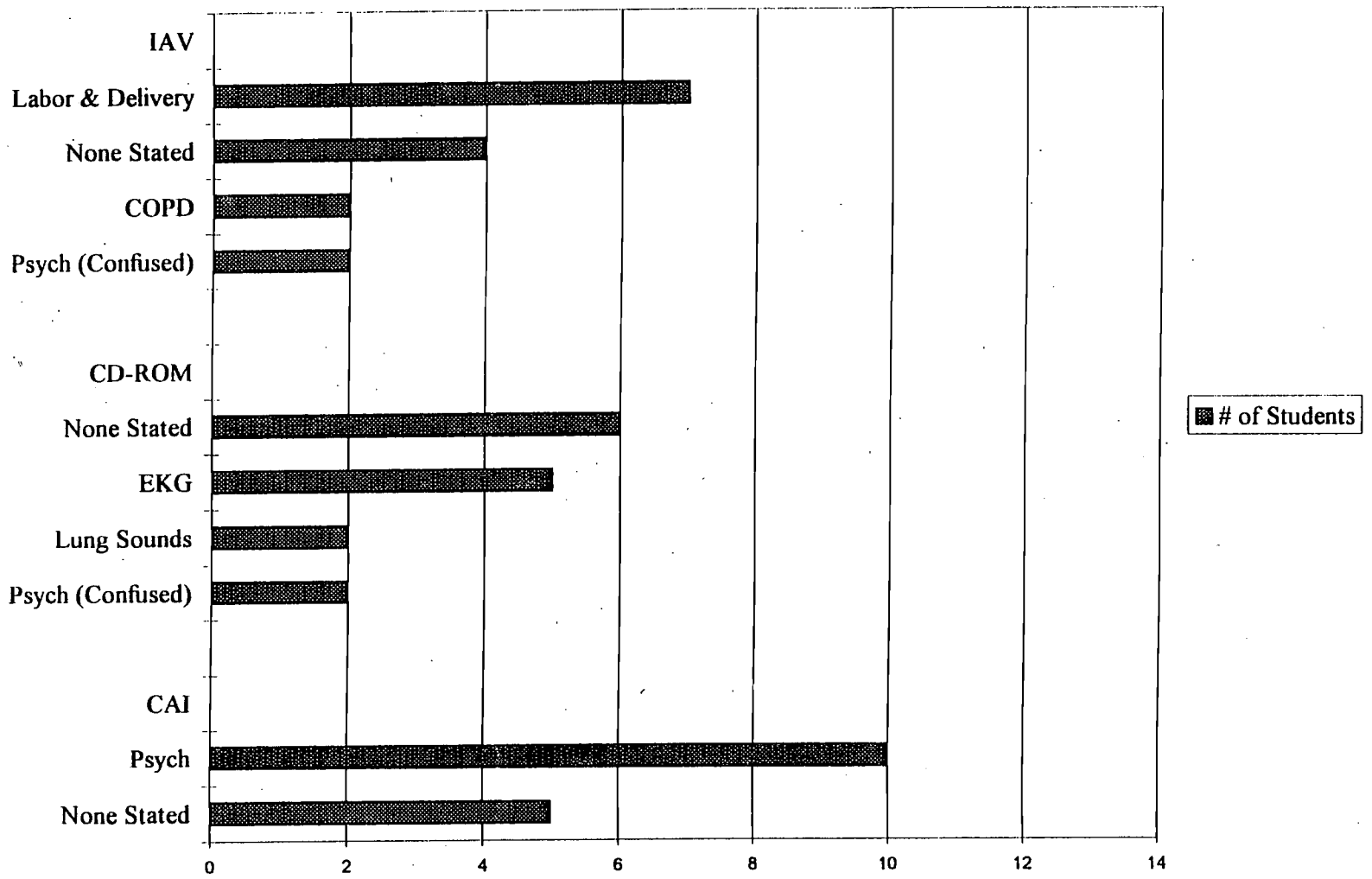

Figure 4. Experience with CBI that Stood Out in Memory

viewed, that is, assignments from the last module of their second year.

The time-bound nature of student recollections and their difficulty in distinguishing among the three types of media frustrated my attempt to measure their perception of progress between three successive generations of technology. The only substantive finding in this regard came later, in response to a request for suggestions on improving CBI, when several students suggested using more interactive videos.

Theme 2: CBI Enhances Learning Under Certain Important Conditions

To investigate how CBI enhanced learning, three interview questions were asked. Each focused on one of the three computer technologies used in the nursing curriculum at Forest College. "What is the most positive thing you can tell me about your experiences using interactive videos? What is the most positive thing you can tell me about your experiences using CD-ROM programs? What is the most positive thing you can tell me about your experiences using CAI programs?" Responses to these questions can be categorized as those related to the positive characteristics of specific CBI programs and those related to the general positive benefits of how CBI programs were used within the curriculum.

Positive Characteristics of CBI Programs

The positive characteristics of CBI programs listed in order by the number of times they were mentioned in the student interviews (most mentions to fewest) were as follows: interactive (feedback), reinforces class content, application of theory, multisensory, realistic, new information, integrates information, new perspective, and rationales (see Figure 5).

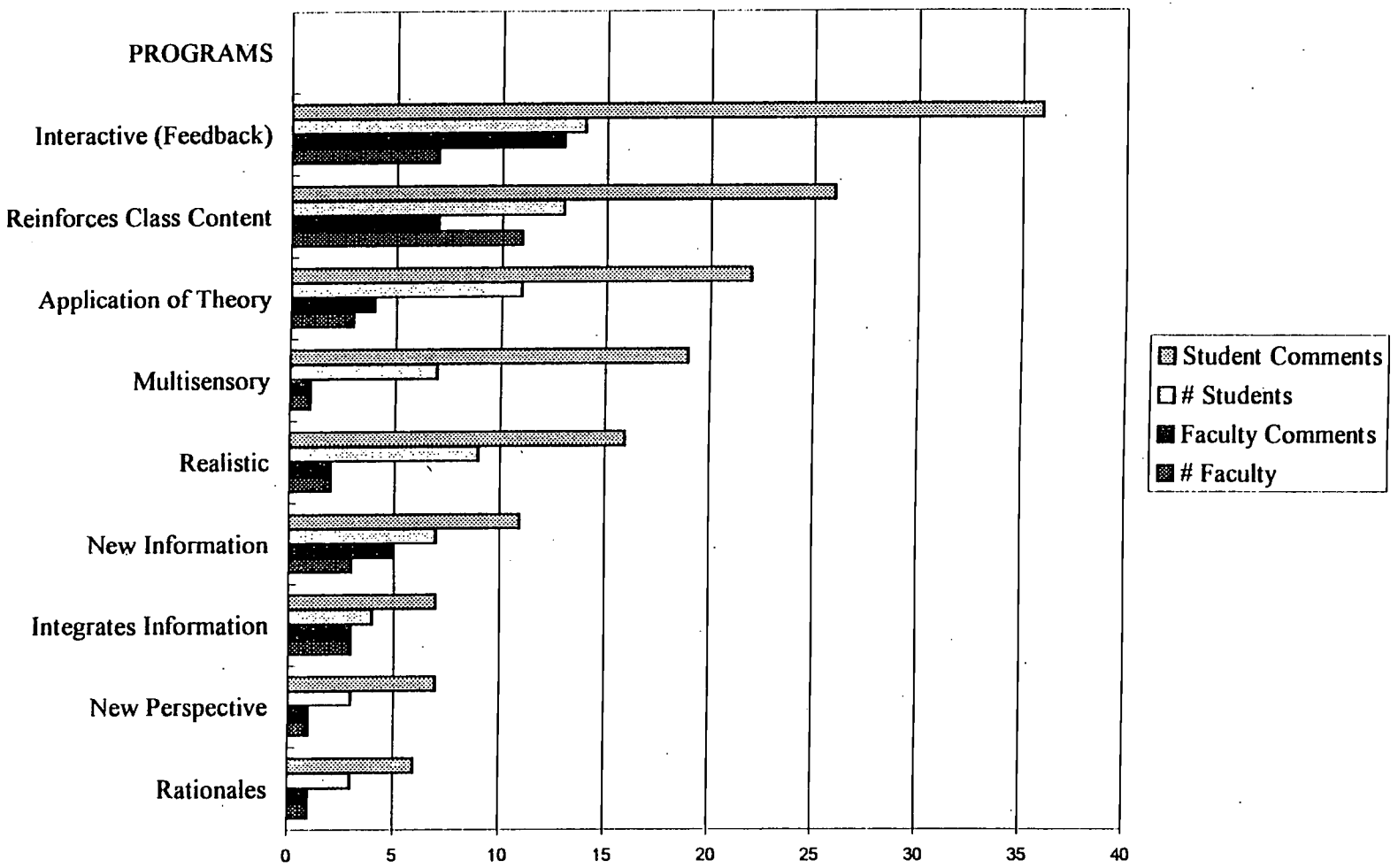

Figure 5. Positive Characteristics of CBI

Interactive (Feedback)

The most frequently mentioned positive characteristic of CBI programs among students was interactive (feedback). This characteristic was mentioned 36 times by 14 of the 15 students interviewed. It was also the most-mentioned characteristic among faculty, with 13 mentions by seven faculty members. One student commented, "It was actual people going through this experience and it was asking questions along the way, which made you stop and think more about what was going on, how to react, and how to intervene. I think this is better than just watching a video on the subject when you're handed the information without any interaction." A second student commented, "They are very helpful in the sense that you are interacting with them. I myself found them helpful."

A third student stated, "Because they are interactive, if you hit the wrong rationale, it tells you why it was wrong." Another student said, "I like when they give you options and they then tell you what was right and wrong. They give a rationale for your wrong answer." A fifth student also commented, "It does give you feedback why your answer is wrong and why the correct answer is right. I think that is what I enjoyed about that."

One student mentioned the quizzes that were part of many programs, stating, "The quiz itself was helpful. Almost all had a feature in which you could review and they would then give you the reason behind the answer." A seventh student stated a printout quiz was helpful: "In a sense, you know where you fall. Like gradewise, if you're really comprehending the material. There was a program that I know we went back because we did absolutely horrible on." Another student stated that she also found having a hard copy of the program quiz helpful. "I was then able to review how I did and was able to see my weaknesses and strengths." This was also expressed by an additional student, who said, "It was a little quiz and that was

helpful; it was about the parameters of reading the monitors, the accelerations and decelerations of labor. I remember that was real good."

According to one student, "In most of the sections, there was a summary at the end of the section that you can print out. Then you could have a hard copy to take notes on and to use for tests, which I did. I liked that." An additional student commented that she found a hard copy of the quiz beneficial: "Then we were able to take that information home with us and review it. For me personally, it was a paper thing that we did not know, and we needed to review it further." Another student said she preferred on-screen feedback rather than written feedback. "That didn't matter to me. As long as I could see on the screen why I got something wrong and got immediate feedback."

One of the students interviewed found the feature of immediate feedback helpful. "You're being prompted as far as what do you think you should do, giving you the answers. Then you are able to see if you are right or not right away instead of waiting till the end." One student recalled, "I like the case study--figure out what to do--I like those. I like where it lets you have a lot of choices, such as pick all the interventions that are appropriate. I like that." Another student responded, "Some of the scenarios that they gave when they asked for your response, what would you do? I remember some of the responses were not what I thought to do. But for the Labor and Delivery in particular, it did have my exact response on there, which I thought was very good."

The nursing faculty also expressed the importance of interaction or feedback. One faculty member stated, "There is instant feedback at the end, which is nice. They get to know who was right and who was wrong [when working in a group] and benefit from the process." Another faculty member stated, "They [students] like the instant feedback they get, that instant feedback that their answer is positive or

negative." Regarding the quizzes the students take, one faculty member commented, "It was low stress because we have them do a test, but there is no grade, it's a group test. If they get something wrong, that's okay. It's a safe place to make mistakes. That's the neat part about it. They don't feel stressed by it at all." Another faculty member stated, "I think that the primary thing, again, you have the feedback, a broad application of theory that is sometimes unavailable in the classroom setting."

Reinforces Class Content

The second most frequently mentioned positive characteristic of CBI programs among students was that they reinforce class content. This characteristic was mentioned 26 times by 13 of the 15 students interviewed. It was also the second most-mentioned characteristic among faculty with seven mentions by 11 faculty members.

One student stated, "I use the programs to back up my readings. After I read, I would go to lecture, and then I would view the computer programs. You have actually three forms of getting the same material into your brain." A second student commented, "With some of them, it really reinforces the nursing process, also the theory behind it." She continued to say,

> Because you always need to know the theory behind the skill and behind the application. So I think it did. In that way, it reinforced that kind of general knowledge that you need as background to everything you do. Not necessarily every specific skill or situation that you might find yourself in, but more of general knowledge background. I did feel it did reinforce that.

A third student said, "I think it is more of a reinforcement of what I learned. If I hadn't read the book first--it does make me go in my book to read more about it. It is a reinforcement to see it, to understand it, and to sometimes hear it." Another student recalled, "I know with the personality disorders, I did the readings before and then I did the CAI. I think it just helped reinforce information I read."

A fifth student commented, "I liked the fact that you can go over them and make a review of what you learned in class." Another student also stated, "I think hearing it and listening to it again, just the repetition."

A seventh student recalled, "None of us was familiar with the psychiatric material, so that [program] gave us an overview before the lecture, and then we were able to review the computer programs afterwards. That reinforced what we learned [in class]." Another student stated, "If there was an option to do a computer program, I would do that." She continued to say, "I used it more as a support for classroom information."

A ninth student reported, "Just from viewing the information we talked about in class. It's a supplement, to see if I can actually grasp what they were talking about with an actual situation." Another student said, "I found that it was an additional review, just one more time to review the content."

The nursing faculty also expressed the importance of reinforcing class content. One faculty member stated,

> Especially for our adult learner who is provided an opportunity to affirm critical-thinking skills, this medium reinforces the development of those skills and hopefully strengthens the student as they anticipate assuming the role of the nurse upon graduation. . . . I think the more that we can reinforce content in different formats the better. I think that's the only way we can position students to be confident as critical thinkers.

Another faculty member reported, "Most of the feedback we get on the computer programs is that they are very helpful, that they learned a lot and they supplemented the lecture, very positive comments." A third faculty member stated, "I think the computer programs are a reinforcement and review, not the initial teaching."

Application of Theory

The third most frequently mentioned positive characteristic of CBI programs among students was that they provide an opportunity for the application of theory. This characteristic was mentioned 22 times by 11 of the 15 students interviewed. Among faculty this characteristic was mentioned four times by three faculty members, making it the fourth most frequently mentioned.

> One student stated,
> In the beginning, we were going by theory, the lectures, and the books. But working with the computers is so much different from that. It's like applying all the nursing process, the assessment, planning. Not just one area. . . . It gives you scenarios to identify the problems, what is important and how to prioritize.

Another student commented,

> The case study approach was helpful because it reflected more of what we see in actual practice rather than just straight theory. It took theory and applied it to a specific client situation. It was the application of the theory in actual practice and actual situations.

> A third student commented,
> I think the programs help seeing something applied rather than just hearing or reading about it. . . . I think in certain cases it did help me. I wouldn't say that every program I used did help me. I know it gave me a better idea how to interact with someone with a certain condition or disease. It did; I can't site a specific instance, but I remember thinking back to the computer program and they said that this is contraindicated for someone with this condition. Or I can picture this from the laser disc programs.

Another student reported, "They gave you the scenario. The person comes in and what do you do first? What is the first thing you need to do? What do you need to be looking for? So I found that to be helpful."

> A fifth student stated,
> During our maternity rotation, we had some material which was really helpful. I'm trying to jog my memory. It basically gave the criteria for stages of labor, as I recall. So I remember it was really helpful that way. . . . The programs helped us apply theory we learned in class. It was really good to help us strengthen our assessment skills and to know the signs to look for in certain diseases. I thought that was good, a lot of individual cases, this client, this age.

Another student recalled, "Just from viewing the information we talked about in class. It's a supplement to see if I can actually grasp what they were talking about with an actual situation."

The faculty also expressed the importance of application of theory. One faculty member stated,

> I expect that the student would take advantage of the opportunity to safely apply theory without risk to clients. The interactive video format provides that format. It allows them to do that because they are able to make decisions, critique their thinking process--what is safe, what is right, and what is wrong--and to do that safely prior to clinical is a fabulous opportunity. . . . Once again, if they would take the initiative to access this learning tool, they would have reduced anxiety because their confidence is building. I can answer this sort of question; I can apply this theory. That way they should be positioned for greater comfort.

Another faculty member stated, "Because it is so interactive, it would help them when they get into the clinical setting, make some critical decisions."

Multisensory

The fourth most frequently mentioned positive characteristic of CBI programs was multisensory. This characteristic was mentioned 19 times by 7 of the 15 students interviewed. Among faculty members, however, this characteristic produced a single comment.

One student stated, "The one that has the actual lung sounds that we could hear. I think that is the one that stands out in my mind. I like to be able to hear." A second student recalled,

> When you go by the written information, you need to go back and read it over and over to understand. With the picture ones, you can see everything and picture it in your mind. . . . If I didn't know the meaning of the particular word, [seeing] the expressions on the client, maybe it meant something like that. But if it is on the paper and written, then I might say, "What does that mean?"

Another student commented, "One thing that is positive about the laser discs

that is not positive about the CAIs is with the medications. For example, sometimes you look at a name of a medication and you don't know how to pronounce it. With the audio portion of the laser disc you can at least hear the words and the pronunciations. I do better with that when I can hear a name rather than just looking at it on a piece of paper." One student recalled, "Just that you could hear the different sounds. I don't think we covered that sufficiently in lecture. She continued to say, "As much as I can get, the more data or anything, such as sounds, situations, anything I can implement and put it all together works the best for me."

> A fifth student reported,
> I had a really hard time with breath sounds. I still am not great, and I need to listen to them about 10,000 times more. But to hear the difference between the things, because people can explain it and explain it to you, but it's not the same as hearing the actual sound. . . . By seeing and hearing and letting me think it through. Give me something that is a real situation that I can relate to. Give me a minute to think it through. Does a lot for my confidence if I do the right thing and helps me remember it.

Another student said,

> Well, seeing it on the interactive video was much better than reading it out of a book or hearing about it. The video would respond to how you answered the question. . . . The lung sounds--there was an interactive video, because of the video, it helped a lot. You can't get lung sounds out of a textbook.

One faculty member also expressed the importance of multisensory. She stated,

> It was the respiratory assessment. It was wonderful; you could see the different chests, different configurations, and hear the different sounds. The students really like that one because the sounds and the simulation were so good they could safely go through and learn.

Realistic

The fifth most frequently mentioned positive characteristic of CBI programs among students was the realistic depictions. This characteristic was mentioned 16

times by 9 of the 15 students interviewed. Among faculty members, however, this characteristic produced just two comments.

> One student stated,
> I knew it was an artificial simulated experience, but it seemed to flow more like a real situation. Even though it was interrupted with asking questions, interventions, it still seemed more real than just even watching a video. . . . It made you feel as if you were right there in a real situation and had to react, just like a nurse. You had to think and respond quickly, which made it very interesting. The textbook gives you the information and the data, but these programs ask you to make choices about certain scenarios, which is more realistic as to what we will be doing as nurses, which is what I found most helpful.

Another student commented, " It gives you a client scenario, just as if you're caring for that client in the hospital."

> According to another student,
> The CD-ROM and the laser disc programs did help. I know the laser disc programs helped just to see someone else doing something maybe [in] a way you never thought could be done. Whether it's how they interact with a client on a one-to-one or procedure.

A fourth student said, "I thought it was helpful that it was giving a scenario, like an actual event happening. And then the nurse would come in and do different steps of the assessment. Another student recalled, "It was nice in the way that they would give individual clients; for example, a client would come to the Emergency Room and they would show signs and symptoms of different diseases."

> A sixth student responded,
> I really liked the way it was presented. One that I remember particularly was working with a client that had COPD. The man came in, and you could actually see the picture of the man and what he looked like, which was real helpful to me. That made it more realistic to me because I had a face attached to it.

I later viewed the interactive video program, "Nursing the Elderly with Chronic Obstructive Pulmonary Disease (COPD)" myself and found it to be quite realistic both in the interactions between the nurse and client and the equipment

used. The client scenario was a true-to-life depiction of a client that one would see in the hospital setting.

One faculty member also expressed the importance of realistic depictions provided by CBI programs. She stated,

> It's very graphic, and for something of that nature, it is probably as realistic as can be. You see the actual birth of the baby. You see the water breaking and the husband is with her during labor. There is interaction between the nurse and the client. When the baby is born, you are definitely dealing with a newborn, with the Apgar. So for the most part, students do enjoy it, and it is probably the best interactive video that I have seen of all the ones we have.

A second faculty member commented,

> They get to eyeball the simulation. So even though they are not in the real world doing it, they get to see the kinds of equipment and see the kind of setting they would be in. So I think it's a great dry run. If they make a mistake no one is hurt by that.

New Information

The sixth most frequently mentioned positive characteristic of CBI programs among students was new information. This characteristic was mentioned 11 times by 7 of the 15 students interviewed. Among faculty, this characteristic was mentioned five times by three faculty members and ranked third in frequency.

One student stated,

> The one that stands out in my mind because it happened early on and it was a new experience for me--those tend to be remembered more than others--it was the Labor and Delivery interactive video. For me it was new information. I'm not a mother nor have I witnessed giving birth or anything like that, so it put it in perspective well for me, what the whole experience is like for both new mothers and fathers, which I really liked about it. . . . The ones I appreciated more was when the computer programs presented information that we could not get elsewhere.

Another student commented, "I think if I went without reading anything, it gave me some information."

A third student recalled, "The ones from the psychiatric module. They were

good to help differentiate between the different categories of the drugs because there are such a vast array of psychiatric drugs." Another student reported, "We viewed a lot of the material before lecture that was a whole new area of material for all of us."

One faculty member also expressed that CBI programs provide new information. She stated,

> I consistently hear from students that it is a positive experience. I think the other thing it does for the student is that it broadens the base of knowledge, especially for the associate degree student who has a lot of theory that is presented in a concentrated manner.

A second faculty member stated,

> In delegation, it is the only chance they may have to practice it. I always thought the purpose of all this new technology, new experiences, was because we can't provide them in the hospital, we don't have the access to the numbers, they may never get to take care of this type of client. So therefore this simulation is very close to that and allows them to make choices and decisions related to that.

Integrates Information

The seventh most frequently mentioned positive characteristic of CBI programs among students was that these programs help to integrate information. This characteristic was mentioned seven times by 4 of the 15 students interviewed. Among faculty this characteristic earned three comments by three faculty members and ranked fifth in frequency.

One student commented,

> This just puts everything together for me as far as you're able to go back if you don't understand it. You can find out where you are rusty. If you can remember basic concepts, you can connect them together. It brought it more together because it gives you what you did wrong. . . . It puts it together more than the book or lecture.

Another student stated, "It helped us apply the theory we learned in class to decipher what was happening in the program."

The faculty members also expressed the importance of integration of information. One faculty member reported,

> Theory you can get out of a book. But I think that some of the newer programs that are coming out, they are tending to write them not for the disease process but the entire picture. The symptoms of the disease seem to be a small component now. It's all of the other, the rest of the picture, the discharge planning, the home care, because people don't stay in the hospital.

Another member shared the following thoughts; "They make comments that it helped clarify what was being seen clinically."

New Perspective

The eighth most frequently mentioned positive characteristic of CBI programs among students was that these programs provide a new perspective. This characteristic was mentioned seven times by three of the students interviewed. Among faculty members, this characteristic earned a single comment.

One student said, "The material was presented in a different way than in the readings or class." Another student stated, "I enjoyed them, because you are always looking for extra ways for you to feel as if you have a hold on something. If you can't get if from the book then you can at least do these programs. It gives you another resource." A third student commented, "Because for rote memorization, which drugs really are a lot of, rote memorization, it is good for me to have an extra source."

One faculty member stated,

> Just the whole idea of looking at the computer and having to pick an answer, not circling or underlining or erasing and all those things that they do on written tests that are really helpful toward the NCLEX-RN exam. Well, we could just as easily say, you're getting some of the same content in a different way."

Rationales

The ninth most frequently mentioned positive characteristic of CBI programs among students was that these programs provide rationales for decisions. This characteristic was mentioned six times by three of the students interviewed. Among faculty members, this characteristic earned a single comment.

One of the students shared the following: "The psychiatric module did a lot with medications. There are so many medications out there, and it gave a rationale for why you would use one, what the side effects were, and why you would use it with this type of person." My review of the CAI programs on psychiatric nursing confirmed that these rationales were provided.

Another student shared the following thoughts: "They tell you what was right and wrong. They give you a rationale for your wrong answer." A third student commented, "Being able to find out the correct answer if you selected it wrong; you could find the rationale for it."

> One faculty member stated,
> The students really like when they can go back and get a score and then are able to go back and see why they got that wrong. Not all of the programs are like that, but more and more are going to that because they give rationales and there is the availability of a posttest and things like that.

Positive Characteristics of CBI Programs Within the Curriculum

The positive characteristics of CBI within the curriculum ranked in order by the number of times they were mentioned in the student interviews were as follows: a combination of required and optional assignments, accommodating learning styles, use of current technology, and integration with modules (see Figure 6).

A Combination of Required and Optional Assignments

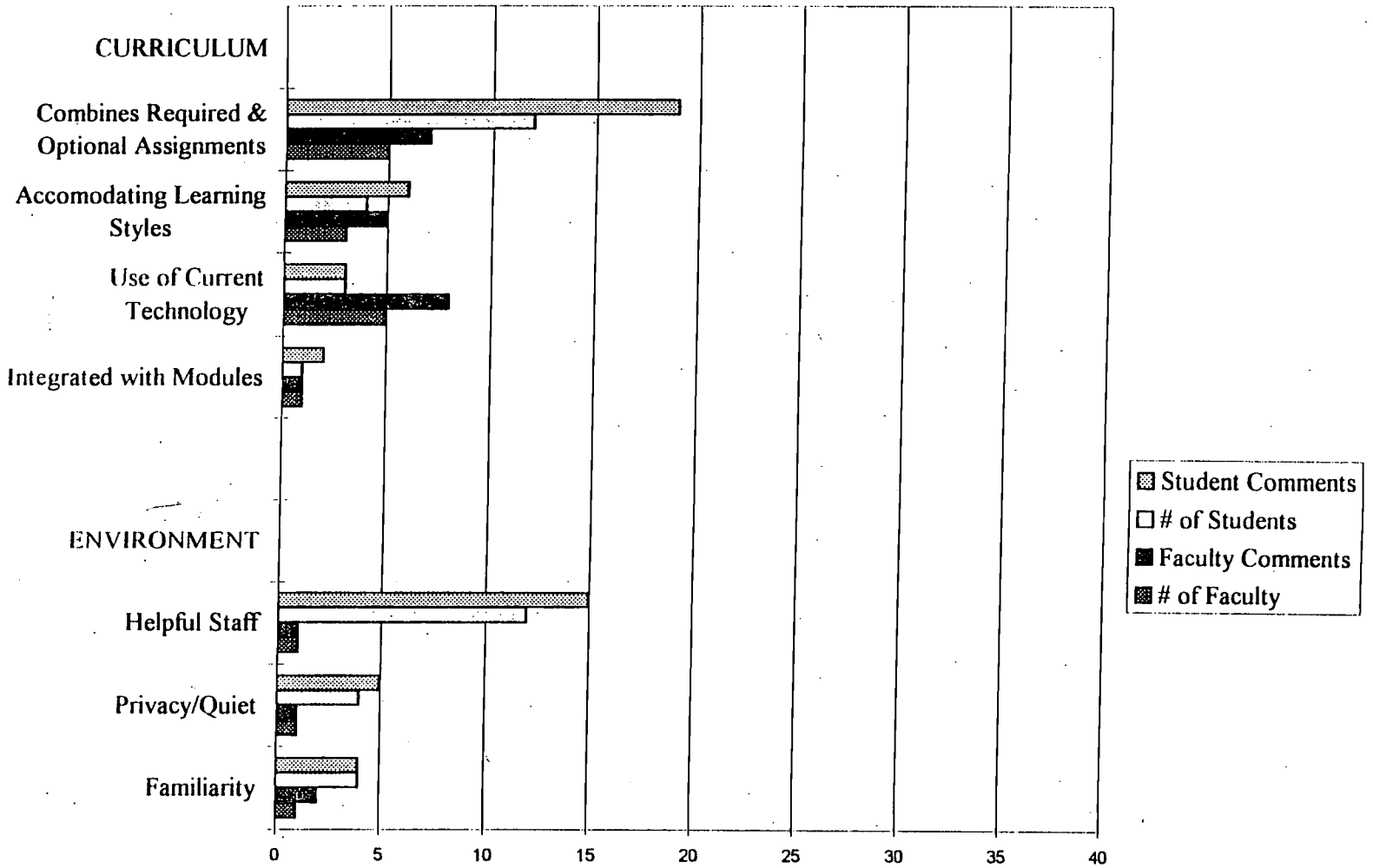

Figure 6. Positive Characteristics of CBI

The most frequently mentioned positive characteristic of CBI programs among students within the curriculum was a combination of required and optional programs. This characteristic was mentioned 19 times by 12 of the 15 students interviewed. Among faculty, this characteristic was mentioned seven times by five faculty members and ranked second.

Two students expressed their preference for optional CBI assignments. One student said, "I liked the modules that left it up to us to choose which tool to use. I tended, when it was left as an optional thing for us, to look at these as reinforcing material." Another student said, "Required makes you know you have to do it and get it done. You as a person know your weaknesses. I think if you want to excel, you will take those options as far as going to the laboratory and viewing these programs." A third student stated, "I probably would have preferred optional, but I think that I would not have taken advantage of it, honestly."

Several other students expressed their support for required CBI assignments. One student admitted, "Although I was annoyed at the time, I think it was good that it was required. It forces you to do it. As long as I know I have to do this, I might as well pay attention." Another commented, "Making it mandatory once in a while is not a bad thing because it is getting someone who does not use it regularly out there." A sixth student said, "It got me to physically go and listen to it because I knew I had to." Another student said, "Actually it's

probably better if they are required. If they are required, you get them done. And they do have valuable information." An eighth student response was, "I made myself budget my time to fit it in. Otherwise I wouldn't have, if they were not mandatory."

> One student shared the following thoughts:
> I felt that there was a reason why it was required and that was why I needed to view them. The optional ones, the majority of times, I did not watch them unless again the instructor had specifically said, "This is a good one to watch." But the majority of time, if it was not required, then I did not watch it.

Faculty members expressed their thoughts regarding required and optional CBI programs in the curriculum. One stated,

> I think that a combination is most effective. There obviously can be some material that is absolutely required for them to review and to learn and to grasp in a stronger format in a shorter period of time than maybe some other content. So those or that type of content I think would need to be mandatory. On the same token, I think it is important at the very beginning with this novice student to reinforce the fact they will never have all the answers to all their questions, but they need to start taking ownership for their learning and lifelong learning needs. When you have those optional components there, they are positioned to say this is also expected of you. The credit you get for that is knowing that you are growing in your competencies.

A second faculty member commented, "I think if it wasn't assigned, 90% wouldn't do them." Another faculty member stated, "If it is mandatory, then they feel, hopefully, more obligated to do it." A fourth faculty member said,

> I do think they should be allowed some choice in learning within the fact that this part of it is mandatory. This piece of it is mandatory, but you can choose from this list of whatever, four or five within that you can choose what will meet your learning needs the most. So that gives them some individualization. You're also assuring that they get the technological piece and the theory information that they need. But they feel rewarded because they feel they have choice in it. So I think that may be what is helpful.

Accommodating Learning Styles

The second most frequently mentioned positive characteristic of CBI

programs within the curriculum among students was that they accommodate different learning styles. This characteristic was mentioned six times by 4 of the 15 students interviewed. Among faculty, this characteristic was mentioned five times by three faculty members and ranked third.

One student recalled, "I know that some people really learn well from just reading or just taking notes in class and other people are more visual learners. I tend to be a mix of both." She continued to say, "If you think you need to actually see and touch something, that is when you go to the laboratory to do some computer programs." A second student reported, "I am a visual learner, so if I see something, if I see a procedure done, I tend to remember it more than someone reading to me what needs to be done. I know in this case the CAI was helpful for me."

> Another student said,
> I really need to hear it. I'm from the old school that you need repetition. For me that works the best. I need to hear something and connect the two. I learn better in that type of technique, to actually hear the crackles and to hear the pleural rub. Then I can associate it with that for the future.

A fourth student explained, "I think it is good for a learner; we learn in different ways. Some of us are visual learners or auditory learners; I think it's good to have a variety of ways to learn."

Faculty members also expressed their thoughts on how CBI programs accommodate different learning styles. One faculty member stated, "Students have the freedom to view these programs without feeling embarrassed about whatever their learning style is." Another faculty member shared the following thoughts:

> I think that it takes into consideration the way the learner learns, whether they are auditory or visual. Some students think it is a benefit if they are an auditory learner or visual learner where they may not have the reading comprehension but they can ascertain the information. So I think it helps those students greatly.

Another faculty member explained, "They're all pieces of the learning. The

demonstration is supported by some computer-assisted instruction, supported by all the other things that you do. You hopefully are going to hit everybody's learning style."

Use of Current Technology

The third most frequently mentioned positive characteristic of CBI programs within the curriculum among students was the use of current technology. This characteristic was mentioned three times by 3 of the 15 students interviewed. Among faculty this characteristic was mentioned eight times by five faculty members and ranked first in frequency.

One student shared, "I appreciate that a variety of technology was used because that is preparing us for the real world. A lot of things are going to computers now on the nursing floor, and I think people need to be familiar with those tools." A second student reported, "I think it is great that we are using computers and getting a grasp on what it is about. It's a great tool if it is used." Another student stated,

> I think this is just one way to enhance, and computers are becoming more and more prevalent in our learning environment. I think that some of us are not expert computer users at this time. But it's good to force us to take the time. I think that's very valuable."

The nursing faculty also expressed the importance of CBI programs using current technology. A faculty member stated,

> The other thing I think is that in any program, we should be teaching the students things that are lifelong. When they get out into the work world now, all of this will help them to be more comfortable. So I think this is the future and we need to be a part of it.

Integrated with Modules

The fourth most frequently mentioned positive characteristic of CBI programs was integrated with modules within the curriculum. This characteristic was mentioned twice by 1 of the 15 students interviewed. Among faculty members, this characteristic earned a single comment.

The student shared these thoughts, "It seemed to integrate well with the modules. The ones in which we were given optional choices of viewing, those seemed to work real well with the material."

One faculty member also expressed her thoughts regarding integration with modules within the curriculum. She stated, "The students view a laser disc on labor and delivery in their second year. They already had a module on labor and delivery in their first year, so they have some basic knowledge."

Positive Characteristics of CBI Programs Within the Learning Environment

To explore the CBI learning environment, three interview questions were asked. "I would like to hear your comments on the learning environment in the computer section of the nursing laboratory" was asked, as was "I would like to hear your comments on the other computer laboratories you have used on campus." Also asked was, "If you needed assistance while using the computer programs, was help available?" The positive characteristics of CBI within the learning environment ranked in order by the number of times they were mentioned in the student interviews were as follows: helpful staff, privacy/quiet, and familiarity (see Figure 6).

Helpful Staff

The most frequently mentioned positive characteristic of the CBI learning environment among students was helpful staff. This characteristic was mentioned 15 times by 12 of the 15 students interviewed. Among faculty members, this characteristic earned a single comment.

One student stated, "Help may not be there instantly, but there was always somebody to answer your questions." Another student said, "The laboratory person was always there if you had any questions. They were all very helpful. If needed, they would stay overtime for us." A third student commented, "The helpers down in the laboratory are very helpful. Whatever help you need with the computer, they would give it to you." Another student reported,

> The laboratory person is a major resource, both with the computer equipment and also if something was unclear in the way the material was presented. If you were not quite sure or if there was a doubt about what the program was saying, the laboratory person was able to clarify things.

A fifth student recalled, "There was always someone there to solve technical difficulties. I know with some of the CD-ROM programs, you needed to exit the main menu and do a few other things; there has always been someone to help." Another student shared her thoughts: "The laboratory personnel were well skilled. They would always take the time. I felt guilty even asking them sometimes because they were so busy. They never got a negative attitude. It made you feel good that you did ask." A seventh student commented, "If we could not get a program pulled up for whatever reason or it was stuck, the laboratory personnel would be more than happy to help me." Another student said, "There was always a laboratory instructor available to help."

One faculty member also expressed her thoughts regarding helpful staff within the environment. She stated, "There are enough technology people on campus that know enough about the CD-ROM and about the computer that it is not

like a foreign body to them."

When reviewing selected CBI programs in the nursing laboratory, I also needed assistance with starting an interactive program. A laboratory staff member was readily available and very responsive.

Privacy/Quiet

The second most frequently mentioned positive characteristic of the CBI learning environment among students was privacy/quiet. This characteristic was mentioned five times by 4 of the 15 students interviewed. Among faculty members, this characteristic earned a single comment.

One student described the following, "I prefer the more carrelled off sections as opposed to the long line of computers. I get distracted easily. You want it somewhat isolated so you can concentrate. Another student said,

> If you really need to view something you don't understand, you don't go when the laboratory is going on. You try not to. I'm one of those people that needs quiet. I pick a time when I know people are retaking a test or there is no scheduled laboratory. Some people can study with the radio or television on and do fine. I can't.

A third student said, "I liked having the partitions; those are good. You get some privacy."

One faculty member also expressed her thoughts regarding privacy/quiet within the computer laboratories on campus versus the nursing laboratory. She stated,

> It's much more quiet, even though there are hundreds of people taking computer courses here on campus, or that they need to do a computer program for a class. We're not talking about a multitude of computer programs or required work or optional work for 240 students in a given area.

Familiarity

The third most frequently mentioned positive characteristic of the CBI

learning environment among students was familiarity. This characteristic was mentioned four times by 4 of the 15 students interviewed. One faculty member mentioned this characteristic twice.

A student responded, "I got used to the environment. I knew how to use the equipment and I knew the laboratory personnel would be there if I had questions." A second student stated, "I pretty much stayed in the nursing laboratory, because most of our classes were in this building. I just viewed the videos in the library." Another student recalled, "We are used to going to the laboratory every day to check our mail. If we had to go to another laboratory, we would say, forget about that." A fourth student commented, "I liked the informal atmosphere in the nursing laboratory, of people being there."

One faculty member also expressed her thoughts regarding familiarity within the computer laboratories on campus versus the nursing laboratory. She stated,

> The students do tend to do these things in the nursing laboratory. This is where they meet their friends. This is where they can ask a question or look up something in the middle of a program. But it's kind of always been that way, no matter how much I encourage them that there are other places that they can use. They tend to still like the nursing laboratory.

Student Behaviors Related to CBI That Enhance Learning

Another interview question asked students, "Did you prefer working with these computer programs individually or in a group? Why?" Students also described their behavior in responding to other questions. The student behaviors toward CBI that enhanced learning ranked in order by the number of times they were mentioned in the student interviews were as follows: working in groups, working alone, reviewing for exams, and devoting time (see Figure 7).

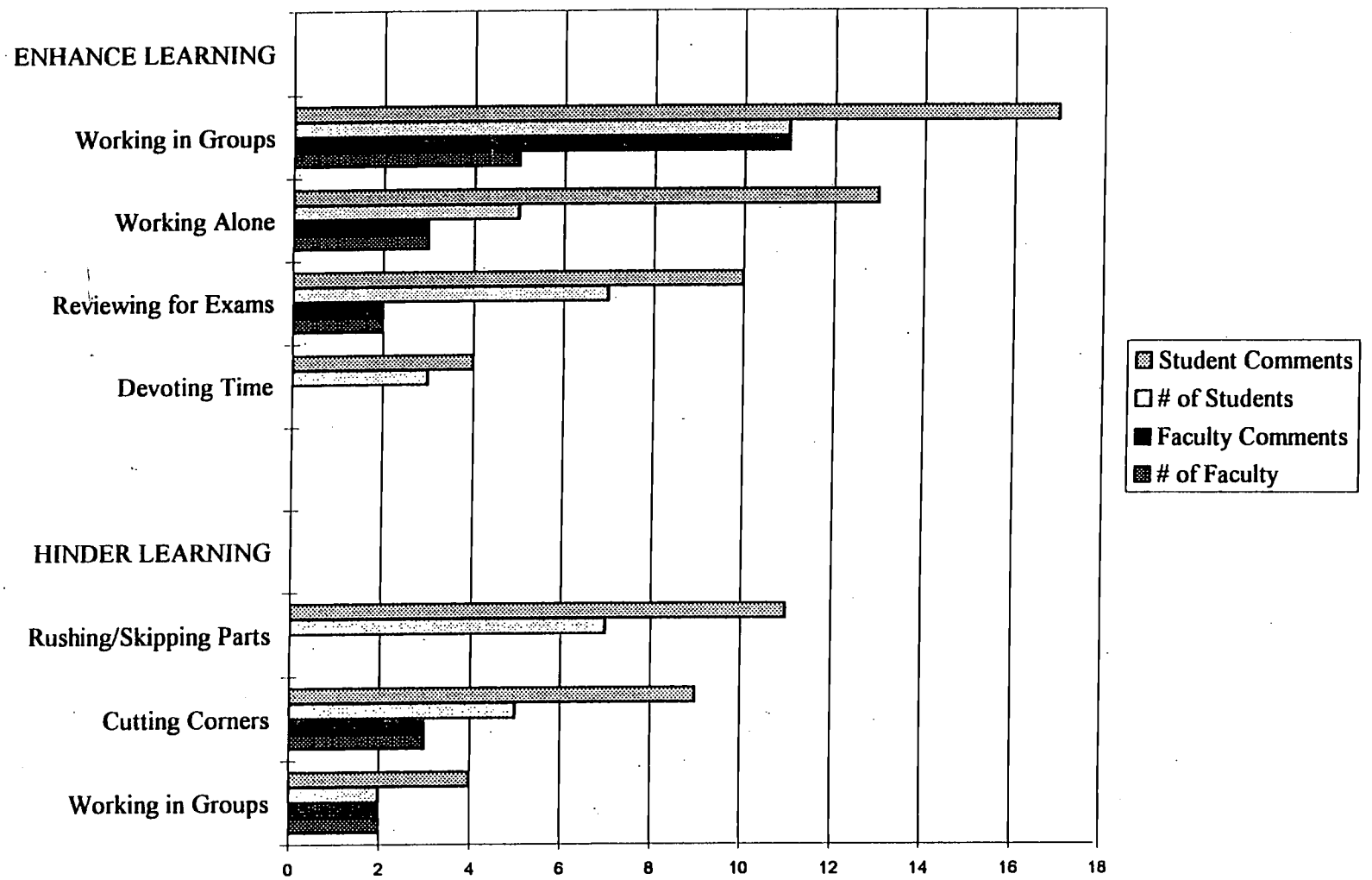

Figure 7. Student Behaviors with CBI

Working in Groups

The most frequently mentioned student behavior related to computer-based instruction that enhanced learning among students was working in groups. This behavior was mentioned 17 times by 11 of the 15 students interviewed. It was also the most-mentioned student behavior among faculty, with 11 mentions by five faculty members.

One student shared the following thoughts: "It's helpful to have one or two people, not four. If it was more than two, it seemed more cumbersome. If I went with Sandy, we would bounce things off each other." She continued to say, "It was helpful to be with someone to discuss it with. Sandy and I were always together." From another student's perspective: "To me it helped. Because you can converse with someone as to what is right or wrong, or what does this rationale mean? When you are by yourself, you don't have anyone to talk to." She continued share the following thoughts, "Usually within our group we could answer the questions, we pooled our knowledge." A third student reported, "Usually when we go to the laboratory, we try to finish more programs, so we would take someone so we didn't get bored or feel tired. Plus sometimes we would discuss, `what did you think that should be,' then we gave our opinions."

Another student described the positive experience of working in a group: "It helps me to think about how other people are seeing it, not just my way. You have variations how people think. I am not just one-sided in how I think." A fifth student shared, "I, for myself, used it with three or four students, and we could discuss certain things or go back to something to review it." She continued to say,

"I think for the people I was with, we would go after class. It was fresh in our minds. We all wanted to be focused on it, and it was just a convenience type of thing."

> Another student stated,
> We always viewed them [interactive videos] in a group, between two and four of us. With the CAI programs, the most students that I ever worked together with was two. . . . You were able to get feedback. Everyone has different insights and everyone's memory was jogged in different ways. I think we were all able to feed off of each other. That's always helpful; two heads are better than one."

A seventh student said, "Sometimes you would view them with people that think similarly to how you think and sometimes not. I got a lot more out of it when you could dialogue with someone."

One student commented, "Most of us were in a group of about three people, which I think is better than individually. I liked to have the input of other people and how they looked at the situation; I never thought about that before." A ninth student explained,

> The thing is that my friends and I would do it together, and we didn't study the material before; we just kind of went in just to see what we were able to retain from lecture. We viewed it and then we knew what our strong points were and what our weak points were. I think it helped to point that out. . . . When I did it with my friends it did help with talking things through. When we disagreed on something before we touched the screen or put in our answer, we tried to find out why we felt differently. That helped to put it into memory when it came to test time or when you had to recall that information.

A tenth student recalled, "Within a group, you could confer with the other people when you couldn't confer with the computer."

> The response from one faculty member was,
> I think the group process is extremely valuable for learning in general. Especially for this particular format, they are able to bounce ideas off each other. In a subtle way, it reinforces the group process, which would be essential for their role as a nurse when they are actually in practice. They're learning to use the team to solve problems. Students tell me, I don't like to work with a group; I like to work alone. This format allows them to get comfortable with the group dynamics and work through those, again, safely

prior to getting into the clinical setting.

Another faculty member stated, "Usually the students view the programs as a group because they are time consuming. There is a lot of interaction among the students, which is a nice thing to see." From the perspective of another faculty member: "I think when they work together with another classmate, it teaches them collaboration, which is something they need to do." She continued to say, "Obviously, because there is someone to talk with, they discuss more. I think they get more out of their learning experience if they work with other people." A fourth faculty member said, "We stress the fact that they're not only interacting with the computer screen; they're interacting with the group. They take the test as a group. We want you to argue about your answers. That's part of it."

During my direct observations in the nursing laboratory, I saw several groups of students working together. A group of three students were viewing a CAI psychiatric nursing program. They were discussing a client situation and comparing answers to a series of questions. There were other students in the laboratory practicing nursing skills on mannequins. I could hear their conversation in the computer section of the laboratory.

On another occasion, I observed a group of three students viewing the same program. They were discussing the rationales given for answers to the program quiz. I did not observe any students having equipment malfunctions. I could hear the sound of the suction machine as other students were practicing nursing skills. This continuous rumbling sound was distracting to me.

Working Alone

The second most frequently mentioned student behavior related to CBI that enhanced learning among students was working alone. This behavior was mentioned

13 times by 5 of the 15 students interviewed. Among faculty, this student behavior was mentioned three times by three faculty members and ranked second.

> One student described her experience:
> I tended to do those by myself because there were less distractions. I can do them at my own pace and use my thinking process and analytical process to answer some of the questions. In my situation, I was looking for additional information for myself. My friends that I study with didn't really need it or have the time for it. Our schedules were different. . . . I prefer to do it on my own. I tended to get kind of crazy if we had to sign up for those programs. Just the nature of my schedule changes frequently.

> A second student said,
> Most of them I did on my own. The majority I did on my own either in the laboratory here or in the computer building. If I needed to get things done and had a limited amount of time, I'd go to the computer building. I would not run into any of my pals. It did not have to do so much with the atmosphere, the specific learning atmosphere; it was more of the distractions that were involved with being here as opposed to the computer building, where I don't know anyone. I could go in, sign in, and do all my work and go home.

A third student commented,

> The CAIs I did mostly on my own. The laser discs I did with one other student. I usually like to view them on my own or with one other person. I think if you did them with a group, you don't get as much out of it. . . . If I do it in a group, sometimes I might not speak up if I wanted to read something over again and everyone wants to go ahead. Whereas when I do it alone, I can take my time and read it over and over. But it's nice to have another person there to clarify information. So I would choose to do it alone or maybe just with one other person."

> Another student recalled,
> I find that I need to do them alone. Last year, I did them with three or four of us. It takes four times as long, and this person reads faster than these people do. So they want to keep flipping through, and there is a lot of talking going on. Or they would say the answer out loud. It's like I didn't even finish reading it yet.

One faculty member stated, "There are a good amount of people who would rather be alone and do their own thing. To get in there and do it and be on their way." Another faculty member explained, "I get the impression that some of the ones that do it individually do it that way because it has to do with their time

limitations. This is when I can do it, and it doesn't matter who else can do it. This is when I have my little piece of time that I can get into the laboratory."

During my direct observations in the nursing laboratory, I observed three students working alone reviewing a CAI psychiatric nursing program. Two students took notes as they viewed the program. One student read the questions aloud. During this particular early afternoon, the laboratory was not crowded. However, I have been present at many other times when almost all the computers were being used by students. The other part of the laboratory was noisy and overcrowded with students practicing skills on the mannequins and using equipment, such as intravenous infusion pumps. The resulting noise level competed with the sound content of the CBI programs.

Reviewing for Exams

The third most frequently mentioned student behavior related to CBI that enhanced learning among students was reviewing for exams. This behavior was mentioned 10 times by 7 of the 15 students interviewed. Two faculty members mentioned it twice.

One student shared the following thoughts: "I liked them because it tells you what you're doing. You can use them as a review for boards, you can use them to review for the tests, and you can use them to review for the final." A second student commented, "The ways it is presented in the computer programs is the way they are asked on NCLEX-RN, which is helpful, too. But to get in there and use the computer is a different way of taking tests and this is how you will take boards."

Another student stated, "So when I prepared for tests, I would use the programs to see how prepared I am. I think that helped me a lot." A fourth student said, "It helped me prepare for tests."

> One faculty member commented,
> I don't know if the students follow through with it. But students have said that they like having this list of programs because even though they won't do them all, maybe during the course they will come back and possibly look at them if they're studying for the NCLEX-RN exam.

Devoting Time

The fourth most frequently mentioned student behavior related to CBI that enhanced learning among students was devoting time. This behavior was mentioned four times by 3 of the 15 students interviewed. Faculty members did not mention this student behavior.

One student described the experience as, "I would go, when I had time, to the laboratory, sit down and slowly listen to the material, take the tests, and retake the tests if I didn't do well the first time to analyze where my weak areas were." Another student commented, "You get to work at your own pace in the laboratory." A third student recalled, "It was nice because in the psychiatric nursing, the classes only ran half of the day and so we were still here. We had the afternoons to work on programs. I think sometimes when we have the longer classes, people just want to go home. So it was nice to already be here and have some extra time to be able to do them."

During my direct observations in the nursing laboratory, I saw a group of three students carefully going through the CAI program on psychiatric nursing. They reviewed the psychiatric client situation and spent time discussing the content and responding to the questions. I could hear the sound of running water, and I found that distracting to me. As more students entered the laboratory to practice nursing skills, the noise level increased. I heard the students at the computers talking more loudly to one another until they completed their programs.

Theme 3: CBI Hinders Learning Under Certain Important Conditions

To investigate how CBI hinders learning, three interview questions were asked. Each focused on one of the three computer technologies used in the nursing curriculum at Forest College. "What is the most negative thing you can tell me about your experiences using interactive videos? What is the most negative thing you can tell me about using CD-ROM programs? What is the most negative thing you can tell me about using CAI programs?" Responses to these questions can be categorized as those that related to the negative characteristics of specific CBI programs and those related to how CBI programs were used within the curriculum.

Negative Characteristics of CBI Programs

The negative characteristics of CBI programs that hinder learning, ranked in order by the number of times they were mentioned in the student interviews, were as follows: time pressures, no hands-on experience, and no rationales (see Figure 8).

Time Pressures

The most frequently mentioned negative characteristic of CBI programs among students was time pressure. This characteristic was mentioned 43 times by 14 of the 15 students interviewed. It was also the most-mentioned characteristic

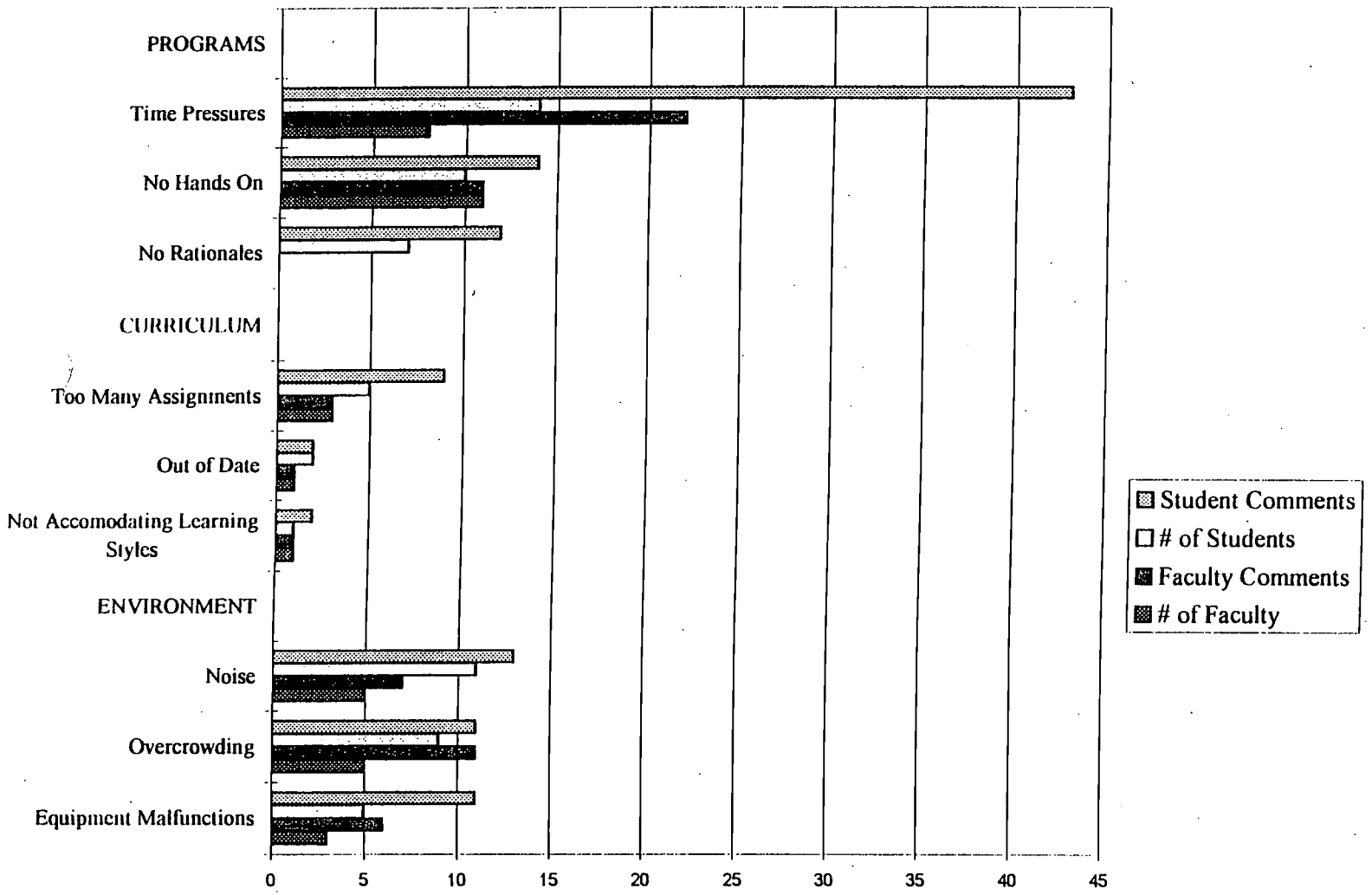

Figure 8. Negative Characteristics of CBI

among faculty, with 22 mentions by eight faculty members. One student shared the following thought: "It seemed in some modules you were inundated with so much information that everything seems to flow together." Another student commented,

> They are long, really long. You don't know enough to skip. Some of them are two and a half hours long. It's okay if you have that kind of time; you're doing one and you're getting a point for it. Or if it's for your own learning plus it's helping my grade. . . . When I was doing it, I was annoyed, but unfortunately, I don't do optional stuff. Even though I know it is good for me, I have this much time to spend on this. People work, have kids, and they need to get home. You know, if they are not required, they [students] will say, this is one less thing for me to be doing.

A third student recalled,

> They [CBI programs] are too long. You need to go through the whole thing, even if you have all the information; there is no way to exit. You need to finish the whole thing. We felt many programs were too general and a waste of our time. Stuff that we would learn in the book, we didn't have to get the printout because we did fairly well. Okay, this didn't help us very much. I know I have to work. I know what my schedule holds for the week, now I have to shoot this in.

From the perspective of another student: "In the psychiatric module we had seven or eight programs that were mandatory. We needed to turn in a computer printout. We had a lot of paper work. Oh, my God! I have so much work to do." A fifth student recalled, "Sometimes they are too long. You have to find time to do them. That is why I cannot think of the last one I had done. It takes a lot of your time."

Another student stated,

> I think probably the only negative thing was the time element involved. They are rather lengthy, and that is time that you schedule on your own. The flexibility is nice; you can do it when you do have time. But then there is also the time element; there is so little time and the fact that so much of it went into greater detail.

A seventh student said, "Although I don't really think there were many that lasted over an hour. But like I said, with schedule conflicts, sometimes even an hour is hard to fit in." One student reported, "If it starts getting too long, you kind of start getting worn out. I felt that towards the end."

A ninth student described the experience of viewing the interactive videos as follows:

> You really needed to devote the morning or the afternoon to it [viewing interactive videos]. Not like some of the others that you could stop and pick up. You had to go through the whole thing from the beginning to end. I felt that was a negative.

Another student responded, "The only thing I can say is you do have to give yourself time. You cannot be rushed 'cause you will not learn. The courses are so stressful and compact and intense, that you need to make every minute count."

An 11th student said,

> The only negative is that some of them are very time consuming. I remember one time, we were there for two and half-hours. So being that our time is so limited anyway, some of them are really lengthy and were required. I felt that some of them could have been shortened. . . . I think for the most part, since this school year, our second year of nursing school, if it wasn't required, the majority of us, with our time limitations, did not view things. I don't know why there is a change, but from then on, maybe because our schedules became heavier. The majority of students that I know, and they are all A/B students, chose to mainly study the theory and read the book versus viewing the optional programs just because of the time constraints.

Another student shared the following thoughts: "They're a little bit lengthy. It's just trying to find the time to do it."

Faculty members also expressed their thoughts regarding time pressures. A faculty member stated,

> Another thing about the interactive videos is that once that you get into them and if something goes wrong with the computer or a student hits or touches the wrong point on the screen, it's very difficult and very time consuming to get out. Sometimes, I would say, you have to reboot or go back to the beginning of the program. It's a very time-consuming process, and in the meantime, the students that you have interested, with their time constraints, are no longer interested. I think the interactive videos are extremely long programs.

A second faculty member commented,

> We had an interactive video we used for communication skills and it was taking the students probably about two hours to get through it. By the time the third group of students came through, they had already heard, you don't need to do that; it takes too long. We found a much better CD-ROM that

they can accomplish in an hour. So we've scrapped the interactive video and now use the CD-ROM.

Another faculty member shared the following thoughts:
I've had students complain that we don't give points for this. For pediatrics, they do five computer-assisted programs. There is a whole list and they choose five. Some of them complain that it is time consuming and that they should get points for it. But I told then that it is a learning experience for them just like reading the textbook or other learning experiences; it's just part of learning. We've not given points for that, but we don't have them hand in an assignment. They have to fill out a little sheet saying which program they did and if they liked it and why or didn't they like it and why.

No Hands-On Experience

The second most frequently mentioned negative characteristic of CBI programs among students was no hands-on experience. This characteristic was mentioned 14 times by 10 of the 15 students interviewed. It was mentioned 11 times by 11 faculty members and also ranked second among faculty.

One student reported,
They [CBI programs] helped, but it's not the same. The real world out there is so different than the school world. I see that even now working as a technician. There's the school way and the real way. It helps and it doesn't. I think you need to have the hands-on.

A third student commented, "For me to just go in the laboratory and do the hands-on, that was more helpful." From the perspective of another student: "Maybe for some of the skills like IVs, but I found the hands-on is more beneficial." Another student said, "Clinical was mainly skills and I got that information from laboratory." A sixth student recalled, "I did not use them for nursing skills."

Faculty members also shared their thoughts regarding no hands-on experience:

I think that a computer program or a videotape is fine as an initial reinforcement. But my experience with the students is that for something that is even basic or complex, they like their instructor to show them so they can get a real view of what they are supposed to do.

A second faculty member commented, "I think the programs are more with critical thinking and decisions. The only way to do the skills is hands-on."

No Rationales

The third most frequently mentioned negative characteristic of CBI programs among students was no rationales. This characteristic was mentioned 12 times by 7 of the 15 students interviewed. Faculty members did not mention it. One student stated her thoughts regarding no rationales: "For me to get a printout at the end--the numbers don't mean anything to me." Another student commented,

> They did give a rationale for the incorrect answers. If you were correct, even if you guessed, then it just said correct. It did not say correct because so on and so forth. But if you were wrong, it would tell you why you were wrong.

A third student said, "It just gave you a summary or highlights of each personality disorder and then only gave you the results of how many you got wrong. I really didn't look back at those hard copies."

Another student stated, "The hard copy with my score was not so much helpful, more discouraging than helpful." A fifth student explained, "A printout summary of the program didn't help me. I tend to lose pieces of paper. I'm not terribly organized in terms of keeping track of those types of things, so I tend to not print them out. I knew I would not use them."

Negative Characteristics of CBI Programs Within the Curriculum

The negative characteristics of CBI programs within the curriculum that hinder learning, ranked in order by the number of times they were mentioned in the

student interviews, were as follows: too many assignments, not accommodating different learning styles, and out of date (see Figure 8).

Too Many Assignments

The most frequently mentioned negative characteristic of CBI programs within the curriculum among students was too many assignments. This characteristic was mentioned nine times by 5 of the 15 students interviewed. It was also the most-mentioned characteristic among faculty, with three mentions by three faculty members.

> One student stated,
> The most negative overall experience, there were not specific programs that I had a reaction to, it was more of how we were assigned to complete them. We had to complete seven of them in one module, eight of them in another module, and turn in your little sheets showing that you have completed them. [Each module lasts four to five weeks.] . . . If they were assigned to us, by the end of this module you had to complete eight programs. I found it to be a waste of time for both me and the instructor.

Another student described the experience: "When we would go through the module and there would be five or six mandatory programs, it doesn't seem stressful, but it was."

> A third student said,
> I think these programs should be optional. If people are willing to learn through computer-based programs, then that is excellent. But I don't think they should be mandatory because people learn in different ways. I'm a lecture learner, and I can sit in a lecture five days a week. It's easier for me to learn that way than sitting at the computer because I get worn out real easily, visual-wise, and it just wears me out.

A fourth student commented, "A lot of the optional assignments I elected not to do because there is quite a bit of required things to do, and more often than not, if it was optional, I elected not to do it."

Out of Date

The second most frequently mentioned negative characteristic of CBI programs within the curriculum among students was that the software was out of date. This characteristic was mentioned twice by 2 of the 15 students interviewed. It was mentioned once by a faculty member.

One of the students stated, "The intravenous interactive video was pretty old, and they were using equipment that we don't even use any more." A second student stated, "I think the interactive videos are good, but some are older and need to be updated."

One faculty member said, "Our interactive videos are probably going to be a thing of the past very soon. I guess that not a lot of new ones are being developed. That's sort of yesterday's news." In my document review, I examined the interactive video program on "Intravenous Therapy" myself and observed the use of outdated glass intravenous (IV) bottles. I was surprised at my strong reaction to seeing glass IV bottles, which I have not seen since I was a student. Because IAV is such a visual medium, I found myself distracted from the other content by this anachronism. Textbooks are a verbal medium and one imagines current equipment when the term "IV bottle" appears in the text. However, new editions of nursing textbooks in which photos and illustrations are updated are an automatic occurrence. Perhaps updated editions need to be part of a CBI program's purchasing agreement.

Not Accommodating Different Learning Styles

The third most frequently mentioned negative characteristic of CBI programs within the curriculum among students was not accommodating different learning styles. This characteristic was mentioned twice by 1 of the 15 students interviewed.

It was also mentioned once by a faculty member.

One student reported, "Some people learn better just reading rather than going through the computer programs. Some people are not even computer literate. Me for one." She continued to say, "It's great to reinforce, to reinforce in a different way, but like I said, I'm not a computer person, so reading it in the book is just as effective." One faculty member commented, "A lot of students have come up to me this time and have said they are so visual. They already realize what their learning style is. The laboratory demonstration was what they needed to put it all together."

Negative Characteristics of CBI Learning Environment

To explore the CBI learning environment, three interview questions were asked: "I would like to hear your comments on the learning environment in the computer section of the nursing laboratory" and "I would like to hear your comments on the other computer laboratories you have used on campus." Also asked was, "If you needed assistance while using the computer programs, was help available?"

The negative characteristics of the CBI learning environment that hinder learning, ranked in order by the number of times they were mentioned in the student interviews, were as follows: noise, overcrowding, and equipment malfunctions (see Figure 8).

Noise

The most frequently mentioned negative characteristic of the CBI learning environment among students was noise. This characteristic was mentioned 13 times

by 11 of the 15 students interviewed. It was mentioned seven times by five faculty members and ranked second in frequency of mentions.

One student shared the following thoughts: "Sometimes when there was a group of first-level students using the laboratory area, it could get very noisy. It could get quite noisy and distracting for other people." Another student recalled, "When you have that blocked-off area, but then you have five other people whose computers are as loud as yours is--it is very loud in there." A third student described the experience as "noisy, plus sometimes you have classmates who talk to us as we are reviewing the program." From the perspective of one of the students interviewed, "Sometimes the laboratory can be noisy. You really have to concentrate." Another student said, "Well, I realize we are short on space. I think it would be nice to have a quieter place to do the programs."

A sixth student commented, "Noises, people walking around. I think they should have a separate entity just for viewing videotapes, CD-ROMs, and the computer programs." She continued to explain, "The noise, people checking mailboxes and chit chat, students taking breaks from the classrooms. It just seemed not conducive for me." Another student recalled, "The noise level carries around the corner. I think that's mediocre; that could be better." An eighth student reported, "The noise level can be really bad, especially during the computer-assisted programs. You're working on one here, and there is a group here. There is a lot of discussion, especially when we are doing the RN-CAT practice; that was really hard." One student described the experience as, "Just basically the noise from the surrounding groups. It was partitioned off, but you can still hear people laughing and talking."

> From the faculty member's perspective,
> If you have the audio and you have several computers there, it is easy to get distracted between the different programs and what the different students are

> doing. But we make it work until we can get something better. . . . So it's difficult then for the instructor to be assisting with the skills and monitoring supplies and answering questions about the computers.

A second faculty member stated,

> There are certain programs that we can hook up with a headphone. If you have two or three people, it's really difficult to do that because everybody wants to stop or when the headphones are on and they're trying to communicate with each other. Their hearing is impaired [by the headphones], so everybody is talking real loud and they don't realize it.

A third faculty member shared the following thoughts:

> The noise level is an issue. Sometimes we have a laser disc going and someone is doing a CD-ROM and they're battling even though when we have the half walls that are supposed to bounce the sound, you can still hear. So you have to tell people to turn things down. . . . There's about three of them against that carrelled wall. The two against the back wall-- you can get the computer-assisted programs. The lasers are only in that back area. That's an issue, too, because when you have four or five students at those carrells doing their computers, there is noise again. It's kind of disruptive.

Another faculty member shared the following, "Noise and lots of activity around the computers. It's distracting."

During all my observational sessions in the nursing laboratory, I could hear conversations and other noise created by students as they practiced skills in the area near the computer section of the laboratory. Students viewing CAI programs had to speak loudly in order to be able to respond to each other and answer questions.

Overcrowding

The second most frequently mentioned negative characteristic of the CBI learning environment among students was overcrowding. This characteristic was mentioned 11 times by 9 of the 15 students interviewed. It was mentioned 11 times by five faculty members and ranked first.

One student shared the following thoughts: "It seems there are times when every module had required programs to do. There would be a fairly large group of

people back there. Sometimes you would have to wait to get on a program." Another student recalled, "It depends how crowded it was. If there was a big skills laboratory coming up and a lot of people were in practicing, it was a little distracting, just space-wise." A third student said,

> I know I was practicing the RN-CAT in the laboratory. There were only a couple of terminals at which you can sit, and I was in a high-traffic area. It was really noisy in the laboratory. I kept looking to see what was going on and people kept walking behind me. I understand that there is just so much room, but I felt it was a little distracting.

Another student shared her perspective: "The laboratory is a joke. It's way too congested. Not at all conducive to learning, way too many distractions." She further stated, "Again there's still too much traffic. The way it is set up, there are not enough barriers. Unfortunately, I get distracted easily." A fifth student commented,

> Where we viewed the computer programs, it was somewhat crowded because you're on a narrow aisle there. The other computer programs are more off to the side so you have a little cubicle, which made it more conducive to viewing in a group. . . . Where the computers are presently lined up, people are passing by and it's not quiet the way it is laid out.

From another student's perspective, she stated, "When I did the psychiatric program, there were people on both sides of me. Then you hear them talking and giving an answer. I could not concentrate. I needed to read the question five times." A seventh student recalled, "The only thing that I did not like in the laboratory was it was too tight."

One faculty member shared the following: "It is what we have. It's certainly cramped and can be very distracting. With our current setup, a group of students are working back there on computers. Even though we have dividers, other things are going on in the laboratory."

Another faculty member stated,

> There is just not room for any more than a couple of people at each of those computers. People cram themselves in there, but it basically is designed for

> one person. . . . Since we do have a good amount of programs that are either required or that the student would like to use as a resource, trying to fit our 240 people, not all on one day, but even 25 of those people on a given day, when it's convenient for them after their classes or before the next day here on campus--it's a real crunch to any laboratory.

A third faculty member commented, "It's very crowded. Space is definitely an issue."

> From the perspective of another faculty member,
> I think it's really difficult for students to keep on track in terms of thought process when the group right next to you an elbow's length away is discussing something that is totally different than what you're trying to watch. There are some people that are very tunnel visioned and can really focus. But I think the majority of people are distracted.

During all my observational sessions in the nursing laboratory, the computer section of the laboratory was not crowded. There were never more than two groups of three students viewing programs during the early to late afternoons when I was there. However, I have personally been present at times when all 13 computers were in use and the other part of the laboratory was full of students practicing on mannequins and other equipment.

Equipment Malfunctions

The third most frequently mentioned negative characteristic of the CBI learning environment among students was equipment malfunctions. This characteristic was mentioned 11 times by 5 of the 15 students interviewed. It was mentioned six times by three faculty members and ranked third.

> One student described the experience:
> I think it was in the cardiac module, there was one, the COPD client. I know why I don't remember it very well, because there were computer problems, it kept freezing up. It seemed that it was a repetitive error. There must have been something wrong with the disc itself, not the player; the disc had some skips. . . . The most discouraging part was the mechanical malfunctions, such as the program with the COPD client. You get frustrated when you're in the middle of watching a situation and all of a sudden the program freezes up. It takes a long time to reboot the machine. It's very bulky.

A second student recalled,

> A lot of times--and it's no one's fault--but computer discs get jammed or the other programs get jammed and you can't finish. You have to hand this in or you get one point off your module grade. Here you blocked this time off and your time is so precious.

Another student recalled,

> When we were viewing the programs, some of our technical problems were unable to be solved by the laboratory staff, so you were stuck. We have all nursing people, and this is a computer problem. That happened to us a couple of times.

A fourth student commented, "One time we had a technological problem. The disc just stopped, and the computer started beeping, and we really don't know what happened."

One faculty member reported the following related to the use of interactive videos:

> Even more so than the length of the program is the problem I have with the actual running of the program. The disc is very sensitive. Another problem that I run into is if there is a group of students and they put their books down or lay their purse on top of the disc player. The least movement or jarring of the desk can throw the disc off and then we have a monitor which will stop. This is mechanical. The mechanical problems are, to me, more problematic than the length.

Another faculty member recalled, "Oftentimes, the students are frustrated because they will get to the point in the program and the program will shut down or it will scramble and because their time is limited, they get anxious." During my observational sessions in the nursing laboratory, I witnessed only one malfunction involving a student viewing an interactive video program. The staff corrected the problem quickly, and the student told me she was able to resume the program without any difficulty.

I encountered another problem while reviewing the CD-ROM program "Auscultation of Normal Breath Sounds." The sound was not working and the

laboratory staff member was unable to correct the problem.

Student Behaviors Related to CBI That Hinder Learning

Another interview question asked students, "Did you prefer working with these computer programs individually or in a group? Why?" Students also described their behavior in responding to other questions. The student behaviors related to CBI programs that hindered learning, ranked in order by the number of times they were mentioned in the student interviews, were as follows: rushing through/skipping parts, cutting corners, and working in groups (see Figure 7).

Rushing Through/Skipping Parts

Among students, the most frequently mentioned student behavior related to CBI that hindered learning was rushing through/skipping parts. This behavior was mentioned 11 times by 7 of the 15 students interviewed. Faculty members did not mention this student behavior. From the student's perspective,

> I saw it in myself, I know that I was doing it. I knew it wasn't helping me to do it that way, but I tended to complete those by going into the laboratory, sitting down, and completing them all at once and turning them in just to get them over with. It was a means to an end. It didn't really help me. I wasn't learning from those experiences by just finishing them fast. . . . I can remember in one module, just to get the computer assignments done, I sat down and did them all at once. Even before we were presented the material in class. I guessed. That didn't help me at all.

Another student recalled, "I remember there was five required programs. It was almost like you rushed through it because you needed to get these five finished. Some of them were 45 minutes. I don't have five hours to complete these. So you rush through them."

A third student described watching a group of students working on a CAI program. "They are trying to get through as quick as they can and not really taking

in what is important. Nobody is concerned about if they are getting the information, just get through the program."

Cutting Corners

Among students, the second most frequently mentioned negative student behavior of CBI programs that hindered learning was cutting corners. This behavior was mentioned nine times by five of the 15 students interviewed. Among faculty, this student behavior was mentioned three times by three faculty members and was the most frequently mentioned negative behavior.

> One student admitted,
> We went back and we memorized the right answers. So we got a 100%, but we didn't know why. . . . People just photocopy the printout and hand it in. I've seen that; it gets you through. It might be a student who gets straight As or just is struggling, but they feel they need to spend time in the book. They say, why don't you copy that for me? And how are you guys going to know? They hand in one copy with four names on it.

Another student explained,

> When we viewed the 5 or 10 programs, then we got four people together and as horrible as it sounds, one person does one, one person does the other. Now I am letting the secret out now. Then we would all write our names on it because we know it would take forever. So we would get four people together and four would get done in the time it would normally take to get one done."

> A third student stated,
> I know there were a couple that were very difficult and they were both related to medications. I did that particular program at the very beginning of the module before we had gone over the psychotropic medications. It went right over my head.

Another student admitted,

> Same thing again, time consuming. So many we had to view; we split viewing these programs among each other. I shouldn't be telling you this, but there were so many of them. It's very time consuming. Some of us don't have time.

A fifth student commented,

> I was sitting with a bunch of students, and they said, just skip to the quiz 'cause it doesn't matter what score you get. So you can just take the quiz and prove that you did it. You don't have to be here. Or there is one program that you can go through the quiz with the answers. So you can go through and write the answers and then take the quiz, then plug them in.

One faculty member stated, "I remember looking at two people's critique of a computer program and it was written word for word on both of them. And I thought, they think we don't read this. They were trying to pull one over on me."

Working in Groups

Among students, the third most frequently mentioned negative student behavior related to CBI that hindered learning was working in groups. This behavior was mentioned four times by 2 of the 15 students interviewed. It was second most mentioned student behavior among faculty, with two mentions by two faculty members.

From the perspective of one student interviewed, "Sure it was faster and we could reach a group consensus. But I think the reason why we did them in groups was efficiency. It would go faster; we could get it done and turn it in." A second student recalled, "It may have helped a little but probably not as much as me doing independently. Just the same as when you're in a group--this person reads faster than that one and is shouting out the answers."

> One faculty member stated,
> I think a lot of times when there are four people viewing together, that can be at a crunch time. They have to get it done, and the paperwork is due tomorrow, and they have no choice but to get in there together and do it. For the most part, I try to encourage no more than a couple of people at a time. Even though collaboration between a group is always good, I have found that there is a lot of distraction. But then it depends on the group. If the group is there to learn, then they are going to learn.

> A second faculty member said,
> One thing I think might be negative about this is that we assign people up in groups of four. Maybe someone who is getting it wrong quite a bit might be afraid to say, "I don't really understand that; could I go back to it?" It is interactive by touching the screen. You can pause and go back and repeat

what you don't understand. I can see how a student who doesn't know it real well could go with the flow of the other three.

Theme 4: Effective Application of CBI Depends on a Variety of Conditions

To investigate the conditions under which CBI could be more effectively applied, a specific interview question was asked: "Based on these experiences, do you have any suggestions for improving the use of computer technology in the nursing program?" Responses to this question can be categorized as those that related to the nursing program curriculum and those related to the learning environment.

Suggestions for Improving CBI Within the Curriculum

Suggestions for improving CBI within the curriculum, ranked in order by the number of times they were mentioned in the student interviews, were as follows: use of programs in class, fewer optional assignments, fewer required assignments, more interactive videos, and more Internet-based assignments (see Figure 9).

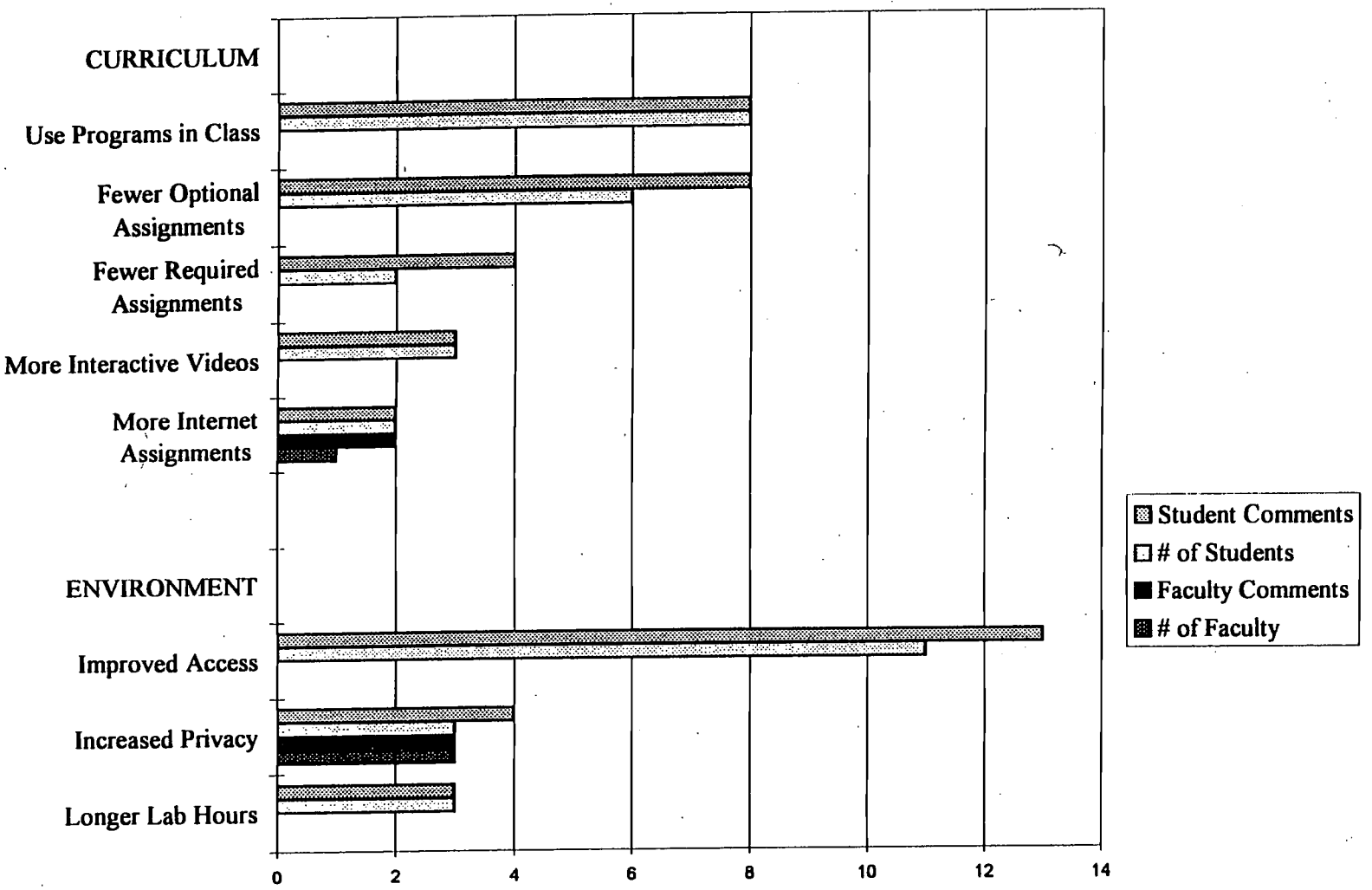

Figure 9. Student Suggestions for Improving CBI

Use Programs in Classroom

The most frequent student suggestion for improving CBI within the environment was to use the programs in the classroom. This suggestion was mentioned eight times by 8 of the 15 students interviewed. One student stated, "Another area might be bringing the computer client situations in class and project them using the LCD monitor, then have the class as a whole analyze the situations." Another student said, "I think it would help to use the computer programs in the classroom setting. In the last module, they would pass out scenarios and give us a 10-minute break. We then came back to then talk about what you decided." A third student stated, "I think it would reinforce theory if the computer programs were used in the classroom. You then could put the theory into a situational practice."

Another student shared the following thoughts: "It would be helpful to have the computer programs in class. Then you're putting everything together and we're seeing it." A fifth student stated, "That would be excellent to have the computer programs brought into the classroom. Saying you should be able to view this on this program and see what we're discussing. Combining it with lecture would help to reinforce and pull things together." A sixth student commented, "I think it's beneficial when instructors give us some real situations; then we are able to put them in the back of our memory and remember those things. We really like that, and it adds some reality to the theory."

Fewer Optional Assignments

The second most frequent student suggestion for improving CBI within the curriculum was fewer optional assignments. This suggestion was mentioned eight times by 6 of the 15 students interviewed.

According to one student, "I think you should keep them required. If you

don't keep them required, I don't think they will get used. They really are good." A second student said, "Maybe if it was something that was brought out right from the beginning, saying, you will have to be involved with the computers. They are a part of your curriculum, not something extra. This is something you will have to do." Another student shared some additional perceptions:

> Actually, I think it is better to have a few of them be mandatory to get people to do them rather than optional. I know that sometimes when you have so many things to do that are mandatory, the optional ones get brushed aside. You may not realize how helpful the resource can be.

A fourth student commented, "If they're not required, I have good intentions to get to them, but I may not always. Maybe it should be required that we view them independently." From the perspective of another student,

> I would think that an instructor should know that a lot of us won't view certain material, even though it might be really beneficial and really enhance things. I'm sure there was a lot of material that would have benefited me, but I can only do so much. There are certain things I should have viewed, but I didn't.

A sixth student explained,

> I would recommend that more of the material be required. With as much as we have as far as requirements go, there were programs I elected not to do. I heard from other people who did them that it would have been beneficial to have done them.

Fewer Required Assignments

The third most frequent student suggestion for improving CBI within the curriculum was fewer required assignments. This suggestion was mentioned four times by 2 of the 15 students interviewed.

One student recalled, "Maybe making one or two mandatory. Also, if you found ones that the staff thought were really great, then maybe this 1 out of 10 should be mandatory. Then the other nine, if you had time to view [them], that would be fantastic." Another student commented,

> Maybe pare it down a little. Pick the ones you feel are the most advantageous and find ones that are in line with exactly what our objectives are for the module. Pare down the additional detail. . . . I think the first thing that comes to mind is just paring it down timewise. If you really want to do all the readings, see all the computer programs, fill out all the objectives before you get to class so then you can take advantage of it, get the most out of it, it just becomes a major burden time-wise.

More Interactive Videos

The fourth most frequent student suggestion for improving CBI within the curriculum was more interactive videos. This suggestion was mentioned three times by 3 of the 15 students interviewed.

One student shared the following thoughts: "Just have more programs like the interactive videos; they give you a picture." Another student explained, "Overall the way they were put together, I think they are helpful as a teaching aid. Actually I think we should have more." A third student said, "Maybe if there were more of the interactive videos on all the different areas of study. I did find them helpful and would like more of them."

More Internet-Based Assignments

The fifth most frequent student suggestion for improvement within the curriculum was more Internet-based assignments. This suggestion was mentioned two times by 2 of the 15 students interviewed. This was also suggested twice by one faculty member.

> One student stated,
> Especially the Internet as a tool. I know just doing things on my own, I got a lot of information from the Internet regarding diagnoses and nursing information. So I think that if that can be integrated into the program, that would be helpful.

Another student said,

> I guess the new thing is the Internet. You can go there for anything that you

need to know as far as procedures. There is also a nursing book out that you can look up different sites as far as information needed for almost anything. So I say the Internet, which the nursing program has implemented onto the coursework, should continue.

From the perspective of one faculty member,

I think that we need to incorporate opportunities for students to bring Internet articles to either the classroom, small-group instruction, or to the clinical in terms of the actual clinical hands-on experience or the postconference or preconference. We need to let them know how to critique information that is sound and reliable as compared to which is bogus.

Suggestions for Improving CBI Within the Learning Environment

Suggestions for improving CBI within the learning environment, ranked in order by the number of times they were mentioned in the student interviews, were as follows: improve access to programs, increase privacy in the laboratory, and have longer laboratory hours (see Figure 9).

Improve Access to Programs

The most frequent student suggestion for improving the CBI learning environment was improved access to programs. This was suggested 13 times by 11 of the 15 students interviewed.

One student recommended,
It might be helpful if there was some way to download the nursing computer programs so the students could have access at home using their own computer. Maybe through the Nursing Department website. This would make the programs available for students to view at any time, day or night.

Another student stated, "It would be nice if you could check out the computer programs, but you can't." A third student shared the following thoughts: "It would be great to access nursing programs over the Internet. Just being able to be at home and at my leisure in the comfort of my own home. Being able to sit down and go

through a program."

> A fourth student stressed,
> It would be much better if the nursing programs were available over the Internet. I could do it in the evening or weekends, because the laboratory is only open a limited time on Saturday. But Sundays were pretty much my day for booking it. So that would have been a real advantage. Then I could access it at home and combine it with my notes and other data that I accumulated.

Another student said,

> That would be great to access the nursing programs on the Internet if it could be done. Because so many of us are trying to juggle family and work, in addition to school. It would give us flexibility that knowing these programs would take a total of four hours this clinical rotation. That we could do it at nine at night, if we wanted, when our kids are asleep, that would be great.

A sixth student shared the following thoughts:

> That would have been really helpful, particularly during the first year. I was working a lot. The laboratory was open in the evening once a week. It happened to be a night that I had a commitment; I found it really challenging to get to the laboratory. So that would have been really helpful.

Another student commented,

> Yes, because it's easier to work out of your home. If you have a couple of things going on and you could let something cook on the stove or whatever, while watching the programs. It would also be quieter, so for me it would help.

An eighth student shared her thoughts regarding being able to access computer programs on the Internet:

> Because you don't need to spend the time. You don't have to spend the time coming here. It takes me 30 minutes to come out here and then maybe another 10 minutes to get into the building from the parking lot. If it is in the winter, it also makes it harder for you to even want to come out. But if it's right at your computer, you could be doing it at 11 or 12 o'clock at night and it's not a problem. It's much more accessible. . . . Even if the instructor had a [compact] disc that she loaned out to students in her clinical group, or if it was on the college web site, that we could go into.

Increase Privacy in the Laboratory

The second most frequent student suggestion for improving the CBI learning environment was to increase privacy in the laboratory. This was suggested four

times by 3 of the 15 students interviewed. It was also suggested three times by three faculty members. One student stated the following:

> It would be nice for me if there would be a separate room, possibly next door, just to be more isolated from the other activities in the laboratory and other distractions. Even physically, one of the classroom areas, if it were set up with the computers, that you could close the door. If students were being checked off or having skills laboratory practicing, that is separate.

Another student commented, "Maybe they could even have a separate room or something." One faculty member suggested, "Whether we ever get more space or not, the logical thing to do would be for nursing to have its own computer laboratory instead of having to go to other areas or other laboratories." A second faculty member commented, "Having a computer area completely separate--adjacent to, so they still are part of nursing--but completely separate from the laboratory. When you have people practicing skills and even though we have a sound board [partitions], it's difficult." Another faculty member said,

> I've always thought that the audiovisual section doesn't need to be part of the laboratory in my way of thinking. It might be very good to have it separate. There are certainly questions that come up, but I don't really see any reason why it couldn't be an entirely separate area.

Longer Laboratory Hours

The third most frequent student suggestion for improving the CBI learning environment was longer laboratory hours. This was suggested three times by 3 of the 15 students interviewed.

One student interviewed stated, "Maybe if the laboratory was opened a little longer, even a little longer on Saturdays." A second student reported, "Having the laboratory opened toward the afternoon helps a lot. I know for me, toward the beginning of the program, it helped me out because I was unable to be in either laboratory in the morning."

Theme 5: CBI Benefits Nursing Education in Certain Important Areas

To investigate the areas in which CBI most benefits nursing education, three interview questions were asked: (1) "Did you find your computer experiences helpful in the understanding of nursing theory? Why or why not?"; (2) "Did you find your computer experiences helpful in learning new nursing skills? Why or why not?"; and (3) "Did you find your computer experiences helpful in preparing for clinical experiences? Why or why not?"

Understanding Nursing Theory

Thirteen of the 15 students interviewed agreed that their computer experiences were helpful in the understanding of nursing theory. Faculty members all agreed with this (see Figure 10).

One student stated, "It reinforces the nursing process and also the theory behind it. It was very realistic and presented the material well and used the theory behind it." Another student said, "It puts it together more than the book or lecture." A third student commented, "Yes, in the beginning we were going by theory, the lectures, and the books. But working on the computers is so much different from that. It's applying all the nursing process, the assessment, planning. Not just one area." A fourth student explained, "I think it is more of a reinforcement of what I learned. If I hadn't read the book, it does make me go in my book to read more about it. It is a reinforcement, to see it and to sometimes

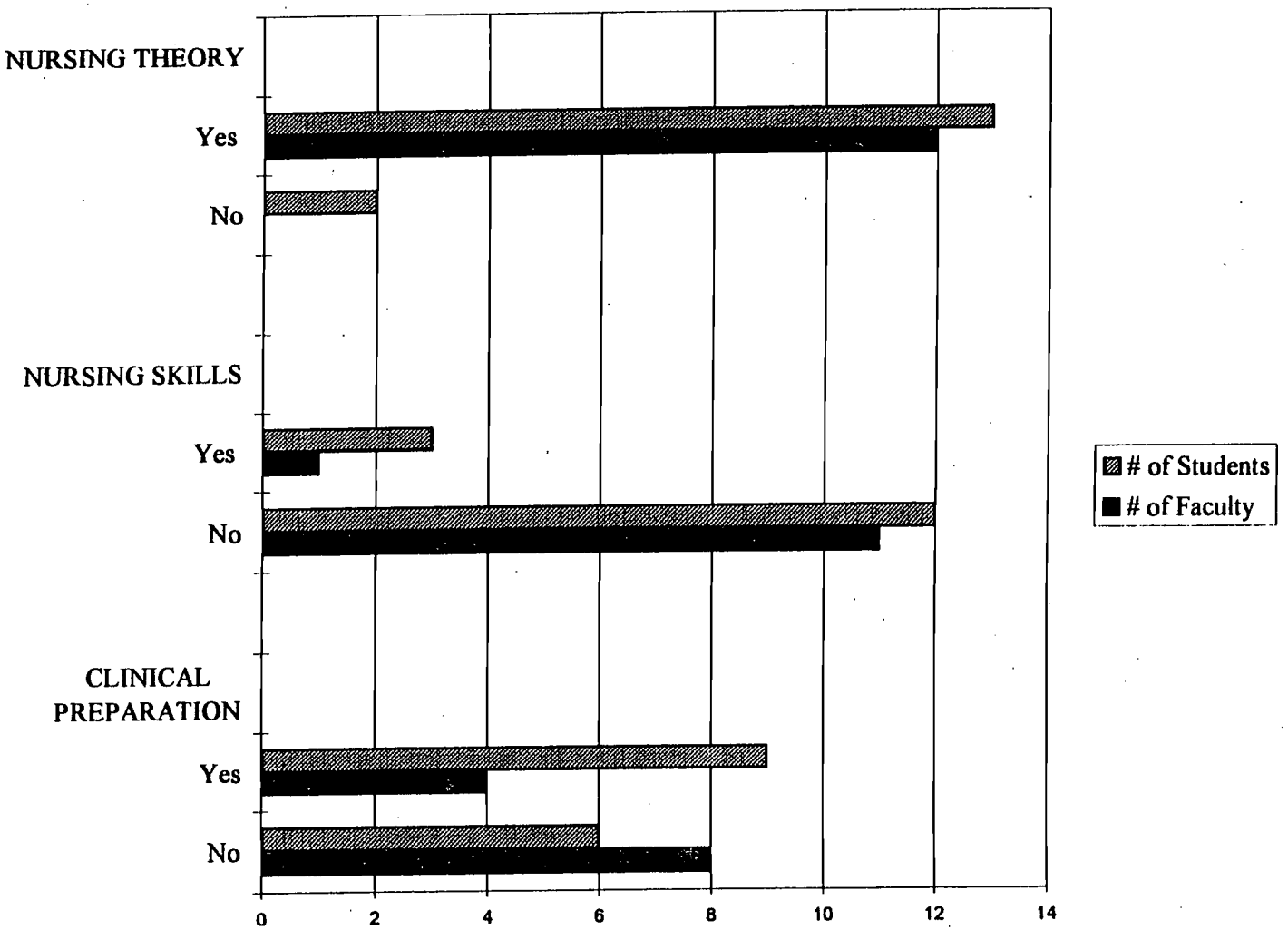

Figure 10. View of CBI as Helpful in Certain Areas

hear it."

A student recalled, "The theory may be not as much as the application of theory in actual practice and actual situations." A sixth student reported, "I think I would like to see something done rather than be lectured about it. I think the programs help seeing something applied rather than just hearing or reading about it." Another student stated, "Definitely, as much as I can get, the more data or anything, such as sounds, situations, anything I can implement and put it all together." An eighth student stated, "They gave you a scenario. This person comes in and what do you do first? What is your first thing that you need to do? What do you need to be looking for? I found that to be helpful."

> Another student shared the following thoughts,
> It was nice the way that they would give individual clients and would show signs and symptoms of different diseases. They helped us apply the theory we learned in class to decipher what was happening to them. It was really good to help us strengthen our assessment skills and to know the signs to look out for in certain diseases.

A tenth student stated the following as helpful: "As far as application for interventions, even assessment, being able to choose something, and if you were wrong, you would be able to understand why it was wrong. And the reason there was a better answer for it." Another student described the experience as, "Overall I think it was helpful. To learn how to read the questions and giving you different scenarios and having you choose which one is correct."

Two students shared why they felt the computer programs were not helpful to their understanding of nursing theory: "I don't think they made that much of a contribution. I only did it when it was mandatory. I think it was more facts than it was theory." A second student stated, "I had to go elsewhere for the information. The computer is not broad enough, the category or information, so I needed to go back to the book or my notes and look up more information. It was very limited."

One faculty member stated,

I think the more that we can reinforce content in different formats, the better. I think that's really the only way that we can position students to be confident critical thinkers. If they're here and they're interacting, the brain is absorbing it in different formats. They are positioned in a better way to develop those necessary skills.

Another faculty member said,

Because that is the way our technology and our world and our profession is going. Theory you can get out of a book. But I think that some of the newer programs that are coming out, they are tending to write them not just for the disease process but the entire picture. I would think that all of the different aspects, probably if they are not now, would eventually come into play. Because this seems to be the way that NCLEX-RN is being written. The symptoms of the disease seem to be a small component now. It's all of the other, the rest of the picture, the discharge planning, the home care because people don't stay in the hospital.

From the perspective of the faculty focus group, they unanimously agreed that the computer programs were helpful in the application and reinforcement of nursing theory.

Learning Nursing Skills

Twelve of the 15 students interviewed stated that their computer experiences were not helpful in learning nursing skills. All faculty members except for one person agreed that the computer programs did not help with learning new nursing skills.

One student stated, "I don't think so. The intravenous one [IAV] was pretty old and they were using equipment that we don't even use any more. That's why I probably don't remember it that well." Another student explained, "For me, it was the videotapes [that were helpful] because you could stop and start them and view them right next to where you needed to practice. [In the nursing lab, videotape players are surrounded by beds with mannequins.] I also used the fundamentals book. It gave you the steps, the performance criteria." A third student said, "Not

really; I used mainly the videotapes and laboratories."

Another student commented, "Basically I used the text, lectures and modules." From the perspective of another student, "I used mostly the videotapes. Because you can see it, you could see it step by step. I never viewed any of the computer programs for learning nursing skills." A sixth student stated, "The textbook is really good because it gives you the rationale for doing certain things as opposed to the computer, which is limited." Another student said, "I went more to the videotapes. I wanted to see actually how to do it." An eighth student explained, "Some of the videotapes were helpful. It was more interesting and it made you want to pay attention more."

Three students stated viewing the computer programs was helpful in learning new nursing skills. One student shared the following;

> The intravenous one I thought was very good. You didn't have to know a thing about it. I felt--even though I had done my reading, watched the laboratory, and practiced, I think having it shown to you again and what to expect made all the difference for me. I felt very comfortable doing it afterwards.

Another student recalled, "The CD-ROM and the laser discs did help. I know the laserdisc programs helped just to see someone else doing something maybe a way you never thought could be done. Whether it's how they interact with a client on a one-to-one or a procedure."

One faculty member said, "I think it's more again with critical thinking and decisions. The only way to do skills is hands-on. Also practicing in the laboratory." Another faculty member commented,

> I still think probably the best tool for the basic skill is a demonstration from their instructor. I think that a computer program or videotape is fine as an initial view of what is going on. They like their instructor to show them so they can get a real view of what they are supposed to do. The actual hands-on.

All faculty members except for one person agreed that the computer

programs did not help with learning new nursing skills. One faculty member who found the computer experiences to be helpful with learning nursing skills stated, "I think that even though our setup is crowded, they can review skills on the computer and then bring over the equipment and practice."

Several of the CBI programs that I reviewed covered the principles and correct procedures for nursing skills, including blood pressure measurement and intravenous therapy. However, these programs did not provide the hands-on experience that both students and faculty identified as important for learning these skills.

Preparation for Clinical Experiences

Nine of the 15 students interviewed stated that their computer experiences were helpful with clinical preparation. Less than half of all faculty members agreed that the computer programs helped with clinical preparation.

One student stated, "In terms of presenting theory it did [help]. You always need to know the theory behind the skill and behind the application. So I think it did; in that way it reinforced that kind of general knowledge that you need as background to everything you do." Another student shared the following thoughts: "The respiratory information was really good. The cardiac information was also really good. There is a lot to learn, and they are big content areas." A third student responded, "It helped a lot for clinical. It gives you scenarios to identify the problems, what is important, and how to prioritize." A fourth student recalled, " I suppose the situations, the scenarios that they gave helped reinforce that. Again with prioritizing, what would be most important to do first if such a situation were present."

Another student interviewed stated, "I know it gave me a better idea how to

interact with someone with a certain condition or disease." A sixth student shared the following:

> I would say that the computer programs were very helpful in the preparation for our psychiatric rotation at clinical. Especially the drugs--they gave different scenarios for anorexic clients and a lot of communication type of things. So those things gave us some hands-on. A lot of therapeutic things to apply to clinical.

Six of the students stated the computer programs were not helpful with clinical preparation. One student commented, "No, not really. Clinical was mainly skills, and I got that information from the laboratory. You also need to know your theory, and I got that from the text and class." A second student said, "I carry a clinical procedure book. I cannot always remember what to do, so I use the clinical procedure book." Another student recalled, "Not for clinical; more for the tests. I used our textbook or our lecture material." A fourth student explained, "I didn't really use them that way. I used it more as a support for classroom information."

One faculty member also shared her thoughts regarding the use of computer programs in preparing for clinical experiences: "If students choose certain programs, they tend to choose the ones they would expect to see in clinical." Another faculty member shared her perception that the computer programs are rarely used for clinical preparation. She said, "Maybe two or three times out of each semester will I have a student approach me and ask me if I have resource material related to a client's diagnosis."

A faculty member who found the computer programs helpful for the students in preparing for clinical experiences said,

> A lot of times, the students say, I get so nervous--I do great in the classroom, but I get so nervous when I get ready to care for clients. If they would take the initiative to access this learning tool, they, I believe, would have reduced anxiety because their confidence is building. If their anxiety is lessened in the clinical setting, then they are able to learn better rather than thinking about their fears.

The Need for Further Analysis

These student and faculty responses to specific questions regarding parts of the curriculum in which CBI was most helpful provide some useful information. However, a better understanding of the strengths and weaknesses of CBI within the Forest College Nursing Program can be obtained by reexamining and summarizing all of the responses obtained during the interviews.

In Chapter 5, three metapolicies have been developed that summarize and interpret the findings of this chapter. Implications of this study for adult continuing education and recommendations for further research are also discussed.

CHAPTER 5

METAPOLICIES

Based upon the findings obtained through student interviews, faculty interviews, and the faculty focus group, three metapolicies have been interpreted from the data. Searching for patterns and structures that connected the coded findings with the research themes led to the creation of these metapolicies:

1. CBI should be applied to appropriate content areas.
2. CBI should make reasonable demands on students.
3. CBI should occur in an environment with minimal distractions.

Metapolicy 1: CBI Should Be Applied to Appropriate Content Areas

The nursing curriculum at Forest College and other nursing programs consists of three major components: class, where the emphasis is on theory; laboratory, where nursing skills are demonstrated and practiced; and clinical experiences, in which theory and skills are applied. When asked about the content areas in which CBI was helpful, both students and faculty made a clear distinction. They were nearly unanimous in the view that CBI was helpful in learning nursing theory (class content) and not helpful in learning nursing skills (laboratory content). The view of CBI's helpfulness in preparing for clinical experiences (application of theory and skills) was evenly split. Further analysis of other student perceptions supports these distinctions (see Appendix K).

Helpful in Learning Theory

Student perceptions of CBI programs that support the proposition that CBI is helpful in learning nursing theory include the perceptions that these programs reinforce class content, provide new information, and bring a new perspective to previously covered content. Student behaviors that support the proposition that the CBI program is helpful in learning theory includes using CBI or printouts obtained from these programs in reviewing for exams. Exams in the nursing program at Forest College are primarily focused on theory covered in class. The proposition that CBI is helpful in learning nursing theory is also supported by the student suggestion that CBI programs be used during class sessions.

Helpful in Applying Theory

The proposition that CBI is helpful in applying theory is supported by the student perceptions that CBI programs provide an opportunity for the application of theory, that they provide realistic portrayal of clinical situations, and that these programs provide rationales for the decisions students make when using these programs. Students also made negative comments about programs that did not provide these rationales. Cohen and Dacanay (1994) had a similar view and stated that the "computer-driven interactive video can portray simulated real-life scenarios and provide student with `clinical' experiences in nonthreatening (to both the student or the patient) settings" (p. 92). CBI provides the student with "conditions requiring critical intervention, diagnosis, and varied acuity levels, including circumstances necessitating complex procedures" (Gonce-Winder, Kidd, & Lenz, 1993, p. 197).

Helpful in Learning and Applying Theory

The proposition that CBI is helpful in both learning and applying theory is supported by the perception that CBI programs are interactive, provide feedback, and provide a multisensory experience. These findings are similar to those reported by Goodman and Blake (1996), who stated that "based on experience with designing and implementing courseware, faculty have found that computer courseware was more effective when it was multisensory and interactive" (p. 295). Rouse (1999) claimed that "multisensory and interactive CAI is a successful tool to communicate educational objectives and involves the student as an active learner" (p. 171). According to Kilmon (1996), computerized learning provides students with immediate feedback, and because no one is watching them, they can feel safe if they select an incorrect answer.

The proposition is also supported by the student perception that the inclusion of CBI within the curriculum helped to accommodate different learning styles. Researchers who shared this viewpoint include Lowdermilk and Fishel (1991), who stated that "using CAI as an additional teaching strategy provides students with a different learning style and more variety in learning opportunities that can lead to more effective decision-making skills" (p. 38). Yoder (1994) reported that learners who preferred to learn by active experimenting learned better with CAIVI; learners who preferred to learn by reflective observing learned better with linear video.

The proposition that CBI is helpful in learning and applying nursing theory is also supported by the student suggestion for more interactive videos. Among the three CBI technologies used at Forest College, interactive videos offered the most interactive and multisensory experience because they used video rather than still photos or artwork to illustrate learning activities.

Not Helpful in Learning and Applying Nursing Skills

Students and faculty overwhelmingly rejected the idea that CBI was useful in developing nursing skills. The single but compelling reason for this is the lack of hands-on experience. The nursing laboratory is equipped with actual hospital equipment, medical supplies, sophisticated mannequins, and anatomical models that provide opportunities for developing complex technical skills and manual dexterity. Students also practice selected skills on each other. Complex psychomotor skills can be visually demonstrated by a CBI program but cannot be mastered without hands-on practice and feedback from a knowledgeable observer. In addition, becoming comfortable performing these procedures on living clients can only be acquired through actual experience.

Baldwin et al. (1991) supported this view with the statement, "While videotapes may enhance learning, faculty contact remains an important factor for students who are learning to perform a basic psychomotor skill" (p. 369). In a follow-up study, Baldwin et al. (1994) confirmed the need for faculty contact when learning beginning nursing skills. A plan for a nursing laboratory at Miami University states that students need hands-on experience with state-of-the-art equipment in an environment that allows them to practice and make mistakes prior to entering client care situations (Vanderbeek et al., 1994).

Metapolicy 2: CBI Should Make Reasonable Demands On Students

Although the first metapolicy was largely the result of specific research and interview questions, this metapolicy arose without any direct questions, and this issue permeated the discussion of all aspects of the CBI experience. The specific demands perceived as unreasonable by the students in this study were time

demands. It is unlikely that a quantitative study would have uncovered this issue. The characteristic of CBI programs that students perceived as hindering learning and increasing time demands was the length of time it took to complete most programs and the lack of flexibility that would allow bypassing redundant sections of a program. In a study by Thede et al. (1994), nursing students stated that they needed to know that the time required to view CAI would be an efficient use of their study time. These students also expressed negative comments and a sense of frustration when there were delays in the program. Hebda, Czar, and Mascara (1998) stated that CAI programs fail when learners believe they have wasted their time.

The characteristic of CBI within the curriculum that students perceived as hindering learning and increasing time demands was too many assignments. Although many students favored a mix of required and optional programs, most argued for fewer assignments in both categories. Because there were so many assignments, most students admitted that they only completed the required assignments. The characteristic of the CBI learning environment that increased time demands was equipment malfunctions. "Crashes" and "freezing up," whether caused by hardware or software problems, were major sources of frustration. This was aggravated by the inability of most programs to resume at the point where the crash occurred without rebooting and starting at the beginning of the program. On the positive side, students viewed the laboratory staff as very helpful and repeatedly cited their skill at solving computer problems.

Because time demands were such a major concern among the students, they used a variety of behaviors to cope with these demands and were quite willing to discuss these behaviors. These behaviors included rushing through programs, skipping parts of the programs, and cutting corners. Cutting corners included taking a quiz to meet a module requirement without paying attention to program content or

correct answers, sharing correct quiz answers with others, and photocopying printouts to turn in as one's own work. Cobb (1999) identified similar behaviors in a study of groups viewing interactive videodiscs. "Seven out of 20 groups inadvertently skipped segments of the lesson or were persuaded by an assertive group member to skip the optional segment of the lesson" (p. 93).

Working in groups can be a positive learning experience, but in some cases, students would merely split an assignment or group of assignments and then share the credit for all the work. Students who chose to work alone often did so because it allowed them to work around other personal time commitments. Even students who devoted sufficient time to benefit from CBI learning programs discussed the difficulty of doing so.

Students also had several suggestions for reducing the time demands associated with CBI. These included fewer assignments, both required and optional, improved access to computer programs (including the suggestion that they be accessible via the Internet) and longer laboratory hours.

Metapolicy 3: CBI Should Occur in an Environment With Minimal Distractions

The nursing laboratory that serves as the learning environment for CBI at Forest College is also used for nursing skill instruction and practice. As a result, most students described this learning environment as noisy and overcrowded. Some suggested that increased privacy in the computer area would improve learning. According to Saranto et al. (1997), "A basic requirement for positive learning outcomes is that the learning environment be at least pleasant and secure" (p. 324). Distractions, of course, are not limited to the noise and overcrowding found in this study. Inadequate lighting, heating, cooling or ventilation,

uncomfortable furniture, insufficient supplies or equipment, or anything that diverts student attention away from the learning experience can be an environmental distraction.

How the Three Metapolicies Can Help to Optimize the Application of CBI To Adult Continuing Education Programs

A diagram that shows the relationships between the three metapolicies has been prepared (see Figure 11). The areas inside the three circles represent appropriate content area, reasonable demands on students, and an optimal environment with minimal distractions. When all three metapolicies are met, the three circles overlap and an optimal fit is achieved between CBI and the program. If only one or two of the metapolices are met, optimal conditions do not exist.
This model can be used in the application of other teaching strategies or technologies by adult program planners in any discipline. The issues of content, environment, and demands on students must be dealt with by every program planner.

Other Implications of the Research for Adult Continuing Education

As a result of the analysis of the findings of this study, the following suggestions are made for adult educators. These recommendations address the three metapolicies developed through the study: CBI should be applied to appropriate content areas, CBI should make reasonable demands on students, and CBI should occur in an environment with minimal distractions.

Recommendations Related to Metapolicy 1: Appropriate Content Areas

Adult educators can assist students with understanding theoretical content

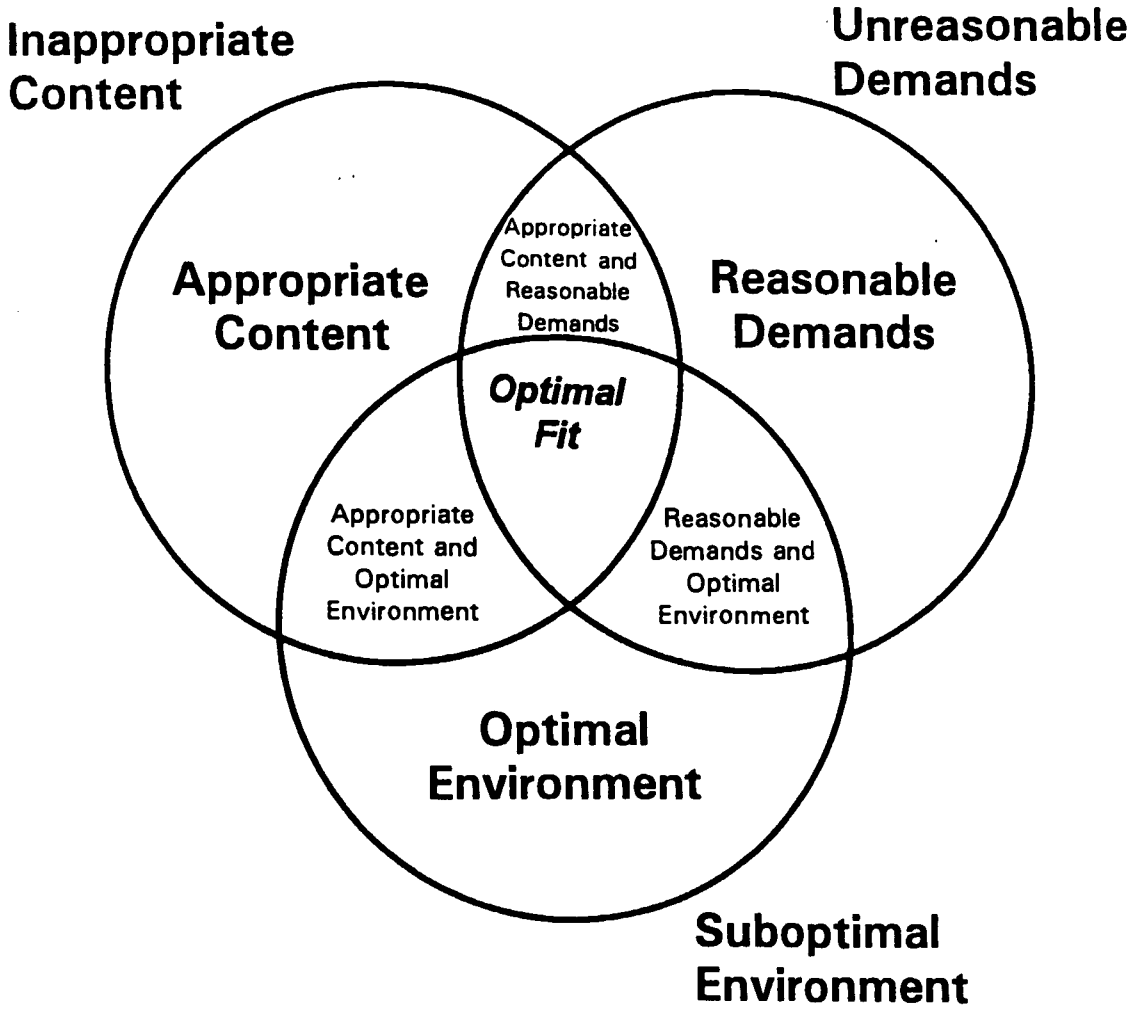

Figure 11. How Three Metapolicies Help to Optimize the Application of CBI to Adult Continuing Education Programs

through the careful selection of well-designed CBI programs. This study found that the CBI programs that students perceive as helpful were those that provided new information, reinforced class content, and provided a new perspective. Educators should be aware of this when previewing and selecting CBI programs. These programs should not merely duplicate the information in the textbook or class sessions but should bring a new dimension to the theory being covered. The CBI programs that students perceived as helpful in applying theory were those that provided realistic situations, opportunities for decision making, and rationales for why the chosen course of action was correct or incorrect.

The type of programs that the students found most useful in this regard were interactive videos. However, interactive videos have become an outdated form of technology and are being replaced by CD-ROMs. This means that educators are facing a new opportunity and a new challenge as they select the next generation of CD-ROM programs for their curriculum. In addition to choosing programs that provide a multisensory, highly interactive experience with rationales for both right and wrong responses, programs should accommodate different learning styles.

Students perceived that CBI programs were not helpful in learning and applying psychomotor skills. Choosing programs that spend large amounts of time demonstrating proper procedure should be avoided. Differences in equipment and procedures vary too much from school to school and clinical site to site for this to be very useful. Hands-on experience in laboratory and clinical under the supervision of faculty is the best way to acquire and develop these skills. CBI is better put to other uses.

Recommendations Related to Metapolicy 2: Reasonable Demands on Students

This study found that CBI programs were perceived by students to be a major contributor to the time demands that they experience as they try to balance their responsibilities as students with other personal and professional commitments. The students viewed the time demands of CBI as excessive and resorted to a variety of coping behaviors. In most cases, these behaviors meant that course requirements were met but learning objectives were not. My first recommendation is that adult learners should be treated like adults. Having students turn in a quiz printout as proof of performance trivializes the assignment and leads to cutting corners. Meaningful assignments that promote critical thinking, such as a summary and critique of a program, should be evaluated.

My second recommendation is that educators be much more selective when adding CBI programs into the curriculum. The number of required CBI programs should be limited. Only carefully selected programs should be recommended as optional. Just because a CBI program covers the same topic as the curriculum is not adequate justification for its inclusion as a required or optional assignment.

My third recommendation is that educators become informed regarding what constitutes good program design and use program design, as well as content, as a criterion for selecting programs. Many of the shortcomings that students cited, such as not getting rationales for correct answers or difficulty in navigating through a program to reach specific content, were the result of poor design. Purchasing and assigning a program based merely on the basis of content without evaluating its design is irresponsible.

The fourth recommendation is that educators provide enough information about selected CBI programs to allow students to identify those that would best meet their individual learning needs. In some cases, a faculty member can recommend a

specific program to an individual student who is having problems with a particular subject area.

A fifth recommendation is that CBI become a more integral part of the curriculum. This can be accomplished in several ways. One student recommendation that I agree with is bringing CBI programs into the classroom as part of class presentation. Another possibility is to use CBI programs as an alternative to textbook assignments, possibly as preparation for a class discussion.

A sixth recommendation that reduces time demands yet enhances learning is using CBI programs as a collaborative learning assignment. This recommendation acknowledges current student behavior. Discussing decision making and rationales with peers when viewing a CBI program is a valuable experience, and collaboration with other health-care team members is an important aspect of nursing practice.

Recommendations Related to Metapolicy 3: An Environment with Minimal Distractions

The best solution for the overcrowded and noisy computer area of the nursing laboratory is easy to diagnose but difficult to implement. A larger, separate room is needed but not currently available. Two other possible solutions exist. One would be to dismantle the nursing computer laboratory and move hardware and software to the main computer laboratory on campus, which is used by all other disciplines. Another solution is to allow CD-ROM and CAI software to be checked out for use on the student's home computer. (Interactive videos require hardware unavailable at home.) A future possibility (suggested by one student) would be to provide Internet access to these programs. Because CAI programs are currently stored on a network server, this would be feasible; however, the limited bandwidth available to most homes would make downloading these programs a long, frustrating endeavor.

Home computer use of programs and Internet access may also require a special license from the software supplier. Improved access to CBI programs overcomes the limitations of the current learning environment and also addresses the issue of time demands by giving students more flexibility as to when they can view these programs.

Recommendations for Future Research

My first recommendation for future research would be replication of this study in other two-year nursing schools. Although it appeared that saturation was reached with 15 interviews in this case, some of the findings may reflect particular aspects of the Forest College nursing program and would not be found in other schools. Repeating this study elsewhere would help identify these areas. Conducting similar studies among baccalaureate nursing students would determine how their perceptions and behaviors relative to CBI compared with those of two-year students.

It would also be helpful to conduct similar studies among other health-care and technical disciplines that utilize CBI as part of their curriculum. These might include dental hygiene, diet technology, and biology. If the findings of this case are confirmed in other educational settings, the implications and recommendations can help improve the CBI experiences for a broader range of students. I would also recommend repeating this study at Forest College within a few years after several of the recommendations resulting from this study are implemented. Comparing the perceptions of this group of students with a group of future students could help identify the impact of those changes.

Research Recommendations Related to Metapolicy 1

Three areas for additional research arose out of the first metapolicy developed from this research: CBI should be applied to appropriate content areas. The first area would evaluate the implementation of the student suggestion that CBI programs be utilized in the classroom. A possible approach would be to compare student satisfaction and student achievement in the year prior to implementing this recommendation with satisfaction and achievement after implementation.

A second area could focus on learning styles. Matching learning styles with various computer technologies for maximum effectiveness is an area for future research. Students in this case study had difficulty evaluating individual CBI programs at the end of the year. It is therefore suggested that students be given a short evaluation tool that could be used to rate individual programs immediately after they are viewed. Scores received by individual programs could then be correlated with learning styles, as determined by Kolb's (1976) Learning Style Inventory. The results could aid in directing students to those programs that best meet their learning needs.

A third area of research would reevaluate the appropriateness of CBI in teaching skills as new computer technologies are developed and applied to CBI. Currently, relatively few CBI programs focus on nursing skills. Videotape is the primary tool available to supplement laboratory demonstrations and clinical experience. As CD-ROM technology makes it feasible to combine live action motion pictures and interactivity without videodisks, research will be needed to evaluate new programs as they become available. Virtual reality programs that can provide both visual and tactile feedback will also need to be evaluated as they become available.

Research Recommendations Related

to Metapolicy 2

The second metapolicy developed from this research, that CBI should make reasonable demands on students, suggests new areas of research broader than CBI. Studies could be conducted to determine whether the time demands identified in this study are the result of the nursing curriculum at Forest College, nursing curriculums at other two-year colleges, or the family and job responsibilities held by many two-year college students. Other studies could be conducted to evaluate attempts to reduce the time demands that can be attributed to CBI. One student suggestion--that CBI programs be accessible at home computers through the Internet--could be implemented and studied if proper program licenses can be obtained. Another student suggestion--using CBI for collaborative learning assignments--could also be investigated.

Research Recommendations Related to Metapolicy 3

Another suggestion for additional research comes out of the third metapolicy developed from this study, that CBI should occur in an environment with minimal distractions. The crowded and noisy environment in the computer section of the nursing laboratory in this study is not found at all two-year nursing programs. Repeating this study at a two-year nursing program with a superior CBI environment could help identify how student perceptions and behaviors are impacted by the learning environment.

Research Recommendations Related to a Broader Context

While the case study method requires a researcher to focus on a system with well-defined boundaries, one must be also be aware that every case exists in a much

larger context outside those boundaries. The nursing program at Forest College is only one program among the two dozen academic, professional, and technical programs that exist within the Life Science and Human Services Division. Life Science and Human Services is one of 10 divisions within Forest College. Forest is only one school among hundreds of community colleges in the United States, and community colleges are one part, along with four-year colleges and universities, of higher education. From another perspective, CBI is only one among thousands of applications of the personal computer, and the personal computer is but one aspect of rapidly developing electronic technology.

Ehrmann (1995) provided an interesting perspective on the relationship between higher education and technology.

> Most institutions of higher education are facing a triple challenge of outcomes, accessibility, and costs. They will find it increasingly difficult to offer a modern, effective academic program that reaches and retains the students they should be serving for a price that those students and their benefactors can afford. . . . I see no evidence that most institutions will be able to meet this triple challenge without the substantial use of computers, video, and telecommunication. (p. 24)

Ehrmann stressed the importance of asking the right questions about technology. He pointed out that searching for generalizations regarding cost and effectiveness of technology versus "traditional methods" is useless because "traditional methods" vary so greatly from classroom to classroom. He suggested that a better approach would be to study which teaching-learning strategies work best and then to study which technologies are best for supporting those strategies.

I would suggest that nursing education offers an excellent context for these types of studies. Nursing education has a long experience with a variety of CBI technologies; a theoretical content that encompasses both the physical and social sciences; a curriculum that stresses analytical, communication, and psychomotor skills; and a uniform, national test of outcomes in the NCLEX-RN examination.

This study, which examined the usefulness of CBI technology in various aspects of the nursing curriculum, may serve as beginning in this effort.

Other questions need to be studied as technology becomes a more important part of higher education. Although computers may be excellent at communicating and testing factual information, will they be able to replace instructors in transmitting values and serving as role models for future professionals? Will the development of face-to-face communication skills suffer as teachers and students increasingly communicate through e-mail and the Internet? Can skills in leadership, teamwork, and cooperation be developed when students are isolated from each other?

The other contextual issue that calls for future study is rapidly changing technology itself. Norman (1998) suggested that the personal computer, the platform for CBI, has grown too complex and is being replaced by smaller, portable "information appliances." Perhaps a future "teaching appliance" is the solution to the flawed learning environment described in this study.

Conclusion

CBI is a relatively new teaching tool whose full potential has yet to be realized. To date, most progress in CBI has been due to advances in technology rather than advances in the way educators are using CBI. This study can impact adult education if it helps educators better understand how CBI is perceived by students and motivates and directs educators toward improving those perceptions as they incorporate CBI and other technologies into their curriculum.

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APPENDICES

APPENDIX A

NURSING DEMOGRAPHIC INFORMATION

Table 1

Nursing Student Demographic Information

Nursing Student	Age	Gender	Racial/ Ethnic	Own a Computer	Word Process'g	Games	Internet	E-Mail	Personal Finance	Spread-sheets
#1	34	Female	White	8-9 years	X		X	X		X
#2	34	Female	White	9 years	X		X	X		
#3	27	Female	White	No						
#4	27	Female	White	5 years	X					
#5	31	Female	White	No						
#6	38	Female	White	1 year	X		X	X		
#7	25	Female	White	8 years	X	X	X	X		
#8	23	Female	White	1 week	X		X	X		
#9	41	Female	Asian	10-11 years	X	X	X	X		
#10	26	Female	White	1 year	X	X	X			
#11	38	Female	White	3 years	X		X			
#12	42	Female	Hispanic	5-6 years	X	X			X	
#13	31	Female	Black	No						
#14	23	Female	White	4-5 years	X	X			X	X
#15	29	Female	Asian	2 years	X					

APPENDIX B

STUDENT INFORMED CONSENT FORM

Student Informed Consent Form

I appreciate your participation in this research process. This form outlines the purpose of these interviews and provides a description of your involvement and rights as a respondent.

The purposes of the interview are to:

- explore student perceptions of the various CBI experiences,
- gain an understanding of the CBI experiences from the students' point of view and value systems, and
- identify factors perceived to help and to hinder learning.

The following method will be used to conduct interviews and to document findings:

- audio tape interviews that use open-ended questioning,
- transcribe tapes into typewritten form, and
- code transcriptions and assign fictitious names to the interviewees.

Your participation is voluntary. If you have any questions about the nature of this study or the methods used, please call me.

I will use the information you provide for my doctoral dissertation. Readers of the report will include my dissertation committee and readers of the completed dissertation.

Do I have your permission to quote your comments? Yes_____ No_____
(using assigned fictitious name)

Do I have permission to audio tape our interview? Yes_____ No_____
(in person or over the phone)

_____ _____
Signature of respondent Today's date

_____ _____
Area code - phone number Scheduled date and time for interview

Thank you

Joanne Leski

APPENDIX C

STUDENT INTERVIEW GUIDE

Student Interview Guide

Demographic Information:
Age: Gender:

Previous experience with computers:

Own/access to a personal computer? Y N How long?
Types of applications used: Word Processing___ Games___ Internet___

E-mail___ Personal Finance___ Spreadsheet___ Other___

Introduction: As a nursing student at Forest College you have had an opportunity for a variety of computer-based learning activities. I am interested in your opinions regarding the value of these experiences and your suggestions on how these learning activities might be improved.

1. Let's begin by talking about your most recent experience using interactive videos.

2. Are there any other interactive video programs that stand out in your memory?

3. What is most positive thing you can tell me about your experiences using interactive videos?

4. What is the most negative thing you can tell me about your experiences using interactive videos?

5. Let's now talk about your most recent experience using CD-ROM programs.

6. Are there any other CD-ROM programs that stand out in your memory?

7. What is most positive thing you can tell me about your experiences using CD-ROM programs?

8. What is the most negative thing you can tell me about your experiences using CD-ROM programs?

9. Let's now talk about your most recent experience using computer-assisted (CAI) programs.

10. Are there any other computer-assisted (CAI) programs that stand out in your memory?

11. What is most positive thing you can tell me about your experiences using computer-assisted (CAI) programs?

12. What is the most negative thing you can tell me about your experiences using computer-assisted (CAI) programs?

13. Based on these experiences, do you have any suggestions for improving the

use of computer technology in the nursing program?

14. Did you prefer working with these computer programs individually or in a group? Why?

15. I would like to hear your comments on the learning environment in the computer section of the nursing laboratory.

16. I would like to hear your comments on the learning environment of other computer laboratories that you have used on campus. (Which ones?)

17. If you needed assistance while using computer programs, was help available?

18. Did you find your computer experiences helpful in the understanding of nursing theory? Why or why not?

19. Did you find your computer experiences helpful in learning new nursing skills? Why or why not?

20. Did you find your computer experiences helpful in preparing for clinical experiences? Why or why not?

APPENDIX D

INTERVIEW GUIDE FOR NURSING FACULTY

Interview Guide for Nursing Faculty

Introduction:

Thank you for agreeing to meet with me. Feel free to help yourself to the desserts and coffee. As listed in the informed consent, your participation is voluntary. I will be audio taping the interview and taking notes during our discussion. I will then transcribe the tape into a typewritten form. You will be assigned a fictitious name, and all of your responses will be kept confidential. The transcriptions will be coded, and categories and themes will be identified. I previously interviewed 15 nursing students and will also interview the two laboratory staff members and the director for their perceptions of the use of technology in the nursing program.

What I am going to do is to spend the next hour or so asking questions designed to get a full picture of your thoughts and feelings. There are no right or wrong answers to anything I ask, only your honest opinions. The purpose of this focus group is to explore your perceptions regarding CBI experiences from your point of view and value system. I would also like to gain insight into the perceived factors that help and hinder learning. I ask that you speak one at a time and to regard this tape recorder as simply an extension of my memory, so that I can write a clear and accurate account of what is said this afternoon. Does anyone have any questions?

As faculty members at Forest College, you had an opportunity to plan for a variety of computer-based learning activities for nursing students.

1. Let's begin by talking about your expectations regarding interactive videos.
2. What positive things do you expect students to experience when using interactive videos?
3. What negative things do you expect students to experience when using interactive videos?
4. Let's now talk about your expectations regarding CD-ROM programs.
5. What positive things do you expect students to experience when using CD-ROM programs?
6. What negative things do you expect students to experience when using CD-ROM programs?

7. Let's now talk about your expectations regarding computer-assisted (CAI) programs.
8. What positive things do you expect students to experience when using computer-assisted (CAI) programs?
9. What negative things do you expect students to experience when using computer-assisted (CAI) programs?
10. Based on your experiences, do you have any suggestions or plans for improving the use of computer technology in the nursing program?
11. Do you expect students to work with computer programs individually or in a group? Why?
12. I would like to hear your comments on the learning environment in the computer section of the nursing lab.
13. How does the computer section of the nursing lab compare with other computer labs you have observed on the Forest campus or at other schools? (Which ones?)
14. Do you believe that adequate assistance is available for nursing students while using computer assisted programs?
15. Do you expect computer experiences to be helpful to students in the understanding of nursing theory? Why or why not?
16. Do you expect computer experiences to be helpful to students in learning new nursing skills? Why or why not?
17. Do you expect computer experiences to be helpful to students in preparing for clinical experiences? Why or why not?

APPENDIX E

NURSING FACULTY FOCUS GROUP QUESTIONNAIRE

Nursing Faculty Focus Group Questionnaire

Name: _____

1. Do you own/access to a personal computer?

   Yes _____

   No _____

2. Place a check indicating the types of applications you use.

   Word Processing ____

   Games ____

   Internet ____

   E-mail ____

   Personal Finance ____

   Spreadsheet ____

   Other _____

Return to me when completed. Thank you.

APPENDIX F

NURSING FACULTY QUESTIONNAIRE RESULTS

Table 2

Nursing Faculty Questionnaire Results

Nursing Faculty	Gender	Own a Computer	Word Processing	Games	Internet	E-Mail	Personal Finance	Other
#1	Female	Yes	X		X	X		Power Point
#2	Female	Yes	X		X	X		
#3	Female	Yes	X		X	X		
#4	Female	Yes	X	X	X	X		Power Point
#5	Female	Yes	X		X	X	X	Power Point
#6	Female	Yes	X	X	X	X	X	Power Point
#7	Female	Yes	X	X	X	X		
#8	Female	Yes	X		X	X		Power Point AutoCac
#9	Female	Yes	X		X	X		Spreadsheets

APPENDIX G

INTERVIEW GUIDE FOR NURSING LABORATORY STAFF

Interview Guide for Nursing Laboratory Staff

Previous Experience with Computers:

Own/access to a personal computer? Y N

Types of applications used: Word Processing____ Games____ Internet____

Email____ Personal Finance____ Spreadsheet____

Other_____

Introduction: As a nursing laboratory assistant at Forest College, you provide assistance to nursing students using computer-based learning activities. I am interested in your opinions regarding the value of these experiences and your suggestions on how these learning activities might be improved.

1. Let's begin by talking about your expectations and experiences regarding interactive videos.
2. What positive things do you expect students to experience when using interactive videos?
3. What negative things do you expect students to experience when using interactive videos?
4. Let's now talk about your expectations and experiences regarding CD-ROM programs.
5. What positive things do you expect students to experience when using CD-ROM programs?
6. What negative things do you expect students to experience when using CD-ROM programs?
7. Let's now talk about your expectations and experiences regarding computer-assisted (CAI) programs.
8. What positive things do you expect students to experience when using computer-assisted (CAI) programs?
9. What negative things do you expect students to experience when using computer-assisted (CAI) programs?
10. Based on your experiences, do you have any suggestions or plans for improving the use of computer technology in the nursing program?
11. Do you find that most students work with computer programs individually or in a group? Why do you think that is so?

12. I would like to hear your comments on the learning environment in the computer section of the nursing laboratory.
13. How does the computer section of the nursing laboratory compare with other computer laboratories you have observed on the Forest campus or at other schools? (Which ones?)
14. Do you believe that adequate assistance is available for nursing students while using computer-assisted programs?
15. Do you expect computer experiences to be helpful to students in the understanding of nursing theory? Why or why not?
16. Do you expect computer experiences to be helpful to students in learning new nursing skills? Why or why not?
17. Do you expect computer experiences to be helpful to students in preparing for clinical experiences? Why or why not?

APPENDIX H

INTERVIEW GUIDE FOR NURSING DIRECTOR

Interview Guide for Nursing Director

Previous Experience with Computers:

Own/access to a personal computer? Y N

Types of applications used: Word Processing____ Games____ Internet____

E-mail____ Personal Finance____ Spreadsheet____ Other____

Introduction: The Nursing Department at Forest College, where you are director, provides a variety of computer-based learning activities for nursing students. I am interested in your opinions regarding the value of these experiences and your suggestions on how these learning activities might be improved.

1. Let's begin by talking about your expectations regarding interactive videos.
2. What positive things do you expect students to experience when using interactive videos?
3. What negative things do you expect students to experience when using interactive videos?
4. Let's now talk about your expectations regarding CD-ROM programs.
5. What positive things do you expect students to experience when using CD-ROM programs?
6. What negative things do you expect students to experience when using CD-ROM programs?
7. Let's now talk about your expectations regarding computer-assisted (CAI) programs.
8. What positive things do you expect students to experience when using computer-assisted (CAI) programs?
9. What negative things do you expect students to experience when using computer-assisted (CAI) programs?
10. Based on your experiences, do you have any suggestions or plans for improving the use of computer technology in the nursing program?
11. Do you expect students to work with computer programs individually or in a group? Why?
12. I would like to hear your comments on the learning environment in the computer section of the nursing laboratory.

13. How does the computer section of the nursing laboratory compare with other computer laboratories you have observed on the Forest campus or at other schools? (Which ones?)
14. Do you believe that adequate assistance is available for nursing students while using computer-assisted programs?
15. Do you expect computer experiences to be helpful to students in the understanding of nursing theory? Why or why not?
16. Do you expect computer experiences to be helpful to students in learning new nursing skills? Why or why not?
17. Do you expect computer experiences to be helpful to students in preparing for clinical experiences? Why or why not?

APPENDIX I

GUIDELINES OF DIRECT OBSERVATION IN THE NURSING LABORATORY

Guidelines of Direct Observation in the Nursing Laboratory

Interview Codes Verifiable by Direct Observation

Student Behaviors	Yes	No
Rushing through/skipping parts		
Working in groups		
Working alone		
Devoting time		

Environmental Characteristics	Yes	No
Equipment malfunctions		
Helpful staff		
Noisy		
Overcrowded		

Date: _____

Time: _____

APPENDIX J

QUOTE RETRIEVAL GRID

Quote Retrieval Grid

Each box is an individual interview: Students (1-15), the Nursing Director (D), Laboratory Personnel (L1 and L2), and the Focus Group (F). The numbers in the box indicates the page number within the transcript of a relevant comment. Circled numbers are especially significant.

CHARACTERISTICS OF CBI THAT ENHANCE LEARNING PROGRAMS

Interactive (Feedback)

1. (4) (6), (13) 18, 19, 30	2. 4, 6, 10, (11)	3. (3)	4. 6	5. 6, 7, 9,
6. 4, 7, 8	7. 7	8. 3, 4, 8, 9	9. 17	10. (4) 11
11. (4) (10)	12. 7, 11	13. (3) 5, 8, 10	14. 4, 10	15 0
D. 8	L1. 8, 9, 19	L2. 4, 6, 7, 8	F. 3, 5, (6) (22), 28	TOTAL 49

Student Comments: 36
Faculty Comments: 13

of Students: 14
# of Faculty: 7

Reinforces Class Content

1. 15, 18, 21, 26, (28) 31	2. 4, 15	3. 9, 17	4. 0	5. (11) 12
6. 9, 10, 17	7. (10)	8. (5)	9. (8) 14	10. 0
11. (7)	12. 14,15	13. (3)	14. 4	15. 6, 8
D. (4) 8, 17	L1. 30	L2. 0	F. 26, 40 (all 9) 42	TOTAL 33

Student Comments: 26
Faculty Comments: 7

of Students: 13
# of Faculty: 11

Application of Theory

1. (12) (13)	2. 22	3. 0	4. 5, (12) (14)	5. 4
6. (4) (16) 17	7. (16) 17	8. 0	9. 20	10. 7, 11
11. 3, (12) (14)	12. 0	13. 3, 8	14. 4, 10	15. 0
D. 3, 18	L1. 0	L2. 4	F. 6	TOTAL 26

Student Comments: 22
Faculty Comments: 4

of Students: 11
# of Faculty: 3

APPENDIX K

CODES SUPPORTING THREE MAJOR METAPOLICIES

Codes Supporting Three Metapolicies

Computer-Based Instruction

I. CBI Should Be Applied to Appropriate Content Areas

A. Helpful in Learning Theory

Program Characteristics
Reinforce Class Content
New Information
New Perspective

Student Behaviors
Review for Exams

Student Suggestions
Use Programs in Classrooms

B. Helpful in Applying Theory

Program Characteristics
Application of Theory
Realistic
Rationales
No Rationales

C. Helpful in Learning and Applying Theory

Program Characteristics
Interactive (Feedback)
Multisensory

Curriculum Characteristics
Accommodating Different Learning Styles

Student Suggestions
More Interactive Videos

D. Not Helpful in Developing Nursing Skills

Program Characteristics
No Hands-On

II. CBI Should Make Reasonable Demands on Students

Program Characteristics
Time Issues

Curriculum Characteristics
Too Many Assignments

Learning Environmental Characteristics
Equipment Malfunctions
Helpful Staff

Student Behaviors
Rushing Through/Skipping Parts
Cutting Corners
Working in Groups
Working Alone
Devoting Time

Student Suggestions
Improve Access to Programs
Longer Lab Hours
Few Optional Assignments
Fewer Required Assignments

III. CBI Should Occur in an Environment with Minimal Distractions

Environmental Characteristics
Noise
Overcrowded

Student Suggestions
Increase Privacy in Lab

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