Assessing the effects of a program to improve questioning skills of nurse educators in clinical post-conferences: an initial study

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ASSESSING THE EFFECTS OF A PROGRAM TO IMPROVE QUESTIONING SKILLS OF NURSE EDUCATORS IN CLINICAL POST-CONFERENCES: AN INITIAL STUDY

by

DIANE M. WINK

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Education in the Department of Educational Foundations at the University of Central Florida Orlando, Florida

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ABSTRACT

The use of cognitively high level questions, those classified in Bloom’s taxonomy at the application level and above, has been suggested as a teaching strategy which will help students develop critical thinking abilities. This study was designed to determine the effect of a program to teach nursing faculty how to ask cognitively high level questions.

A convenience sample was used. Subjects in the treatment (N=10) and control (N=4) groups were faculty and the students in their clinical laboratory groups from four National League for Nursing accredited undergraduate nursing programs in the state of Florida. Pre- and post-intervention data on the cognitive level of questions asked in clinical post-conferences were collected by way of audiotapes recorded during the Fall 1991 semester. Members of the treatment group received an intervention which included an inservice class, subsequent feedback on questioning patterns, and a one hour seminar.

Cognitive level of questions was coded using the Teacher Pupil Questioning Inventory. Descriptive statistics were used to compare data on the treatment and control group faculty and student percentages of
cognitively high level questions. The significance of differences between groups was determined with the Mann-Whitney U Test.

Prior to the intervention, faculty in the treatment group asked less cognitively high level questions than control group faculty. This difference was not statistically significant. After faculty in the treatment group participated in the intervention, their percentage of cognitively high level questions was higher than the percentage for the control group. The difference was statistically significant (p = .012).

Prior to the intervention, students in the treatment group asked less cognitively high level questions than control group students. This difference was not statistically significant. After treatment group faculty participated in the intervention, the percentage of cognitively high level questions asked by students in their clinical groups dropped. The difference between percentages of cognitively high level questions asked by students in the treatment and control groups was still not statistically significant.
DEDICATION

This dissertation is dedicated to the memory of my parents, Gerard and Mary Wink, who let me know nothing was impossible. I hope they would be proud of what all of their children have accomplished.
ACKNOWLEDGEMENTS

I would like to express my appreciation to Dr. Marcella Kysilka for her unfailing support as I completed this research. The expert guidance of the other members of my dissertation committee, Dr. Barbara Redding, Dr. Mary Ann Lynn, Dr. K. Phillip Taylor, Dr. Robert Lange, and Dr. Timothy Daly, throughout this learning experience is gratefully acknowledged. And, a special thank you is due to Miss Nannette McLain for making my introduction to the study of education so wonderful.

I would also like to express my gratitude to the faculty who allowed me to audiotape their post-conferences. The clinical laboratory is the core of nursing education and we will learn to use it well only when faculty, like the fourteen in this study, help researchers explore its intricacies.

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CHAPTER I
INTRODUCTION

Background of the Study

Nurses who effectively care for the sicker and more complex clients served by the health care system must possess communication, clinical assessment, surveillance, diagnostic reasoning, and care delivery skills. These professional nurses must be autonomous and accountable for their actions, and be able to practice collaboratively with other health care providers and collegially with peers. They must be able to provide direct patient care, teach clients, and delegate and coordinate care (Primm, 1987).

If nursing education is to provide the foundation for this level of professional nursing practice, nursing students must be assisted in developing their higher order thinking skills, creativity, and ability to cope with and manage change. They must be prepared to function in the health care arena of today and know how to change their practice as health care continues to undergo rapid change. Much of the knowledge which will form their future practice base has not yet been discovered.

To foster higher order thinking skills and the ability to carry out clinical decision making, nursing education programs must help students learn to recognize and interpret significant cues, know when additional data are needed and where such data might be found,
synthesize and analyze this data, and make context appropriate plans for action. One technique proposed to help students achieve these competencies is the use by the clinical faculty of cognitively high level questions. Such questions would help the student focus on the application, analysis, synthesis and evaluation phases of professional nursing practice (Craig & Page, 1981; House, Chassie, & Spohn, 1990; Pond, Bradshaw, & Turner, 1991; Scholdra & Quiring, 1973).

Cognitively high level questions, drawn from the world of nursing practice, can help students examine assumptions, recognize cues, analyze patterns, prioritize assessments, synthesize plans, and evaluate nursing assessments and interventions. Because there are rarely single correct answers to such questions, they are ideal for settings like the nursing education clinical laboratory and clinical laboratory post-conference where a free flow of ideas can occur and the ambiguities inherent in the solving of real life problems can be addressed. Cognitively high level questions presume a thorough knowledge of the content in the field and they demand that the respondent (often a student) go beyond simple parroting of previously learned facts and concepts or recounts of what happened during the clinical laboratory. The respondents would need to be able to use higher order thinking skills to apply accumulated knowledge and analyze, synthesize and evaluate the events at hand.

When cognitively high level questions are asked, and discussion techniques which promote their answering are utilized, students would
be expected to not only answer at these higher cognitive levels, but also to begin asking cognitively high level questions themselves. As the students formulate and ask questions, they will be clarifying their own confusion and learning needs. And, when these questions are answered - by fellow students, the faculty member, or the questioning students themselves - learning will occur (Dillon, 1988).

If nursing faculty are to use the clinical laboratory and clinical laboratory post-conference to their full potential, programs must be developed to help faculty increase their effectiveness in these settings. And, if techniques such as the use of cognitively high level questions are to be used, empirical evidence of the effectiveness of various approaches to teaching faculty to use these techniques, and the effect of such techniques on student performance, must be gathered (Tanner & Lindeman, 1987).

**Statement of the Problem**

This initial study assessed the effect of one program designed to increase the use of cognitively high level questions in clinical laboratory post-conferences. The direct effect of the program on the cognitive level of faculty questions, and the indirect effect of the program on the cognitive level of student questions, were the outcome measures.
Theoretical Perspectives

Any program designed to help faculty prepare student nurses for nursing practice should consider the theoretical principles of adult learning theory, change theory, and systems theory. Adult learning theory is based on a process model in which the learner is actively involved in their own learning (Knowles, 1973). Change theory examines the forces which both facilitate and restrain an individual's ability to alter behavior. For the adult learner, individual motivation and active involvement in learning can be major facilitating forces for change (Walter & Marks, 1981).

According to systems theory, the composite parts of a system "become changed by their mutual association ... their whole becomes more than the sum of their parts" (LaViolette, 1981, p. xv). When systems theory is applied to education, the content, teacher, student, and learning environment become parts of the learning system. A change in any part of the system, for example the teacher, will change the system and have an effect on all other parts of the system.

Adult learning, change and system theories are applicable to both students and faculty. In this research, they formed the foundation for decisions about the nature of the approaches to questioning taught in the faculty development program and for decisions related to the content, structure and climate of the faculty development program itself.
Study Overview

This initial study was designed to determine if a program could be developed to increase the use of cognitively high level questions in clinical post-conferences. The program's curriculum content and the teaching strategies used during the program were selected to reflect the faculty members' unique needs as adult learners and the factors which both facilitate and restrain change in their behavior. The fact that the students were also adult learners going through a change process formed the basis for the selection of questioning techniques taught in the program. The cognitive levels of the questions asked in clinical post-conference by both students and faculty were used as outcome measures of the success of the program. Students' questions were included although students did not receive the intervention. This was done because, according to systems theory, students should demonstrate a change in the cognitive level of their questions if there is an alteration in the student-faculty system brought on by a change in the faculty member's questioning behavior.

Research Design

A quasi-experimental pretest-posttest treatment and control group design was used. Pre- and post-intervention analysis of questioning patterns was carried out through the use of audiotapes of two sets of three post-conferences conducted by faculty participating in the study.
Treatment Group | Pretest | Intervention | Posttest |
--- | --- | --- | --- |
Control Group | X | X | X |

Figure 1. Study Design

Hypotheses

Two hypotheses were investigated:

1. Nursing faculty who participate in a program designed to increase the cognitive level of their questions will ask a higher percentage of cognitively high level questions in clinical post-conference when compared with faculty who did not attend such a program.

2. Students of nursing faculty who participate in a program designed to increase the cognitive level of their questions will ask a higher percentage of cognitively high level questions during clinical post-conference when compared with students of faculty who did not attend such a program.

Definitions of Terms

**Cognitively High Level Questions:** Questions classified at the application, analysis, synthesis and evaluation levels based on Bloom’s Taxonomy of Cognitive Objectives (Bloom, 1956).

**Program to Develop Ability to Ask Cognitively High Level Questions:** A three part program consisting of a seven hour inservice class, feedback on questioning patterns during a subsequent post-conference, and a one hour seminar. This program includes
information on questioning techniques, questioning levels, techniques to develop cognitively high level questions, and practice in the development and use of cognitively high level questions.

Clinical Laboratory: An institution, home, or community agency where a student nurse comes in contact with clients for the purpose of acquiring intellectual and psychomotor skills (Infante, 1985). During this experience, the student applies theory to practice, explores personal feelings and attitudes encountered in client care situations, and develops professional role behaviors.

Nursing Faculty Member: Person who assumes primary responsibility for the quality of the learning environment for the student nurse relative to the prevailing climate, availability of resources and the process of goal-directed learning (Reilly & Oermann 1985).

Student Nurse: Person who enrolls in an associate or baccalaureate degree nursing education program with the intent of accumulating the knowledge and higher order thinking skills needed for professional nursing practice and licensure as a registered nurse.

Clinical Laboratory Post-conference: Clinically focused conference attended by nursing faculty and the students in their clinical laboratory group during which there is group discussion about some aspect of clinical practice. Students problem solve, share clinical experiences, review and critique their own and other
students' work, and address issues and concerns related to clinical practice (Reilly & Oermann 1985).

Assumptions

The three assumptions which were made in the design and implementation of this study are:

1. Faculty desire to increase the cognitive level of the questions they ask in clinical post-conference.
2. Faculty and students are capable of changing interaction behaviors.
3. The asking and answering of cognitively high level questions is beneficial in the education of nursing students.

Subjects

A convenience sample was used. Subjects were drawn from nursing faculty, and the students in their clinical laboratory groups, at four National League for Nursing accredited undergraduate nursing programs in the state of Florida. Members of the treatment group were from two of the schools and members of the control group were from the remaining two schools.

To be eligible for participation in this study, nursing faculty had to be involved in clinical instruction of undergraduate nursing student during the Fall of 1991. Faculty in the treatment group were required to have planned a sufficient number of clinical post-conferences to enable the taping of four before the intervention and four after the intervention. Faculty in the control group were
required to have planned a sufficient number of clinical post-conferences to enable the taping of four during the first four weeks of the semester and four starting in the eighth to tenth week of the semester.

All participation was voluntary and a consent to participate was obtained from each faculty member. Consents were not requested from students since data which could identify them were not collected. To avoid loss of internal validity of the study, the study title on the consent form read: Interaction Patterns in Post-Clinical Conferences. All faculty participants were aware that interaction patterns between themselves and their students were being analyzed but none knew the specific interaction being studied before the intervention.

To determine the degree of equivalency of the treatment and control groups prior to the intervention, and to identify any confounding variables, demographic data were collected on all participants. Data on the faculty members beliefs about the importance of the development of higher order thinking skills in student nurses were also collected.

Intervention

The intervention (independent variable) was a program designed to increase the cognitive level of questions asked in clinical laboratory post-conferences. The intervention program was developed and carried out by the investigator. The program consisted of three parts: a seven hour inservice class, feedback on questioning patterns
during a subsequent post-conference, and a one hour seminar. All members of the treatment group participated in the intervention program at their respective home schools. Members of the control group did not participate in the intervention program.

Data Collection and Analysis

Data for the measurement of questioning level were collected by having participating faculty audiotape selected post-conferences. Each participant was asked to audiotape a total of four post-conferences before the intervention (beginning of the semester for control group members) and a second set of four post-conferences after the intervention (beginning in the eighth to tenth week of the semester for the control group). The first tape in each set was discarded unless only three tapes were submitted or one of the other tapes was unusable.

Questioning patterns of both faculty and students were analyzed using the Teacher Pupil Questioning Inventory (TPQI) designed by Davis and Tinsley (1967). This question classification system is based on Sanders (1966) adaptation of Bloom’s (1956) Taxonomy of Cognitive Objectives. Analysis of the post-conference audio-tapes was performed by the investigator. The consistency of the investigator’s ratings of the questions and responses was determined by calculating intrarater reliability.

Throughout the study, a coding system was employed to ensure anonymity of participants and prevent identification of treatment and control group audiotapes during data analysis. Human subject
defense was carried out using the procedures of University of Central Florida's Department of Sponsored Research.

Analysis of Results

The following analyses were conducted:

1. Descriptive analysis of the post-conference environment and faculty beliefs about the development of critical thinking in nursing students.

2. Comparison of questioning patterns in the baccalaureate and associate degree groups prior to the intervention using the Mann-Whitney U Test to determine if data from the two program types could be combined during data analysis.

3. Comparison of percentages of cognitively high level questions asked by the treatment and control group faculty prior to the intervention using the Mann-Whitney U Test.

4. Comparison of percentages of cognitively high level questions asked by treatment and control group students prior to the intervention using the Mann-Whitney U Test.

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CHAPTER II

REVIEW OF THE LITERATURE

The literature which provides the foundation for this initial study is extensive. This review is divided into three parts. The first presents the theoretical foundations of the study: Adult Learning Theory, Change Theory, and Systems Theory. Part two provides an overview of the theoretical and research papers on critical thinking and professional nursing. Part three is an examination of the theory and research on questioning as a teaching strategy.

Theoretical Foundations

The theories which provided the foundation for this initial study were adult learning theory, change theory, and systems theory. This section contains an overview of each theory and discusses how the theory was applied in the development and implementation of this research.

Adult Learning Theory

Adult learning theory states that teaching strategies designed for adults must involve students in the process of their education. Adult learners are characterized by great variability in the motives, roles, personalities, life events, and physiologic and psychosocial
variables they bring to the learning experience (Long, 1990). The educator of adults must take on the role of facilitator. The adult educator must establish a physical and psychosocial climate which will be conducive to learning. This climate puts learners in charge of their own learning, and helps them identify resources, plan for learning, and evaluate the effectiveness of their learning efforts (Galbraith, 1990).

The major example of adult learning theory is andragogy as described by Knowles (1973). According to Knowles, andragogy encompasses the specific goals and practices believed to benefit the education of an adult. The student centered approach of Rogers (1969) can also provide a theoretical foundation for the education of adults (Boyer, 1984). Rogers emphasizes non-directive teaching in which the individual student remains at the center of the process with the teacher operating as a counselor who helps the student set and achieve goals (Joyce & Well, 1986).

Both theorists have the goal of establishing a pattern of lifelong learning. The objective presented in both theories is that the learners will learn to learn for themselves. According to Knowles (1973) and Rogers (1969), the adult learner must be encouraged to be active in the learning process while recognizing and accepting self-limitations.

One of the most important characteristics of adult learners is the changeable nature of their motivation for learning (Wlodkowski, 1990). Even when adult learners have a high level of interest in the
subject at hand, other components of their lives may provide a stronger motivation and become the focus of their attention. Educational events, if they are to be successful, must have merit for adult learners in light of their total responsibilities. Wlodkowski (1990) presented four points about the adult learner and the educator of adults:

1. Adults engage in learning on their own volition and, although the forces which cause them to participate may be external to the learner, the decision to learn is their’s.

2. The educator of adults needs to gain and then hold the attention of these highly pragmatic learners who have a strong need to apply what they have learned and to be competent in that application.

3. If the learning experience is to be successful, the educator must treat learners with the expectation that they will learn and make the learning worthy of the adult learners’ choice.

4. The resulting learning experience does not have to be easy but the learner should be able to achieve a sense of pleasure as a result of the accomplishment of learning.

Today’s student nurses are adults. Many are embarking on a second career or starting higher education after beginning their families (Beck & Srivastava, 1991; Jacobs, 1989). Adult undergraduates tend to experience not only the inner growth often associated with the student in higher education, but also "centrifugal growth . . . towards outward roles and experiences"
(Kasworm, 1990, p. 366). Today's nursing students come from an environment rich in stimuli which compete for their attention and interest (Beck & Sivastava, 1991).

Infante (1985) described the clinical laboratory as a prime site where students can be actively involved in their own learning. This active involvement has been found to be very stressful for the nursing student (Kleehammer, Hart, & Keck 1990). To lessen this stress, Reilly and Oermann (1985) suggested that the faculty foster a climate where students feel it is safe to challenge themselves and take the risks necessary to learn. This climate of safety and support should extend into the clinical laboratory post-conference where students work with faculty and fellow students to problem solve and receive feedback (Reilly & Oermann, 1985).

Infante (1985) identified 14 elements of the clinical laboratory experience. These included learning activities which engage students as adult learners and help students think critically about nursing practice. Infante suggested that the clinical laboratory experience be structured to allow students to integrate newly acquired knowledge, examine beliefs and assumptions, and develop the performance patterns characteristic of professional nursing practice. Under this structure, the students would be given increasingly greater levels of responsibility as support from the faculty is gradually withdrawn and the students prepare to move on to independent professional nursing practice (Infante, 1985).
Proponents of formalized faculty development programs have suggested that when inservice programs are designed for faculty members, principles of adult learning must be considered. The suggested changes must be perceived as beneficial and non-threatening. Teaching remains a very private act, rarely open to collegial scrutiny. Any activity which focuses on the faculty member’s performance can be both frightening and threatening (Freedman et al., 1979; Group for Human Development in Higher Education, 1974). In addition, although all true learning involves a certain degree of vulnerability, learning activities engaged in by faculty have the added threat of a real or perceived connection between program participation and job performance evaluation (Glen, 1991).

A program designed to alter or refine the teaching approaches used by faculty must carefully build on prior learning and abilities. While there will always be some stress, the learning atmosphere must be as safe as possible. Programs should not be directly tied to the faculty evaluation processes. Exact content must be determined by the participants, and there must be an opportunity for participants to practice the techniques suggested, not just talk about them. The program should also address the philosophical implications of the strategies taught as well as the difficulties of implementing new strategies. Since, as adult educators, they must be knowledgeable in their field, technically proficient, and able to use a variety of
instructional methods, programs which addresses these needs are more likely to be successful (Galbraith, 1990).

Change Theory

Because both nursing education, and programs designed to help nursing educators develop teaching strategies, require an alteration in thought processes and approaches, change theory must be applied during program design and implementation. According to Lewin (1951), all situations have driving forces which both facilitate and restrain change. According to Lewin's theory of change, these forces are usually balanced, with thought processes frozen, and little change occurring. However, if forces which facilitate change exceed forces which restrain change, the resulting disequilibrium will create a climate where change can occur and new behaviors can emerge. Because there is a natural tendency to return to the status quo, the new behavior must be reinforced and supported. This process is facilitated by institutionalization of the changes through formal and informal mechanisms (Walter & Marks, 1981).

Walter and Marks (1981) outlined six forces generated in a learning experience which can influence the individual's ability to change. The first force is composed of a collection of conditions generated within the individual. For example, an individual's unique collection of fears, angers and vulnerabilities, level of anxiety about expressing themselves in public, and their degree of complacency with their life can be conditions which restrain personal growth. However, a desire for personal growth, an enjoyment of
people, and a natural curiosity can be facilitating conditions. The second force is generated by the leader (teacher). Inappropriate pacing of a learning experience and status differences between the learner and leader can impede change. A leader who is sensitive to participants' needs can be a facilitating force for change.

Walter and Marks' (1981) third force is the effect of the participants on each other. A highly aggressive participant or one who is insensitive to other participants may reduce involvement of other learners. Participants who are enthusiastic about learning and supportive of other group members are often facilitating forces. The physical setting for the learning experience is the fourth force. Room size and decor, the environmental temperature, and seating arrangement all have the power to restrain or facilitate change. The structure of the learning experience itself, the fifth force, is facilitating if it matches the goals and learning styles of the participant. When a mismatch occurs, structure can be a restraining force. Climate, the sixth force, is an aggregation of the preceding forces.

Haverlock (1973) stated that if programs designed to promote change are to be successful, several events must occur. The change agent must carefully build a relationship with the group undergoing change, diagnose any problems, acquire needed resources, choose an appropriate solution, gain acceptance for the solution, and then take steps to stabilize the change. Essential to this last step is the
ability of the change agent to terminate the relationship (Lippitt, Watson, & Westley, 1958).

The practice of specific skills in role play or simulation has been suggested as a necessary part of programs designed to promote individual change (Walter & Marks, 1981). Walter and Marks (1981) also suggested that optimal group size is between five and fifteen individuals if the dynamics necessary for interaction and discussion are to occur. Program length should also be considered if change is desired. Long marathon sessions can provide the best opportunity for the change process but follow-up sessions may be necessary for reflection and integration of the change process (Walter & Marks, 1981).

Research on student nurses indicates that a major facilitating force which promotes change is the active decision to pursue education as a professional nurse. Two major restraining forces are the multiple other obligations in students' lives and the increasingly poor academic preparation students bring to the nursing education program (Beck & Srivastava, 1991; Merritt, 1991; Wolahan & Wieczorek, 1991).

For educators, one of the most powerful facilitating forces identified has been the desire to be effective educators (Allen, 1990; Bevis & Murray, 1990; Pugh, 1988; Wong & Wong, 1980). Professional nursing organizations and accreditation agencies have demanded that nursing educators prepare nurses who have critical thinking and clinical decision making skills and the ability to
design and implement the nursing care required in the future (Bevis & Watson, 1989; Council of Baccalaureate and Higher Degree Programs, 1989; Council on Associate Degree Programs, 1990; Deering-Flory & Neighbors, 1991; Neighbors, 1991). The need to meet these obligations can be a facilitating force.

Restraining forces which impede change in the educators' ability to learn new teaching strategies include the difficulty some adult learners have believing they can change (Freedman et al., 1979). Another restraining force is the lack of time which faculty have to devote to changing their teaching strategies ("As enrollments rebound", 1991; Williams, 1989). A fear of opening themselves to negative critique by their peers, and the possibility of a negative evaluation of their work performance, also keep faculty from participating in faculty development programs (Glen, 1991).

It has been suggested that programs designed for educators should support forces, such as their readiness to learn and their need to maintain and build self-esteem and decrease fear of failure, which facilitate change. Forces which impede change can be minimized by designing the program to fit into the educators' schedule in a way which will have minimum negative impact on the rest of their obligations. The program itself should deal directly with the restraining forces and take advantage of the powerful facilitating forces, especially the desire to be a good teacher (Freedman et al., 1979; Group for Human Development in Higher Education, 1974; Walter & Marks, 1981).
Systems Theory

Systems theory completes the framework used in the design of this research. According to Laszlo (1972), the major characteristics of a system are wholeness and order. Wholeness is a "characteristic which is not possessed by its parts singly" (p. 36). In other words, the whole is greater than the sum of the parts. Order refers to the regularities exhibited by the independent elements of the system which determine the functional behavior of the system (Laszlo, 1972).

Systems are characterized by inputs and outputs which serve as controls for system maintenance and evolution (Laszlo, 1972). The modification and evolution of the system occurs as a result of the effect of external forces on forces internal to the system. The system has a natural tendency to return to a stable state and this occurs through the reorganization of the system's internal forces and the development of new responses after being affected by the external environment (Laszlo, 1972). In an environment where the forces are relatively constant, and variations are within a range which can be tolerated by the system, the system maintains stability and gradually evolves into a more complex system (Laszlo, 1972).

Social systems display the same characteristics as biologic systems. Wholeness, order, control mechanisms, dynamic functions, adaptive self-stabilization and organization, and the development of hierarchies, both within the social system and with other social systems, have all been described (Laszlo, 1972).
Within the system, input is transformed into output in a manner determined by the rules of behavior set up and used by the system. Feedback mechanisms help stabilize the system. Any change in the system, be it system composition, input, or rules of behavior, will alter the output (von Bertalanffy, 1981).

The highly dynamic student-faculty system receives input from the student, the faculty member and the environment. The state of the student and faculty member, and the rules which govern the nature of their interactions, will determine the specific form of system processing. In nursing education the output (product) should be a professional nurse who has the capacity to think, learn, and create as well as to care. Any alteration in either student or faculty member, or the rules which govern their interactions, will alter the system, cause a change in throughput, and, therefore, in the resulting output.

In summary, if a program designed to change the behavior of the faculty member (i.e. to ask cognitively higher level questions in a climate which promotes discussion and student participation and questioning) can be designed and implemented, there should be a corresponding, and hopefully beneficial and effective, change in the student/faculty member interaction and the output of that process.

Critical Thinking and Professional Nursing Practice

Critical thinking has been identified as an essential element of both nursing education and professional nursing practice (Council for Associate Degree Programs, 1990; Council for Baccalaureate and Higher
Degree Programs, 1989; Tanner & Lindeman, 1987). This portion of the literature review will discuss how critical thinking has been defined for nursing practice, the role of nursing education in the development of critical thinking, and research on critical thinking in nursing students and practicing nurses.

Critical Thinking Defined

Many definitions of critical thinking, often called higher order thinking skills, have been proposed in the nursing literature. While the definition of critical thinking often stood alone, it has also been tied to clinical decision making and the development of clinical judgment. In this section of the literature review, definitions of critical thinking will be reviewed, and the concept of clinical decision making will be discussed.

Bandman and Bandman (1988) have defined critical thinking as:

the rational examination of ideas, inferences, assumptions, principles, arguments, conclusions, issues, statements, beliefs, and actions. This examination covers scientific reasoning, includes the nursing process, decision making, and reasoning in controversial issues (p. 5).

They suggested an approach to the development of critical thinking in nursing which involves teaching the student the process of evaluation of arguments by the use of formal logic and reasoning approaches.

Another definition of critical thinking has been provided by Mathews and Gaul (1979) who defined critical thinking as an attitude of inquiry which involves the use of facts, principles, theories, abstractions, deductions, interpretations and evaluations of arguments.
Watson and Glaser (1980) viewed critical thinking as a composite of capabilities which include:

1. Attitudes of inquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true;

2. Knowledge of the nature of valid inferences, abstractions, and generalizations in which the weight or accuracy of different kinds of evidence are logically determined;

3. Skills in employing and applying the above attitudes and knowledge; and

4. The ability to define a problem, select pertinent information for the solution of a problem, recognize stated and unstated assumptions, formulate and select relevant and promising hypotheses, draw conclusions validly, and judge the validity of inferences (p. 1).

Miller and Malcolm (1990) based their definition of critical thinking on the work of Watson and Glaser. They proposed a model of critical thinking in which the nursing curricula, the students, the faculty, and specific teaching strategies interacted to yield various levels of critical thinking. They viewed the nursing process as the major tool for helping the student learn to think critically.

When the nursing process is used, the multiple cognitive processes described by Bloom's taxonomy of cognitive objectives can be demonstrated. When using the nursing process, nurses recall knowledge (from memory) and this knowledge is translated and
interpreted in the specific situation. Rules and knowledge are
applied and there is analysis of data, and the development of nursing
diagnoses and plans for action. At all points, professional nurses
evaluate the accuracy of their knowledge base, level of
comprehension, application of principles, analysis of data, and
implementation of plans. This entire process is called the nursing
process (McCann & Flynn, 1988).

These definitions of critical thinking, as they apply to nursing
and the concomitant use of the nursing process, have been seen as too
narrow by researchers who examined clinical decision making (Benner,
1983, 1984; Benner & Tanner 1987; Benner & Wrubel, 1982; Gordon,
1980; Tanner, 1986). These researchers proposed that, to teach
effective clinical decision making, the way expert nurses gather and
use data and make decisions must be studied. Their research has
approached decision making in nursing from the belief that nurses
evaluate multiple hypotheses at once, using data from many sources to
come to diagnostic conclusions.

While the nursing process is often discussed as if it always
occurred in a fairly rigid sequence, Tanner (1986) suggested that the
experienced professional nurse approaches nursing care in a more
global, holistic manner than the less experienced professional nurse.
Gordon (1980) demonstrated that the hypothesis testing used by nurses
to determine nursing diagnoses was similar to that described in
concept attainment literature. Nurses rapidly evaluated data and
discarded those data which were irrelevant. Often, multiple
hypotheses were tested at once and nursing care was planned and implemented based on comparisons of the patterns at hand to patterns seen in the past. Benner and Wrubel (1982) found that nurses used opportunistic as opposed to systematic strategies in the evaluation of complex situations. This was supported by the work of Benner and Tanner (1987) who found that expert nurses attained a grasp of the whole situation based on a combined input from a variety of senses. As professional nurses grew in both knowledge and experience they were able to steadily increase their level of practice to the point where common-sense understanding, skilled know how, and deliberate rationality become components of everyday practice (Benner, 1984; Benner & Tanner, 1987). This research was supported by Itano (1989), who found that experienced nurses elicited more cues in all categories than student nurses.

The clinical judgment described by these studies can be defined as a process of data collection, hypothesis generation, cue interpretation and hypothesis evaluation (Itano, 1989). This process of solving clinical problems requires that nurses be able to deal with the many difficulties in critical thinking described by Sternberg (1985). Unnecessary and irrelevant information is discarded, while cues which help illuminate patterns which are significant in light of the situation as a whole are identified. Solutions to problems are drawn from an infinite set of possibilities. Benner (1984) demonstrated that when professional nurses complete their initial formal education, they are at an early
stage in what should be their steady development from the level of a novice, who follows context free rules, to the point where they can achieve an intuitive grasp of situations as an expert nurse.

The Role of Nursing Education in the Development of Critical Thinking

If the ability to progress toward the level of expert is a desired characteristic of graduates of formal nursing education programs (Benner, 1984), formal nursing education programs must prepare their students for this progression. Opportunities for students to use both their nursing knowledge and critical thinking skills occur in many venues. Lecture presentations can demonstrate the seeking of alternative solutions; on-campus laboratories can allow skill development and "what if" practice; computer simulations and interactive video can expand the scope of these experiences with "real life," but safe, situations (Pond, Bradshaw, & Turner, 1991). The clinical laboratory can allow the use of accumulated knowledge and the development of critical thinking skills (Infante 1985).

Infante (1985) described the clinical laboratory as an institution, home or community agency where a nursing student comes in contact with clients for the purpose of acquiring intellectual and psychomotor skills. During these experiences, students have the opportunity to apply theory to practice, develop problem solving skills, and evaluate the effectiveness of their assessments, goals, and interventions. In the clinical laboratory, the closest paradigm for actual nursing practice that students encounter during formal
nursing education, students are faced with an array of unique situations in which assumptions can be isolated and examined, and plans for action evaluated (Infante, 1985).

At the conclusion of most clinical laboratory experiences, students have a chance to engage in a group discussion with the faculty member and other students (Carpenito & Duespohl, 1985; Reilly & Oermann, 1985). This clinical post-conference provides an opportunity for students to validate assessments and inferences, evaluate cues, analyze patterns, problem solve, receive immediate feedback, learn from other student's clinical experiences, and discuss concerns and issues related to clinical practice (Reilly & Oermann, 1985).

Nursing faculty have reported that they have little preparation for their role as clinical educators and simply teach as they were taught (Karuhlje, 1986). Many nursing faculty reported that they came to the clinical laboratory with graduate preparation as clinical nurse specialists and practitioners but little or no formal preparation in teaching methods, learning principles, or curriculum development. They expressed a need for these skills (Karuhlje, 1986). Bevis and Watson (1989) suggested that faculty must develop pedagogic skills which will enable them to educate learners, not train nurses, in a faculty-student relationship which engages both students and faculty members and requires students to take an active role in their own learning. They stated that the curriculum development process which will foster these changes begins with
faculty development programs which help faculty cultivate "a repertoire of teaching tools and skills that supports active, educative, egalitarian learning" (Bevis & Watson, 1989, p.6).

Research on Critical Thinking

Research on the actual effect of nursing education on the development of critical thinking has had three foci. The first has been the difference in critical thinking development and/or abilities of students prepared in the three types of nursing programs (baccalaureate degree, associate degree, and diploma). The second focus has been the change in critical thinking of students in specific nursing programs. The third focus has been the effect of particular interventions on the development of nursing students' critical thinking.

When the critical thinking of students in the three types of nursing educational programs are compared, the results are very inconclusive. Scoloveno (1981), delBueno (1983), Danielson (1985) and Lynch (1985) demonstrated that graduates of baccalaureate degree nursing programs demonstrated higher levels of critical thinking than graduates of associate degree or diploma programs. However, these studies also indicated that factors such as academic ability, scores on SAT tests, and level of education were also strong contributing factors to these higher levels of critical thinking. This may indicate that differences in critical thinking are the result of the baccalaureate degree students having more education and higher aptitudes, and are not the result of program differences.
Scoloveno (1981) compared the problem solving ability of 90 baccalaureate degree, 93 associate degree, and 97 diploma senior level nursing students. Using the Watson-Glaser Critical Thinking Appraisal (WGCTA) and the revised Nursing Process Utilization Inventory (NPUI) Scoloveno demonstrated that the baccalaureate degree graduates scored significantly higher on the NPUI and the WGCTA than either the associate degree or diploma students.

delBueno (1983) studied 85 professional nurses who viewed vignettes on 12 clinical situations. Subjects were asked to state the priority problem, what actions or actions they would take to correct the problem and the rationale for the action. If they stated more than one action, the actions were prioritized. Of the 29 baccalaureate degree graduates, 53% had all correct responses. Of the 39 associate degree graduates, 40% had all correct responses. However, of the 17 diploma graduates, only 1 had all correct responses. In addition, delBueno observed that many nurses choose the correct response for the wrong reason.

Danielson (1985) looked at variables which influenced the professional socialization of nursing students. Forty-seven baccalaureate degree and 42 associate degree students were compared using the WGCTA, the Nurses Professional Orientation Scale, and a demographic questionnaire. The critical thinking scores of the two groups were found to be significantly different with the baccalaureate degree scores much higher. The most significant
variables were the educational achievement and social scores of the students.

Lynch (1988) studied 74 students graduating from baccalaureate degree programs and 87 students graduating from associate degree programs. The baccalaureate degree students scored significantly higher in critical thinking on the WGCTA than the associate degree students. There was no relationship between age and critical thinking. The educational level of the student was found to have the greatest effect on critical thinking.

Other researchers (Dungan, 1985; Jones, 1984; Yocum, 1985) documented differences between graduates of baccalaureate degree, associate degree and diploma programs. Although one measure always favored the baccalaureate graduates, other measures in the same study favored graduates from one of the other program types.

Jones (1984) studied 49 graduating associate degree students and 33 graduating baccalaureate degree students and found the baccalaureate group had a slight gain in critical thinking as measured by the WGCTA at the end of their nursing education. However, there was no significant difference in critical thinking between the two groups.

Yocum (1985) studied the influence of initial nursing educational preparation on patient assessment (problem solving) using latent image branching clinical simulations and reported inconclusive results. There was a significant difference in the diagnostic ability of the 91 baccalaureate degree and 86 associate degree
students on one of the simulations, again in favor of the baccalaureate students. However, there was no difference on the second simulation and conflicting evidence when path analysis was done. The authors questioned if the baccalaureate students were simply able to write better diagnostic statements.

Dungan (1985) used the NPUI and the Cornell Critical Thinking Test (CCTT) to evaluate differences in critical thinking between 31 graduating associate degree students and 43 graduating baccalaureate degree students. No significant difference in performance was found on the CCTT although there was a significant difference between the groups on the NPUI in favor of the baccalaureate degree students.

Studies of changes in critical thinking of students in a particular program have primarily focused on students in baccalaureate degree nursing programs (Berger, 1984; Brigham, 1989; Fleeger, 1986; Gafford, 1987; Grossman, 1985; Huff, 1979; Tiessen, 1983). Researchers tested students at various points in their education. No consistent, significant changes in critical thinking were found.

Huff (1979) tested the critical thinking of freshmen and graduating seniors in the same program. The mean increase of 5.4 points on the WGCTA was not found to be statistically significant. This was similar to the results obtained by Fleeger (1986) who examined the critical thinking and moral reasoning behavior of baccalaureate degree nursing students and found no differences in critical thinking between the 41 first, 23 second, and 27 third year
students studied. However, a weak but significant relationship between aptitude, critical thinking (measured by the WGCTA) and moral reasoning (measured by the Defining Issues Test) was found. Gafford (1987) also demonstrated no statistically significant difference in critical thinking between 20 freshman and 20 senior baccalaureate degree nursing students. The WGCTA was used for the analysis. Brigham (1989) used the WGCTA to examine critical thinking skills in a stratified random sample of freshmen, sophomores, juniors and seniors at one school with a total sample size of 114. No differences were found. In this study, Scholastic Aptitude Test (SAT) verbal scores and Grade Point Average (GPA) for the humanities and fine arts accounted for 41% of the variance in critical thinking among the students.

Tiessen (1983) looked at the contribution of selected variables to the development of critical thinking of 150 students enrolled in a four year baccalaureate degree nursing program. Critical thinking, as measured by the WGCTA, was found to be most closely correlated with variables which reflected academic aptitude. These results were similar to those of Grossman (1985) who looked at factors associated with the clinical competence of 75 generic baccalaureate degree students drawn from three programs. The NPUI, the WGCTA, and a demographic data form were used to measure study variables. Younger age, a high aptitude, work experience of any kind (except as a licensed practical nurse) and holding a prior degree were found to significantly increased problem solving ability. In addition,
problem solving and critical thinking ability were positively related.

Berger (1984) followed the same student cohort through a nursing curriculum. One hundred and thirty-seven students in a single baccalaureate degree program were tested using the WGCTA in their sophomore and senior years. The researcher reported an increase in the mean score on the WGCTA from 77 to 80. The researcher stated this was significant with a t equal to 3.98.

When registered nurse graduates of associate degree or diploma programs who return to school to complete a baccalaureate degree in nursing are studied, the effect of the program on critical thinking is equally variable. Soefje (1985) demonstrated a significant difference between 110 registered nurse students entering and 136 registered nurse students exiting baccalaureate degree programs on four sub-tests of the WGCTA. Miller (1987) obtained similar results after studying an intact cohort of registered nurse students completing their baccalaureate degree. The most significant gains were noted on the sub-test: Recognition of assumptions and deductions.

Sullivan reported two studies of registered nurse students obtaining baccalaureate degrees. The first (Sullivan, 1984) compared students entering and those exiting a program and found creativity higher at graduation than at entrance to the program. The second study (Sullivan, 1987) compared critical thinking in an intact sample of 51 registered nurse students. While scores for flexibility, mean
GPA and clinical performance increased significantly, creativity was lower at graduation and critical thinking scores on the WGCTA were identical on entry and exit.

A number of studies attempted to vary the educational process in an attempt to increase critical thinking of the students (Currier, 1986; Newman, 1981; Newsome, 1989; Paul, 1979; Pond, 1987; Richards, 1977; Tilson, 1986). None of the teaching strategies demonstrated any effect on student critical thinking.

Richards (1977) examined the effect of a baccalaureate degree nursing program with an integrated curriculum by comparing graduates of the integrated program with those who graduated from the program before the content was integrated. The students exposed to the integrated curriculum had significantly lower critical thinking skills than the students in the traditional curriculum. Paul (1979) studied the effect of a junior year course which emphasized the improvement of critical thinking through the use of the nursing process. Using the Critical Thinking Appraisal for Student Nurses, no differences in mean scores were found between the 46 students who took the course and the 103 who did not take the course. Newman (1981) examined the effect of an idea checklist on the development of divergent thinking in 63 nursing students who were divided into experimental and control groups. Both groups increased fluency of response over the trials but there were no significant differences in scores between the groups after the treatment. Strong correlations
between flexibility and theory grades, and flexibility and clinical grades were found.

Currier (1986) studied the effect of a summer work study program on the problem solving ability of 32 baccalaureate degree nursing students. No significant increase in posttest scores on the WGCTA between the students who did and did not participate in the program was found. Newsome (1989) compared the effect of a guided design approach and lecture teaching on the ability of students to solve problems in the clinical setting. The guided design approach was found to be more effective in teaching students to use the nursing process but it was no more effective for teaching content and it had no effect on the students' anxiety.

Both Tilson (1986) and Pond (1987) looked at the effect of computer assisted instruction (CAI) on critical thinking. Tilson (1986) used 38 students in the same course and Pond (1987) studied 28 students in a different course. Neither found that computer assisted instruction was superior in the development of critical thinking. However, CAI was found to be as effective as lecture in teaching content, and it decreased instruction time.

Three reviews of the literature (Davis-Martin, 1990; Eisenhauer & Gendrop, 1990; Tanner, 1987) reported no clear relationship between type of education or any specific teaching strategy, and the development of critical thinking in the studies reviewed. Tanner (1987) concluded that different processes are used by different persons for concept attainment dependent on their level of expertise.
and the demands of the task. However, because the interventions described in the studies reviewed were all very brief, lasting only 4 to 15 hours, the lack of time for reinforcement may have affected results.

Eisenhauer and Gendrop (1990) examined 21 studies on problem solving in nursing. They concluded that these studies demonstrated variable effects of specific educational programs on clinical problem solving. After reviewing over sixty studies published between 1966 and 1988, Davis-Martin (1990) concluded that there were no major differences in the cognitive abilities of graduates of associate and baccalaureate programs. In addition, the studies reviewed indicated that any differences seen between the groups could be attributed, in part, to role demands of the practice setting.

**Summary**

The theoretical and research literature on critical thinking in nursing students indicates that critical thinking is valued in nursing practice, and that it develops over time. Much of this development appears to occur after professional practice begins as the practitioner increases clinical competence. The superiority of any one type of educational program, as demonstrated by critical thinking of students at exit from the program, and the superiority of any one teaching technique, has not been demonstrated. Many techniques have been proposed to help nursing faculty teach student nurses critical thinking and clinical decision making abilities.
However, programs to formally teach problem solving and the practice of critical thinking have had limited success.

Most of the interventions used in the research were of fairly short duration and involved learning activities outside of the clinical laboratory setting. While some of the study groups were large and included students from multiple programs, most were small and drew their subjects from one school, sometimes only one class in the school. No single, definitive study on the development of critical thinking was located in this review.

Research on the development of critical thinking has not examined relationships between faculty and students. Although the literature on the development of clinical decision making suggests that students may learn best by seeing behaviors modeled, the effects of such modeling by faculty on students were not addressed. If student-faculty interactions have some effect on the development of critical thinking, the nature of these interactions must be examined, ways to develop effective interaction techniques determined, and the effects of such interactions studied.

**Questioning as a Teaching Strategy**

**Classification of Questions**

Multiple schema for the classification of questions have been proposed. The system most familiar to nurse educators is that based on Bloom’s Taxonomy of Educational Objectives (1956). This taxonomy describes cognitive functions in six areas: Knowledge, Comprehension, Application, Synthesis, Analysis and Evaluation. Each category
except Application is subdivided to describe the specific forms questions in that classification can take. For the Knowledge category, this includes knowledge of specifics, ways and means of dealing with specifics, and knowledge of the universals and abstractions in a field. The Comprehension category includes translation, interpretation and extrapolation abilities. Under Analysis, Bloom has included the analysis of elements, the analysis of relationships and the analysis of organizational principles. Synthesis includes the production of a unique communication, plan or set of operations and the derivation of a set of abstract relations. Evaluation encompasses judgments in terms of both internal evidence and external criteria.

Bloom's categories have been viewed as hierarchical because each level is based on the use of the thinking processes of all lower levels. However, because all of the categories at the top four levels are often viewed as requiring higher order thinking skills, the classification is often divided into high (Application, Synthesis, Analysis and Evaluation categories) and low (Knowledge and Comprehension categories) cognitive levels (Craig & Page, 1981; Davis & Tinsley, 1967). Sanders (1966) modified Bloom's taxonomy by replacing the knowledge and comprehension categories with the categories of Memory, Translation and Interpretation. The affective domain is addressed in a separate taxonomy (Krathwohl, Bloom, & Masia, 1964). Hunkins' (1972, 1976) work on question development and
the involvement of students in questioning was based on Bloom's
taxonomy.

Hyman (1979) developed a non-hierarchical classification system
which described four types of questions: definitional, empirical,
evaluation, and metaphysical. Definitional questions simply elicit
definitions. Empirical questions seek facts and relationships
between facts. Evaluation questions ask the respondent to provide
opinions and justification of opinions. Metaphysical questions ask
respondents to state their metaphysical or theological beliefs.
Hyman described the functions of questions as centering, expansion,
distribution and order. He promoted the use of a planned, sequential
approach to questioning which would gradually lead students to higher
level questions and responses.

Christenbury and Kelly (1983) proposed the use of Questioning
Circles instead of a questioning hierarchy or schema. They criticize
hierarchies which they believe promote linear or sequential questions
and are dependent on pre-planning of questioning activities. Their
three Questioning Circles represent what Christenbury and Kelly call
the Matter, Personal Reality and the External Reality. Specific
titles for the circles are dependent on the topic under discussion.
Questions during any class can reflect any one circle (white
questions), two circles overlapping (shaded questions), or all three
overlapping (dense questions). Hunkins (1987) observed that rather
than present an alternative to hierarchies, Questioning Circles
helped the teacher and student consider realms about which questions
can be raised. Within any one area, the questions can cover the full range of cognitive levels although those in the dense area are more likely to be at higher cognitive levels.

Questioning Techniques

The structure of the teaching activity into which questioning is integrated, and not simply the type or level of question, has also been seen as significant. For example, the question's environment has been identified as a determinant of the likelihood that students will take the risks necessary to display the cognitive activities necessary to answer a question. Researchers on questioning have identified important environmental factors including the obvious physical factors such as room arrangement (can participants see each other?), physical comfort (not hungry, thirsty, cold or very hot) and the privacy to speak freely. The emotional environment, including the safety to err, an atmosphere of inquiry, not inquisition, and a level of faculty openness which allows the challenging of everyone's beliefs, not just those of the students, have also been identified as essential for questioning to be effective (Dillon, 1988; Hunkins, 1976; Rowe, 1987; Wilen, 1987).

Techniques used during the questioning activity have also been identified as factors which increase the quality of student responses. One such technique which has been discussed is the use of probes (House, Chassie, & Spohn, 1990). After an eliciting question by a student or faculty member, extension, clarification,
Justification, prompting and redirection probes can help students extend the depth and breath of their answers.

Wait time has also been identified as an important questioning technique (Rowe, 1987). Rowe (1987) described wait time as the amount of time allowed to elapse after the faculty question (Wait time I) and after a student question or response before the faculty speaks again (Wait time II). Rowe (1987) reported that increasing wait time resulted in more cognitive processing time, increased student initiated discourse with better support of answers, decreased failures to respond, increased student confidence, and improved expectations of performance for some students. After a review of over twenty-five research studies on wait time, Tobin (1987) concluded that "wait time facilitated higher cognitive level learning by providing teachers and students with addition time to think" (p. 69). The studies reviewed also indicated that there is a critical length of wait time - three seconds - after which benefits are clear. Wait time below this threshold had little effect. In addition, longer wait times decreased the number of faculty questions and increased the number of student responses.

Dillon (1988) suggested that, if anything, faculty ask too many questions. He suggested that student questions (expressions of perplexity) be encouraged and allowed into classrooms. These questions "make the perfect opening for teaching to enter as well as for learning to occur" (Dillon, 1988, p. 22). And, rather than responding verbally to each student statement, alternative faculty
responses such as silence, brief restatements, and encouragement of a student's questions can be used.

Research on the Use of Questions

Research on the use of questions has been divided into studies which focused on either pre-college classrooms or higher education. Within higher education there are studies of general college classrooms and nursing education settings.

Gallagher and Aschner (1963), using a tool developed to document questioning activities based on Guilford's Structure of the Intellect Classification System, conducted an analysis of questions asked in a social studies class for gifted children. After studying five consecutive class sessions in 12 classes of intellectually superior children in junior high, they found that a slight increase in the number of teacher initiated divergent questions caused a much greater increase in student responses at the divergent level. In fact, the number of responses far exceeded the number of questions asked. This was attributed to the fact that one divergent question generated responses from a variety of students.

Davis and Tinsley (1967) studied the cognitive levels of questions asked by social studies teachers using the Teacher Pupil Questioning Inventory. They studied 44 pre-service teachers in junior and senior high school social science classes. Using Sanders' modification of Bloom's taxonomy, they found that 61% of the questions asked by faculty were at the memory level. Only 12% were at the level of application. They concluded that the only cognitive
objectives effectively used in the classrooms observed were at the lowest cognitive level.

Beseda (1973) and Bedwell (1975) examined the effect of questioning on student performance. Beseda (1973) pretested and posttested students using a variety of measures, including the WGCTA, and evaluated the questioning behaviors of experimental and control groups of student teachers. The experimental group received 12 hours of training in questioning tactics and received feedback from the coding of their classes as the study progressed. Although the teachers were found to increase their ability to ask divergent questions, the critical thinking of their students decreased when compared to the students in the control group. Bedwell (1975) studied if pupils of nine inservice teachers trained in question-asking skills would demonstrate greater cognitive achievement and positive attitudes. The teachers demonstrated the ability to classify and write questions representing higher cognitive levels. However, the students in classes where the teachers used these techniques did not demonstrate greater cognitive achievement or a more positive attitude when compared with students in classes with the same teacher where a preponderance of low level questions were used.

Ghee (1975) studied the effects of higher level questions, as described by Sanders, on students' responses. A teacher was trained by the researcher to ask higher level questions. These questions were found to significantly affect the levels of responses of the 28
students studied. However, Ghee did not find a corresponding increase in the students' ability to think through situations presented to them.

Davivongse (1984) and Gall (1970) studied the effects of training programs on question behaviors. Davivongse's program was found to be effective in training the teachers to decrease their use of cognitive-memory questions. Gall reported a highly significant positive change in questioning behavior, an increased rate of probing questions, and a decrease in poor questioning habits.

There have been three major reviews of the research on the affect of higher level cognitive questions on student achievement in pre-college classrooms. Two (Sampson, Strykowski, Weinstein, & Walberg, 1987; Winne, 1979) indicated that changes in faculty questioning patterns did not result in a clear improvement in student achievement. However, the third review (Redfield & Rousseau, 1981) indicated that teacher use of predominately higher level cognitive questions had a significant and positive affect on student achievement.

Barnes (1983) studied the questioning patterns of college professors. Questioning patterns in 40 classes at two private and two public undergraduate institutions were analyzed. The Amidon Multiple Category System (a modification of the Flanders' Interaction Analysis System) and the Aschner-Gallagher System for Classifying Thought Processes were used for analysis of audiotapes of the classes. A very small portion of the college class time was
found to be spent in questioning. Questions asked were predominately low-level, although faculty at large private colleges asked more divergent questions. A positive correlation between the cognitive level of professor's questions and the cognitive level of the students was found.

Foster (1983) studied the relationship between verbal participation of 119 third year medical students (divided into 62 discussion groups) to teacher support, the students' entry characteristics and outcome measures. Ninety percent of the questions were at the knowledge and comprehension levels. Ninety-five percent of student talk was at these low levels. Faculty who asked higher level questions tended to use probes to extend student responses. The cognitive level of the teacher's questions was found to be significantly correlated with the cognitive level of the student's response. Students who participated more in the discussions scored higher on cognitive entry measures including the critical thinking pretest. And, although there was some correlation between verbal participation and cognitive outcome measures, entry characteristics seemed to be more closely related to the outcomes measured.

Analyses of questions asked by nursing faculty indicated that a relatively small number of their questions reflect Bloom's four highest cognitive levels: application, analysis, synthesis and evaluation (Craig, & Page, 1981; Malcomson, 1990; Scholdra & Quiring, 1973; Wang, & Blumberg, 1983). However, it was possible for faculty
to increase the cognitive level of questions asked (Craig & Page, 1981; Harrison, 1988; Malcomsom, 1990).

Scholdra and Quiring (1973) determined the cognitive level of questions asked by 16 faculty members and their students during 22 clinical post-conferences which averaged 63 minutes in length. A total of 719 questions were identified. After discarding 102 on which no agreement on category could be reached, 617 questions, 38% of which were student questions, were classified by a three member panel and 92% were found to be at the knowledge or comprehension level.

Wang and Blumberg (1983) made 44, two hour observations of instructors in clinical settings. Questioning was one of the most frequent techniques used by these instructors but most questions asked were of low level. The authors suggested that this could be because the students' level of preparation was inadequate due to lack of necessary content prior to the clinical experience, because the faculty did not ask high level questions in order to allow student learning and analysis at the bedside, or because the faculty did not know how to ask high level questions.

Craig and Page (1981) designed a self-instructional module to help faculty members classify their questions, generate higher level questions, and evaluate questions. The cognitive level of questions asked by the treatment and control group faculty and the students in their clinical groups during half-hour post-clinical conferences were rated before and after the treatment group faculty completed the
module. The cognitive level of the questions was analyzed by the investigator using audiotapes of the post-conferences studies. Prior to the intervention, the faculty subjects asked 19% high level questions (application or above). Following the intervention, treatment group faculty asked 35% cognitively high level questions in comparison to the 20% asked by the control group faculty. Four members of the six person treatment group increased the percentage of cognitively high level questions they asked by 11% or more. One showed an increase of only 0.4% and one showed a 9% drop in the number of high level questions asked. Members of the control group showed no corresponding increase in the number of high level questions asked. Less than one percent of the student questions were cognitively high level prior to the intervention. After the intervention, students of faculty in the treatment group asked no cognitively high level questions and students of faculty in the control group still asked only one percent cognitively high level questions.

Harrison (1988) used a computer assistance instruction (CAI) module to help baccalaureate nursing educators improve their use of classroom questions. A sample of 30 educators and their students participated. Faculty completed a pre-intervention "Intended Use of Question" form, audiotaped a 45 minute class, and had their students complete a "Student Perception of Questions" form. After the treatment group completed the CAI program, the assessments were repeated. The members of the treatment group asked significantly
more high level questions after the intervention and their students showed a significant increase in their perception of the use of higher level questions by the faculty.

Malcomson (1990) studied the effect of a faculty development module on the cognitive level of faculty questions, first student response, and student questions using transcripts of the first 45 minutes of clinical post-conferences. A repeated measures/time series design was used with the 16 faculty members in the study. After all participants audiotaped two clinical post-conferences, the eight members of the treatment group completed a self-instructional module on the asking of cognitively high level questions which was designed by the investigator. All participants then audiotaped a second set of two post-conferences after which the members of the control group completed the self-instructional module. This was followed by the audiotaping of a third set of two post-conferences by all participants. Using analysis of covariance, a statistically significant treatment effect from the use of the module was measured. This effect was maintained over the six weeks of the study. Students asked a higher percentage of cognitively high level questions than faculty both before and after the intervention. A highly significant correlation between the cognitive level of questions asked by faculty and cognitive level of students' first responses was also found.

Summary

There have been few studies of questioning in higher education and even less in the area of nursing education. Regardless of
setting, the studies indicated that the overall level of the questions asked is low, that when the questioning level is increased the level and amount of student talk increases, and that the level of questions asked by faculty can be improved. Students asked virtually no cognitively high level questions.

Research on programs designed to increase the cognitive level of questions asked by faculty, and the cognitive level of student questions and responses, has indicated they can have a positive effect on the number and level of questions asked by faculty. However, all studies, except that reported by Malcomson, indicate that the programs have had little effect on student questioning behavior.

Additional research is needed to document the most effective approach for programs designed to increase the cognitive level of questions asked, to increase the number of questions asked by students, and to verify the stability of any changes over time. In addition, studies which document the effect of such questioning patterns on student achievement are needed.
CHAPTER III

METHODOLOGY

Study Design

This was a quasi-experimental study using a pretest-posttest treatment and control group design. This design enabled the investigator to distinguish changes in the cognitive levels of faculty and student questions caused by the intervention (independent variable) from changes which occurred naturally due to changes in the faculty and students over the course of the study. Pre- and post-intervention analyses of questioning levels were carried out by the use of two sets of three audiotapes of nursing clinical laboratory post-conferences conducted by each faculty member participating in the study.

This study was a modification of the research studies reported by Craig and Page (1981) and Malcomson (1990). As in these earlier studies, the present study defined cognitively high level questions as those at the application, analysis, synthesis or evaluation levels. Both the original and present studies used pre- and post-intervention audiotaping of post-conferences and analyses of the cognitive level of both student and faculty questions.

The number of post-conferences analyzed varied among the studies. Craig and Page (1981) used one, Malcomson (1990) two, and the current study three, at each data collection point. Unlike the
earlier studies, the present research protocol called for analysis of the entire post-conference, the use of Sanders (1956) and Davis and Tinsley's (1967) modifications of Bloom's taxonomy of cognitive objectives, and a three part intervention which required interaction between the investigator and the participants instead of a self-instructional module. In addition, in the present study, faculty from each school were in either the treatment or control group instead of having treatment and control group faculty at the same institution.

Subjects

The Institutional Review Board for Human Subjects in the Division of Sponsored Research at the University of Central Florida approved the study and the study consent form. Students in the audiotaped clinical post-conferences were not required to sign a consent because data collection and analysis methodology ensured anonymity of student participants.

A convenience sample of nursing faculty and the students in their clinical laboratory groups was used. Faculty were eligible to participate in the study if they were involved in clinical instruction of undergraduate nursing students during the Fall of 1991. Faculty in the treatment group had to have a sufficient number of clinical post-conferences planned to allow the taping of four prior to the intervention began and four after the intervention was completed. Faculty in the control group had to have a sufficient number of clinical post-conferences planned to allow the taping of
four during the first four weeks of the semester and four starting in the eighth to tenth week of the semester. All faculty participation was voluntary.

Study sites were selected based on similarities in program size, faculty, students, and the willingness of faculty to participate in the study. Initially, four National League for Nursing (NLN) accredited baccalaureate degree nursing programs in the state of Florida were contacted by letter sent to their deans or program directors on July 5th, seven weeks before the start of the semester in which the study was to take place. The deans or program directors communicated the request for participants to their faculty at the initial faculty meeting of the semester. Two additional schools, both NLN accredited associate degree programs, were contacted and invited to participate in the study during the first week of the semester.

Meetings between the investigator and interested faculty were scheduled at the schools immediately before or after a regularly scheduled faculty meeting between August 26th and September 20th. Potential participants were told that the investigator was examining faculty-student interaction in the clinical laboratory post-conference but that the specific interaction being examined could not be revealed. Consent forms were signed by all faculty participants (Appendix A) and coded audiotapes for the initial phase of data collection were distributed.
Faculty participants were asked to explain the nature of the study and the purpose of the audiotapes to their individual clinical groups. They were asked to reinforce the fact that the tapes were for the use of the investigator and would not be used in student or faculty evaluation.

Eighteen faculty from two baccalaureate degree and two associate degree programs agreed to participate. The number of faculty subjects at each site ranged from four to six. Ten faculty, four from one of the baccalaureate degree programs and six from one of the associate degree programs, constituted the treatment group. Eight faculty, four from the other baccalaureate degree program and four from the other associate degree program, constituted the control group.

Four members of the control group (two from each school) withdrew from the study. One withdrew the day after signing the consent because the students in her clinical group did not want to be audiotaped. The other three control group dropouts did not notify the researcher of their intention to withdraw from the study. All three sent back blank audiotapes seven weeks after the start of the study. The researcher attempted to contact each of these subjects. One stated the structure of her clinical day changed, making taping of post-conferences difficult; one needed to conduct her post-conferences in a cafeteria making audiotaping impossible; and one could not be contacted. The result was an treatment group of ten
subjects and a control group of four subjects. Table 1 is a summary of the study participants.

**TABLE 1**

**STUDY PARTICIPANTS**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>TYPE OF PROGRAM</th>
<th>NUMBER OF PARTICIPANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>School E-1</td>
<td>Treatment</td>
<td>Baccalaureate</td>
</tr>
<tr>
<td>School E-2</td>
<td>Treatment</td>
<td>Associate</td>
</tr>
<tr>
<td>School C-1</td>
<td>Control</td>
<td>Baccalaureate</td>
</tr>
<tr>
<td>School C-2</td>
<td>Control</td>
<td>Associate</td>
</tr>
</tbody>
</table>

Faculty members at two additional baccalaureate degree programs declined to participate. Reasons given for non-participation included a lack of time to attend the intervention (for potential treatment group faculty), the cumbersomeness of doing the audiotapes, a concern that the audiotapes would interfere in normal post-conference dynamics, and personal stress which made participation burdensome. Similar reasons for not participating were given by faculty at the treatment and control schools who declined to take part in the study despite meeting eligibility requirements.

To determine the equivalency of the treatment and control groups, demographic data on participating faculty members' clinical experience and speciality, experience as an educator, educational background, age, and racial group were collected. The faculty members' perception of the importance of the development of critical thinking in nursing students was also collected (Appendix B). Data
on the mean GPA, age, and prior education of the students in each participating program were requested from the program director (Appendix C).

All faculty participants were caucasian females. Participants were similar in age and years of clinical experience. Members of the treatment group had almost twice as much experience as educators when compared to the control group. The range of experience as an educator for faculty in the treatment group was 3 to 28 years while the range of experience as an educator for the control group was only one to nine years. The most experienced educators were in the associate degree treatment group. These data are summarized in Table 2.

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>CHARACTERISTICS OF FACULTY PARTICIPANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN MEAN MEAN MEAN</td>
<td>YEARS YEARS OF YEARS AS</td>
</tr>
<tr>
<td>MEAN AGE MEAN YEARS SINCE PART OR MEAN MEAN YEARS AS</td>
<td></td>
</tr>
<tr>
<td>MEAN MEAN INITIAL FULL TIME NURSING MEAN MEAN CLINICAL EDUCATOR</td>
<td></td>
</tr>
<tr>
<td>MEAN MEAN MEAN MEAN</td>
<td>MEAN MEAN MEAN</td>
</tr>
<tr>
<td>MEAN MEAN MEAN MEAN</td>
<td>MEAN MEAN MEAN</td>
</tr>
<tr>
<td>MEAN MEAN MEAN MEAN</td>
<td>MEAN MEAN MEAN</td>
</tr>
<tr>
<td>Treatment Group</td>
<td>45</td>
</tr>
<tr>
<td>Associate Faculty</td>
<td>45</td>
</tr>
<tr>
<td>Baccalaureate Faculty</td>
<td>46</td>
</tr>
<tr>
<td>Control Group Total</td>
<td>42</td>
</tr>
<tr>
<td>Associate Faculty</td>
<td>44</td>
</tr>
<tr>
<td>Baccalaureate Faculty</td>
<td>42</td>
</tr>
</tbody>
</table>

In the study sample, four (67%) of the faculty from the baccalaureate degree programs and none of the faculty from the
associate degree programs held an earned doctorate degree. Nationally, 23.7% of faculty of baccalaureate degree programs hold an earned doctorate and 2.3% of associate degree educators are doctorally prepared (Nursing Data Review 1987, 1988). Two (33%) of the participants from the baccalaureate degree programs and six (75%) of the participants from the associate degree programs held the Masters Degree in Nursing (MSN) as their highest degree. Nationally, the number of faculty who hold a MSN is 74.5% for baccalaureate program faculty and 80.1% for associate degree program faculty (Nursing Data Review 1987, 1988). Two subjects (25%) from the associate degree program in the treatment group had not earned a Masters Degree in Nursing. Nationally, 15% of associate degree educators have only earned a baccalaureate degree (Nursing Data Review 1987, 1988). One of the two subjects without a nursing masters degree was in the last semester of a MSN program and the other was enrolled in a MSN program although she held a MA (in education) and had ten years experience as an educator in an associate degree program. Participant educational background is summarized in Table 3.
TABLE 3

EDUCATIONAL BACKGROUND OF FACULTY PARTICIPANTS

<table>
<thead>
<tr>
<th>HIGHEST DEGREE EARNED</th>
<th>BSN</th>
<th>MA</th>
<th>MSN</th>
<th>DNS/PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Group Total</td>
<td></td>
<td></td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Associate Faculty</td>
<td>1</td>
<td>1</td>
<td>4^a</td>
<td>0</td>
</tr>
<tr>
<td>Baccalaureate Faculty</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Control Group Total</td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Associate Faculty</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baccalaureate Faculty</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^aOne associate degree treatment group member had an EdS degree in addition to the MSN.

All participants were teaching clinical laboratories in their general specialty areas. In the treatment group, there were an equal number of faculty teaching in family focused clinical laboratories and acute care adult focused clinical laboratories. All faculty in the control group were teaching clinical laboratories which focused on the acute care needs of adults. Table 4 summarizes the clinical specialty of the faculty participants.
In order to determine the degree of participant agreement with statements from national nursing groups about the importance of the development of critical thinking in nursing education programs, all participants were asked to indicate their level of agreement with the following statements:

1. The curriculum should emphasize the development of critical thinking and of progressively independent decision making (Council for Baccalaureate and Higher Degree Programs, 1989).

2. Graduates of nursing programs should possess the nursing intervention and clinical skills necessary to make clinical judgments (American Association of Colleges of Nursing, 1986).

3. The practice of a graduate of an Associate Degree in Nursing program is characterized by critical thinking, clinical competence, accountability, and a commitment to the value of caring (Council for Associate Degree Programs, 1990).
Faculty were asked to indicate level of agreement with a five item Likert scale: strongly agree, somewhat agree, agree, somewhat disagree, and strongly disagree. Faculty responses to these questions are reported in Chapter IV.

The student demographic data forms were incomplete and only mean student age, GPA and number of students were reported for all schools. Student age ranged from 20 to 59 years. The mean GPA ranged from 2.8 to 3.2. Students of the treatment group faculty were slightly younger than students in the control group, and they had slightly lower mean GPAs. The student body size in the two treatment group schools was larger than in the control group schools. Table 5 summarizes the data on the students at each of the schools.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>MEAN AGE</th>
<th>MEAN GPA</th>
<th>TOTAL NUMBER OF STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate Faculty</td>
<td>29</td>
<td>2.8</td>
<td>244</td>
</tr>
<tr>
<td>Baccalaureate Program</td>
<td>26</td>
<td>2.9</td>
<td>224</td>
</tr>
<tr>
<td>Control Group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate Faculty</td>
<td>33</td>
<td>3.1</td>
<td>116</td>
</tr>
<tr>
<td>Baccalaureate Program</td>
<td>32</td>
<td>3.2</td>
<td>185</td>
</tr>
</tbody>
</table>

**Intervention**

The intervention was a program designed to increase clinical faculty members' ability to ask cognitively high level questions during clinical post-conferences. All faculty in the treatment group
participated in this program. Faculty in the control group did not participate in the intervention.

The intervention, developed and carried out by the investigator, consisted of three parts: a seven hour inservice class conducted the week after the pre-intervention audiotapes were completed, feedback on questioning levels during a subsequent post-conference conducted by the participant, and a one hour seminar attended by the participants at each school three weeks after the inservice. Treatment group faculty at the associate degree program attended the inservice on October 4th. Treatment group faculty at the baccalaureate degree program attended the inservice on October 11th. A total of ten hours of continuing education credit was awarded to faculty in the treatment group.

Adult learning theory and change theory were applied during the design and implementation of the intervention. The intervention reflected application of teaching strategies which have been recommended for programs designed to change faculty-student interactions. These included: presentation of an overview of the skill and its theoretical basis, practice in the discrimination of one questioning technique from another, modeling of each technique, and extended practice with feedback in a micro-teaching setting (Good & Brophy, 1984; Van Ort, Woodtil, & Hazzard 1991; Wilen, 1987).

The format allowed participants to be actively involved in the learning process. Participants were encouraged to share personal experiences related to faculty-student interaction in the clinical
laboratory. Fears and concerns about changing approaches were addressed as they arose and were a focus of the seminar.

Part one of the intervention was a seven hour inservice class presented to faculty in the treatment group at their home schools. The day began with a request that participants identify questions they had about faculty-student interactions. These questions were addressed during the inservice class. This was followed by a review of the goals of the clinical laboratory, a discussion of ways to develop critical thinking in nursing students, and an overview of research on the nature of faculty-student interaction in the clinical laboratory. Types of questions, the development and classification of questions based on Bloom's Taxonomy of Cognitive Objectives, and the dynamics of effective questioning were then discussed. Specific information on the use of wait time, probes, and clearly phrased questions was included. The importance of encouraging both student response and question asking was emphasized. A cueing bookmark, based on that proposed by McTighe and Lyman (1988), was distributed and used during the inservice. Questioning Circles (Christenbury & Kelly, 1983) were explained as one way to facilitate question development. The class objectives and content outline are presented in Appendix D.

Multiple opportunities for participants to practice all techniques were provided during the inservice class. These included practice in the development of questions using vignettes provided by the investigator and clinical vignettes written by participants.
Videotapes of actual client interactions were used to allow participants to practice the development of cognitively high level questions appropriate for clinical post-conferences.

Part two of the intervention consisted of feedback on an audiotape of a post-conference conducted the week after the inservice class. (This tape was not part of the post-intervention data analysis). Each member of the treatment group mailed the audiotape to the investigator using a pre-stamped envelope and the tape was analyzed using the Teacher Pupil Questioning Inventory (TPQI) (Appendix E). The investigator mailed the tape and a written narrative analysis back to each participant within a week. A journal article by House, Chassie and Spohn (1990), which provided an overview of the use of effective questioning techniques in nursing education, was included.

Part three of the intervention was a one hour seminar led by the investigator and attended by treatment group faculty at their home schools three weeks after the inservice. During this seminar the faculty critiqued their ability to use the techniques presented in the inservice and discussed any difficulties they faced implementing the strategies. The seminar with the treatment group associate degree faculty was held on October 25th. The seminar with the treatment group baccalaureate degree faculty was held on November 1st. Participants began recording the post-intervention audiotapes the week after their seminar. Faculty in the control group were told to begin recording their second set of audiotapes at this point.
Data Collection

Post-conferences were audiotaped using coded audiotapes provided by the investigator. Faculty were given written instructions for completing the audiotapes (Appendix F). Subjects were not told to tape sequential post-conferences and, as a result, all subjects did not tape sequential post-conferences. Reasons for these skipped post-conferences were not collected. An audiotape recorder was provided if a participant did not have access to one. Tapes were returned in stamped, self-addressed boxes provided by the investigator or picked up by the investigator at the participants' schools when the entire set was completed.

Each participant was asked to audiotape a total of four post-conferences before the intervention (beginning of the semester for control group faculty) and four post-conferences after the intervention (beginning in the eighth to tenth week of the semester for the control group.) The first tape in each set was not included in the analysis unless only three audiotapes were submitted or one of the other tapes was unusable. Criteria for a tape being declared unusable were that the tape was inaudible or that there was no faculty identification statement on the audiotape. Faculty were not told that only three of the tapes would be used in the analysis.

To gather background data about the specific post-conferences being recorded, the faculty participants completed a post-conference data sheet on each post-conference recorded (Appendix G). Information on the level of the student, clinical focus of the day,
and the week the post-conference fell in the semester was requested. Faculty were also asked to indicate in which week in their rotation with the student the post-conference fell. Data on the physical set-up of the room, the number of participants in the post-conference, the presence of guests, and any unusual events during the clinical day or post-conference were also collected.

Data Analysis

The cognitive levels of the questions, question responses, and statements of faculty and their students were analyzed using the TPQI developed by Davis and Tinsley (1967). This question classification system was based on Sanders (1966) adaptation of Bloom's (1956) Taxonomy. In addition to the categories of Memory (Knowledge), Translation, Interpretation, Application, Analysis, Synthesis and Evaluation, categories which reflected questions in the affective domain and classroom procedural areas were included. An inter-rater agreement of .85 (over categories) and .6 to 1.00 (by categories) was reported for this tool (Davis, Morse, Rogers, & Tinsley, 1969). Although this instrument was originally used during direct observation of teacher pupil questioning levels, its use for the analysis of audio-taped sessions is acceptable (O. L. Davis, personal communication, April 5, 1991).

The TPQI has been seen as appealing because of its ease of use (Hunkins, 1972). The tool has content validity because the definitions used for the assignment of questions and responses to
cognitive categories are drawn directly from the definitions developed by Bloom (1956) and Sanders (1966).

In addition, the TPQI allows identification of both the kind and number of questions asked, responses generated, and their sequence. Because the cognitive level of student questions and responses are also analyzed, it is possible to determine if questions designed to stimulate certain levels of cognitive functioning are actually doing so. A sample TPQI is presented in Appendix E.

Analysis of the post-conference audiotapes was carried out by the investigator. The definitions used for the analysis (Appendix H) were reviewed by two experts in the use of Bloom's taxonomy. The audiotapes were then coded in a random order. The audiotapes were not separated into early and late semester or treatment and control group until after all analyses were completed.

All faculty and student questions, answers, and statements were coded. If a faculty member used a probe to extend a student's response, that probe was coded at the same level as the initial question. If two or more students responded to a question, all responses were coded. Statements by both faculty and students which were not in direct response to a question were also coded in the response section. The guidelines for audiotape analysis are a part of Appendix H.

Intrarater reliability was determined by re-rating ten tapes and computing a Pearson correlation coefficient \( r_{xy} \) for the actual number of cognitively high level questions in each conference. The
Pearson r for the number of cognitively high level questions asked by the faculty was .94. The Pearson r for the number of cognitively high level questions asked by the students was .74.

Descriptive statistics were used to summarize the data. Medians were used as a measure of variability in addition to means because of the non-normal (non-parametric) nature of the data. The Mann-Whitney U Test was used to determine if there were significant differences between the percentages of cognitively high level questions at each point where comparisons were made.

The Mann-Whitney U, a non-parametric statistic, was appropriate for the analysis of this data because the data met the requirements that the entire sequence of scores be known, that the groups be independent samples, and that the data are at least ordinal in nature. This statistic has high power and can be used with small samples and unequal n's (Bartz, 1976; Neave & Worthington, 1988, Sawilowsky, 1990).

The Mann-Whitney U was calculated on SPSS-X release 4.1 by requesting the statistic "NPAR TESTS M-W". The p value calculated by the SPSS-X program for the Mann-Whitney U is for a two tailed test. If no prediction of the direction of the difference is made in advance, the two tailed value is appropriate. However, if the hypothesis predicts the direction of change, only one end of the sampling distribution, as discussed above, is of interest. A one tailed test statistic can be used. The p for the one tailed test
equals one half the p for the two tailed test (Neave & Worthington, 1988).

The following analyses were conducted:

1. Descriptive analysis of the post-conference environment and faculty beliefs about the development of critical thinking in nursing students.

2. Comparison of questioning patterns in the baccalaureate and associate degree groups prior to the intervention using the Mann-Whitney U Test to determine if data from the two program types could be combined during data analysis.

3. Comparison of percentages of cognitively high level questions asked by the treatment and control group faculty prior to the intervention using the Mann-Whitney U Test.

4. Comparison of percentages of cognitively high level questions asked by treatment and control group students prior to the intervention using the Mann-Whitney U Test.

5. Descriptive comparison of number and types of questions asked by faculty pre- and post-intervention.

6. Descriptive comparison of number and types of questions asked by students pre- and post-intervention.

7. Comparison of percentages of cognitively high level questions asked by faculty in the treatment and control groups after the intervention using Mann-Whitney U Test.
8. Comparison of percentages of cognitively high level questions asked by students in the treatment and control groups after the intervention using Mann-Whitney U Test.

Pilot Study

This study was piloted in the Spring of 1991 at the investigator's home school, an NLN accredited baccalaureate program. The Institutional Review Board for Human Subjects Protection in the Division of Sponsored Research at the University of Central Florida approved the pilot study protocol. Faculty gave verbal consent to participate. The six participants completed one post-conference audiotape during the first three weeks of the Spring 1991 semester. All participants then attended a three hour inservice which focused on increasing the cognitive level of the questions they asked and improving their questioning techniques. A second post-conference audiotape was recorded six weeks later.

Multiple procedural problems with the original study design were identified. Participants had little time to practice during the inservice class. Two faculty had to drop out of the pilot study because of problems in their clinical group which made it inappropriate for their post-conferences to be audiotaped. Another participant could not record one post-conference because the tape recorder malfunctioned. As a result, only two participants submitted both pre- and post-intervention audiotapes. This final sample size of two made any interpretation of the results inappropriate. And, since each participant taped only one post-conference, it was
impossible to determine if any differences seen were a reflection of normal variations in the clinical post-conferences or the result of the intervention.

As a result, several changes were made in the study protocol. The inservice class was expanded to seven hours to allow more time for practicing the techniques taught. More time was allotted for the discussion of the place of the clinical laboratory and clinical laboratory post-conference in the total learning experience of the student, and of the use of cognitively high level questions to promote critical thinking. Feedback on the analysis of an audiotape of a post-conference conducted by faculty in the treatment group and a follow-up seminar were included to provide additional practice and reinforce the content of the class. The number of audiotapes recorded at both the pre-intervention and post-intervention data collection points were increased from one to three. This gave a clearer measure of usual behavior and questioning levels.

Methodological Limitations

The major methodological limitations of this study were the convenience sample, small sample size, and use of volunteers. Because participating programs were all from the State of Florida and not selected using sampling procedures, findings from the study can not be generalized to other baccalaureate or associate degree programs.

The small sample size increased the possibility that the cognitive levels of the questions measured before and after the
intervention, and differences between the treatment and control groups, were the result of chance and not caused by the intervention. The use of volunteers was necessary because it was not appropriate to mandate participation in the study. However, this increased the likelihood of self-selection by participants in favor of faculty who were more comfortable being evaluated and/or interested in learning new clinical teaching skills.

The small sample size and the use of volunteers also made it impossible to stratify the sample to ensure that all clinical specialties were represented equally in the treatment and control groups. No schools represented in the sample had clinical rotations in progress in all clinical specialties during the semester of the study. In addition, faculty in two clinical areas (psychiatric/mental health and community health nursing) did not have group post-conferences with the students. The result was a high number of faculty in clinical laboratories which focused on acute care of adults and children or the care of the childbearing family. No participating faculty taught a clinical laboratory in community health, psychiatric-mental health, or leadership.

An additional methodological limitation resulted from the small number of cognitively high level questions asked by students in all groups. This made it possible for small, but clinically insignificant, differences in the number of questions asked by students in any one group to result in statistically significant changes. This problem is illustrated by the observation that of the
eighty-four post-conferences used in the data analysis, twenty-eight (33%) contained no high level questions asked by a student.

Several threats to internal and external validity must be acknowledged. The history of the participants, especially the possibility they had recently studied or been exposed to information on using cognitively high level questions, made it possible that their performance was not caused by the intervention. The demographic data revealed that although all but one faculty member had taken either formal or inservice courses on curriculum or teaching, the treatment group faculty had participated in a greater number.

There was also a possibility that the presence of the audiotape recorder altered faculty-student interaction. Changes occurring due to changes in the students and faculty members over the semester of the study were also possible. The control group was used to quantify the nature of any maturational change.

A final limitation was that the effectiveness of the intervention and accuracy of the data analysis was modulated by the teaching ability and accuracy of the investigator. To decrease the effect of these factors, all parts of the inservice were taught by the investigator at least once before the day of the first inservice. In addition, the investigator requested feedback on the quality of the class and the presentation. All evaluations were strongly positive (Appendix I). To increase intrarater reliability, the investigator practiced coding of the audiotapes extensively before
beginning the official analysis of the audiotapes. Final intrarater reliability figures were reported earlier.
CHAPTER IV
DATA ANALYSIS

This initial study was planned to test the effect of a program designed to increase the cognitive level of questions asked in clinical post-conferences. The data analyses presented in this chapter were based on post-conferences audiotapes submitted by participants in the study. Fourteen subjects, ten from the treatment group and four from the control group, submitted a total of 108 post-conference audiotapes. Eighty-four tapes, three from each participant at each of the two data collection points, were analyzed. Fourteen sets contained only three tapes and, in these cases, all three tapes were analyzed. The remaining sets each contained four tapes. The first tape in each set was omitted from the analyses unless one of the other tapes was unusable. Table 6 summarizes the reasons for omission of audiotapes from the analysis.

<table>
<thead>
<tr>
<th>REASON</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>First tape in a four tape set</td>
<td>9</td>
</tr>
<tr>
<td>Tape inaudible</td>
<td>4</td>
</tr>
<tr>
<td>No faculty ID on tape</td>
<td>1</td>
</tr>
</tbody>
</table>
This chapter has seven sections. The first is a descriptive analysis of faculty responses to questions about their opinions on the importance of critical thinking in nursing education. The second is a descriptive analysis of the environment of the post-conferences. The third contains descriptive statistics on the cognitive levels of questions asked by faculty and students in the pre-intervention post-conferences. The fourth establishes the equivalency of the percentage of cognitively high level questions asked by faculty and students in the baccalaureate degree and associate degree programs. The fifth and sixth sections present the data derived from the Mann-Whitney U Test on the significance of observed differences found between the percentages of cognitively high level questions asked by the faculty and students. Section seven contains supplemental analysis of the two treatment group faculty who decreased the percentage of cognitively high level questions they asked in their post-intervention post-conferences.

**Faculty Opinions About Critical Thinking**

In order to determine the degree of participant agreement that the development of critical thinking abilities is an expected outcome of nursing education programs, all participants were asked to indicate their level of agreement with three statements. A five item Likert scale (strongly agree, somewhat agree, agree, somewhat disagree, and strongly disagree) was used for participant responses.

Faculty from both baccalaureate and associate degree programs had similar responses to the first two statements. For the
statement: "The curriculum should emphasize the development of critical thinking and of progressively independent decision making" (Council for Baccalaureate and Higher Degree Programs, 1989), 13 of the 14 participants strongly agreed and 1 agreed somewhat. For the statement: "Graduates of nursing programs should possess the nursing intervention and clinical skills necessary to make clinical judgments" (American Association of Colleges of Nursing, 1986), 11 strongly agreed and 3 agreed somewhat.

For the statement: "The practice of a graduate of an Associate Degree in Nursing program is characterized by critical thinking, clinical competence, accountability, and a commitment to the value of caring" (Council for Associate Degree Programs, 1990), baccalaureate and associate degree educators responded differently. Seven of the eight associate degree educators strongly agreed and the eighth agreed somewhat. However, only one baccalaureate degree educator strongly agreed with this statement with two others agreeing somewhat. The remaining three stated they disagreed somewhat.

A full analysis of the meaning of these responses is beyond the scope of this report. These responses do indicate that all of the nursing educators participating in this study view critical thinking skills as a competency of graduates of nursing programs. However, faculty who believed that the development of critical thinking skills was an expected outcome of associate degree nursing were more likely to be associate degree educators.
Environment of Post-conferences

Data on the environment of the conferences were obtained from the post-conference data sheets submitted for 74 of the 84 audiotapes used in the analysis. Post-conference data sheets were blank or incomplete for the remaining 10 conferences.

The number of students in each conference for which a post-conference data sheet was completed, ranged from 6 to 12 with a mean of 9. Seventy of the 74 post-conferences (95%) took place immediately after a clinical laboratory experience. The remainder occurred the next day. Fifty-three (72%) of the conferences took place in rooms with chairs and a table. Twenty (27%) took place in a room with chairs. One conference occurred in a room with desks facing forward. One faculty member who used a room with chairs and a table commented that students needed to sit on the floor because of an insufficient number of chairs. In general, the number of participants in the conferences and the room arrangement were conducive to group discussion.

The clinical focus of each conference mirrored the clinical expertise of the faculty. Thirty-nine of the 84 clinical post-conferences (46%) focused on acute care of adults. Twenty-four (29%) focused on Pediatrics. Nine conferences (11%) focused on critical care, six (7%) on obstetrics, and six (7%) on Introduction to nursing.

Two associate degree faculty members in the treatment group changed clinical laboratory settings between the pre- and post-
intervention audiotaping. One moved from a clinical focusing on obstetrics to one focusing on pediatrics. The other moved from pediatrics to obstetrics. Both were educationally prepared to teach in either clinical setting but both listed their major area of clinical expertise as obstetrics. Table 7 summarizes the clinical foci of the conferences.

TABLE 7

CLINICAL FOCI OF POST-CONFERENCES

<table>
<thead>
<tr>
<th>CLINICAL FOCUS</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Care Adults</td>
<td>39</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>24</td>
</tr>
<tr>
<td>Critical Care</td>
<td>9</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>6</td>
</tr>
<tr>
<td>Introduction to Nursing</td>
<td>6</td>
</tr>
</tbody>
</table>

Conference length ranged from 10 to 65 minutes with a mean length of 38 minutes. Conferences conducted by the treatment group faculty were longer (mean of 41 minutes) than those of the control group faculty (mean of 31 minutes).

Ten of the post-conferences were not completely taped. In four cases, the students were doing individual work (e.g. evaluations, interpreting rhythm strips, taking a quiz) and no discussion would have occurred. In two cases, the tape recorder was not on during the entire post-conference. It is possible some student-faculty interactions were not recorded during these conferences.
In four cases, all from one control group faculty member, the reason given for incomplete taping of the post-conferences was that student presentations were not recorded. All other faculty appeared to have included student presentations on the audiotapes. This faculty member had one of the shortest mean conference lengths (15 minutes). The consistent omission of student presentations would seem to account for this. Examination of the raw data from the audiotapes of the conferences which contained student presentations indicated that these presentations usually accounted for very few question-response exchanges. Therefore, it is unlikely the omission of the student presentations from those four tapes altered the proportion of cognitively high level questions asked by that faculty member. Table 8 summarizes the reasons why entire post-conferences were not taped.

**Table 8**

**Reasons Why Entire Post-Conference Was Not Taped**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Presentation</td>
<td>4</td>
</tr>
<tr>
<td>Students Completing Evaluations</td>
<td>2</td>
</tr>
<tr>
<td>Forgot to turn on recorder</td>
<td>1</td>
</tr>
<tr>
<td>Quiz in post-conference</td>
<td>1</td>
</tr>
<tr>
<td>Practice with rhythm strips</td>
<td>1</td>
</tr>
<tr>
<td>Forgot to turn tape over</td>
<td>1</td>
</tr>
</tbody>
</table>
The faculty reported 15 events which they believed made the clinical day on which a post-conference was recorded unique. Eight of these reflected usual events in the clinical laboratory such as the first day on a unit (five reports), the last day on the unit (two reports) and harried staff (one report). Three faculty reported that a student participated in a code during the clinical day, and two reported problems with their post-conference room. There were single reports of a student needle stick and staff anxiety caused by layoffs at the agency. The codes, harried staff, needle stick incident, and staff layoffs were discussed during the post-conferences associated with the clinical day they occurred.

In summary, the majority of the conferences were conducted in an environment in which the number of participants in attendance and the room arrangement promoted discussion. The focus of the clinical laboratory experience associated with the conference was one in which the faculty member had expertise. There was a difference in the length of the post-conferences recorded by faculty in the treatment and control groups with the treatment group conferences being longer.

**Numbers and Types of Questions Asked**

Audiotapes were analyzed using the Teacher Pupil Questioning Inventory (TPQI) (Davis & Tinsley, 1967). Each faculty and student question was coded according to its cognitive level. Questions reflecting the affective domain or procedural issues were identified but not included in the analysis. The TPQI is presented in Appendix E and definitions used for each category are provided in Appendix I.
Table 9 summarizes the number and percentages of questions at each cognitive level asked by faculty at the pre-intervention data collection point. This table reflects the ranges, medians and means of the total number of questions asked in the three pre-intervention post-conferences of all participants (treatment and control groups). Percentages for each of the categories based on the total number of questions asked is also given. Over 77% of faculty questions were at the interpretation level or below. Faculty asked 13.1% application questions, 4.3% analysis questions, and 5.3% evaluation questions. No questions were asked at the synthesis level. The absence of synthesis questions will be discussed in Chapter V.

**TABLE 9**

**NUMBER AND PERCENTAGE OF QUESTIONS ASKED AT EACH COGNITIVE LEVEL BY ALL FACULTY PARTICIPANTS BEFORE THE INTERVENTION (TOTAL OF THREE POST-CONFERENCES)**

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>NUMBER</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RANGE</td>
<td>MEDIAN</td>
</tr>
<tr>
<td>Memory</td>
<td>30 - 73</td>
<td>51.5</td>
</tr>
<tr>
<td>Translation</td>
<td>0 - 1</td>
<td>0.0</td>
</tr>
<tr>
<td>Interpretation</td>
<td>1 - 15</td>
<td>6.0</td>
</tr>
<tr>
<td>Application</td>
<td>0 - 43</td>
<td>9.0</td>
</tr>
<tr>
<td>Analysis</td>
<td>0 - 11</td>
<td>2.0</td>
</tr>
<tr>
<td>Synthesis</td>
<td>0 - 0</td>
<td>0.0</td>
</tr>
<tr>
<td>Evaluation</td>
<td>0 - 8</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Table 10 summarizes the number and percentages of questions at each cognitive level asked by students at the pre-intervention data collection point. This table reflects the ranges, medians and means of the total number of questions asked by students in the three
pre-intervention post-conferences (treatment and control groups). Percentages for each of the categories based on the total number of questions asked is also given. Students asked 87.3% questions which were coded at the interpretation level or below. Students asked 6.9% application questions, 5.1% analysis questions, and 0.8% evaluation questions. No student questions were at the synthesis level. The absence of student synthesis questions will also be discussed in Chapter V.

**TABLE 10**

NUMBER AND PERCENTAGE OF QUESTIONS ASKED AT EACH COGNITIVE LEVEL BY ALL STUDENTS BEFORE THE INTERVENTION
(TOTAL OF THREE POST-CONFERENCES)

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>RANGE</th>
<th>NUMBER</th>
<th>MEDIAN</th>
<th>MEAN</th>
<th>RANGE</th>
<th>PERCENT</th>
<th>MEDIAN</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td>10 - 57</td>
<td>34.0</td>
<td>33.9</td>
<td>53.1 - 90.9</td>
<td>76.2</td>
<td>74.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Translation</td>
<td>0 - 0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0 - 0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpretation</td>
<td>1 - 11</td>
<td>4.0</td>
<td>5.6</td>
<td>4.7 - 22.2</td>
<td>16.5</td>
<td>12.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>0 - 8</td>
<td>3.0</td>
<td>3.5</td>
<td>0.0 - 13.0</td>
<td>6.5</td>
<td>6.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis</td>
<td>0 - 4</td>
<td>1.0</td>
<td>1.9</td>
<td>0.0 - 15.4</td>
<td>3.5</td>
<td>5.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesis</td>
<td>0 - 0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0 - 0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>0 - 2</td>
<td>0.0</td>
<td>0.3</td>
<td>0.0 - 4.3</td>
<td>0.0</td>
<td>0.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The number of questions asked by each faculty member at the cognitive levels of knowledge, translation and comprehension were tallied to give a single number for the category "Low Cognitive Level." Questions reflecting the cognitive levels of application, analysis, synthesis and evaluation were tallied to give a single number for the category "High Cognitive Level." The percentage of cognitively high level questions was calculated by dividing the
number of high level questions by the total number of questions categorized as either high or low level. These percentage figures were used for data analyses. Figure 2 depicts the distribution of the percentages of cognitively high level questions asked by faculty in the treatment and control groups before and after the intervention. Table 11 summarizes this data for the faculty in the treatment and control groups before and after the intervention. Because the Mann-Whitney U Test is based on the relative ranking of the data, the rank for each faculty participant before and after the intervention is included in Table 11.

**Pre-intervention**

```
0 0 0
X XX XX X X
0% 30% 60%
```

**Post-intervention**

```
X X X XXXX X X
X = Treatment Group
O = Control Group
```

Figure 2. Pre- and Post-Intervention Distribution of Percentage of Cognitively High Level Questions Asked by Faculty
### TABLE 11

PERCENTAGE (AND RANK) OF COGNITIVELY HIGH LEVEL QUESTIONS ASKED BY FACULTY BEFORE AND AFTER THE INTERVENTION

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>PROGRAM TYPE</th>
<th>GROUP</th>
<th>PRE-INTERVENTION</th>
<th>POST-INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>% HIGH LEVEL QUESTIONS</td>
<td>% HIGH LEVEL QUESTIONS</td>
</tr>
<tr>
<td>007</td>
<td>Bacc</td>
<td>E</td>
<td>10.2 2</td>
<td>30.8 10</td>
</tr>
<tr>
<td>013</td>
<td>Bacc</td>
<td>E</td>
<td>43.7 14</td>
<td>38.7 13</td>
</tr>
<tr>
<td>015</td>
<td>Bacc</td>
<td>E</td>
<td>16.5 6</td>
<td>26.7 7</td>
</tr>
<tr>
<td>016</td>
<td>Bacc</td>
<td>E</td>
<td>30.9 11</td>
<td>32.9 11</td>
</tr>
<tr>
<td>001</td>
<td>AD</td>
<td>E</td>
<td>13.5 4</td>
<td>30.4 9</td>
</tr>
<tr>
<td>002</td>
<td>AD</td>
<td>E</td>
<td>20.7 8</td>
<td>52.2 14</td>
</tr>
<tr>
<td>004</td>
<td>AD</td>
<td>E</td>
<td>12.1 3</td>
<td>30.3 8</td>
</tr>
<tr>
<td>010</td>
<td>AD</td>
<td>E</td>
<td>18.0 7</td>
<td>18.3 4</td>
</tr>
<tr>
<td>011</td>
<td>AD</td>
<td>E</td>
<td>32.9 12</td>
<td>11.8 3</td>
</tr>
<tr>
<td>014</td>
<td>AD</td>
<td>E</td>
<td>15.4 5</td>
<td>34.0 12</td>
</tr>
<tr>
<td>003</td>
<td>Bacc</td>
<td>C</td>
<td>42.9 13</td>
<td>26.1 6</td>
</tr>
<tr>
<td>005</td>
<td>Bacc</td>
<td>C</td>
<td>26.8 9</td>
<td>22.2 5</td>
</tr>
<tr>
<td>006</td>
<td>AD</td>
<td>C</td>
<td>4.7 1</td>
<td>11.6 2</td>
</tr>
<tr>
<td>012</td>
<td>AD</td>
<td>C</td>
<td>29.8 10</td>
<td>11.5 1</td>
</tr>
</tbody>
</table>

Bacc - Baccalaureate Degree Program    AD - Associate Degree Program
E - Treatment Group Member           C - Control Group Member

The same procedure was used for determining the percentage of cognitively low and cognitively high level questions asked by students. Table 12 summarizes this data for the students in the treatment and control groups before and after the intervention. Because the Mann-Whitney U Test is based on the relative ranking of the data, the rank for each student group before and after the intervention is included in Table 12.
### TABLE 12
PERCENTAGE (AND RANK) OF COGNITIVELY HIGH LEVEL QUESTIONS ASKED BY STUDENTS BEFORE AND AFTER THE INTERVENTION

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>PROGRAM TYPE</th>
<th>GROUP</th>
<th>PRE-INTERVENTION</th>
<th>POST-INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>% HIGH LEVEL QUESTIONS</td>
<td>% HIGH LEVEL QUESTIONS</td>
</tr>
<tr>
<td>007</td>
<td>Bacc</td>
<td>E</td>
<td>1.8</td>
<td>9.4</td>
</tr>
<tr>
<td>013</td>
<td>Bacc</td>
<td>E</td>
<td>25.5</td>
<td>13.9</td>
</tr>
<tr>
<td>015</td>
<td>Bacc</td>
<td>E</td>
<td>8.2</td>
<td>6.7</td>
</tr>
<tr>
<td>016</td>
<td>Bacc</td>
<td>E</td>
<td>14.0</td>
<td>6.8</td>
</tr>
<tr>
<td>001</td>
<td>AD</td>
<td>E</td>
<td>7.0</td>
<td>0.0</td>
</tr>
<tr>
<td>002</td>
<td>AD</td>
<td>E</td>
<td>20.0</td>
<td>20.0</td>
</tr>
<tr>
<td>004</td>
<td>AD</td>
<td>E</td>
<td>14.5</td>
<td>15.6</td>
</tr>
<tr>
<td>010</td>
<td>AD</td>
<td>E</td>
<td>5.0</td>
<td>4.8</td>
</tr>
<tr>
<td>011</td>
<td>AD</td>
<td>E</td>
<td>15.2</td>
<td>16.7</td>
</tr>
<tr>
<td>014</td>
<td>AD</td>
<td>E</td>
<td>11.0</td>
<td>3.1</td>
</tr>
<tr>
<td>003</td>
<td>Bacc</td>
<td>C</td>
<td>19.6</td>
<td>22.5</td>
</tr>
<tr>
<td>005</td>
<td>Bacc</td>
<td>C</td>
<td>12.5</td>
<td>4.0</td>
</tr>
<tr>
<td>006</td>
<td>AD</td>
<td>C</td>
<td>8.7</td>
<td>4.0</td>
</tr>
<tr>
<td>012</td>
<td>AD</td>
<td>C</td>
<td>15.4</td>
<td>31.0</td>
</tr>
</tbody>
</table>

Bacc - Baccalaureate Degree Program  AD - Associate Degree Program  
E - Treatment Group  C - Control Group

**Equivalency of Programs**

**Faculty**

In order to determine if the data from the baccalaureate degree and associate degree faculty could be combined, the percentages of cognitively high level questions asked by faculty in each group before the intervention were compared. The descriptive data indicated the baccalaureate degree faculty asked a higher percentage of cognitively high level questions than associate degree faculty before the intervention.
For the six baccalaureate degree program faculty, the median percentage of cognitively high level questions asked was 28.85% with a mean of 28.50%. Median percentage of cognitively high level questions asked by the eight associate degree program faculty was 16.70% with a mean of 18.39%. The median percentage was 12.15 percentage points higher for the baccalaureate degree faculty than for the associate degree faculty. The mean percentage was 10.11 percentage points higher for the baccalaureate degree program faculty than the associate degree program faculty. These data are presented in Table 13.

**TABLE 13**

DESCRIPTIVE COMPARISON OF PERCENTAGE OF COGNITIVELY HIGH LEVEL QUESTIONS ASKED BY BACCALAUREATE AND ASSOCIATE DEGREE FACULTY BEFORE THE INTERVENTION

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>MEDIAN</th>
<th>MEAN</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baccalaureate</td>
<td>6</td>
<td>28.85</td>
<td>28.50</td>
<td>12.42</td>
</tr>
<tr>
<td>Associate</td>
<td>8</td>
<td>16.70</td>
<td>18.39</td>
<td>8.70</td>
</tr>
</tbody>
</table>

The Mann-Whitney U was calculated to determine if these differences could be the result of random variation. No statistically significant difference was found between the baccalaureate and associate degree faculty's percentage of cognitively high level questions asked before the intervention (U = 14 with p = .2284). The difference observed between the two groups before the intervention probably occurred as a result of random
chance. Data from faculty in the two program types were combined within the treatment and control groups for all subsequent analyses.

Students

To determine if the data from the baccalaureate and associate degree students could be combined, the percentages of cognitively high level questions asked by students in each group before the intervention were compared. The descriptive data indicated the students from the baccalaureate degree groups asked a higher percentage of cognitively high level questions than students from the associate degree groups before the intervention.

For the six baccalaureate degree program student groups, the median percentage of cognitively high level questions asked was 13.25% with a mean of 13.60%. The median percentage of cognitively high level questions asked by the eight associate degree program student groups was 12.75% with a mean of 12.10% percent. The median percentage was 0.50 percentage points higher for the baccalaureate degree student groups than for the associate degree student groups. The mean percentage was 1.50 percentage points higher for the baccalaureate degree student groups than the associate degree student groups. These data are presented in Table 14.
TABLE 14

DESCRIPTIVE COMPARISON OF PERCENTAGE OF COGNITIVELY HIGH LEVEL QUESTIONS ASKED BY BACCALAUREATE AND ASSOCIATE DEGREE STUDENTS BEFORE THE INTERVENTION

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>MEDIAN</th>
<th>MEAN</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baccalaureate</td>
<td>6</td>
<td>13.25</td>
<td>13.60</td>
<td>7.61</td>
</tr>
<tr>
<td>Associate</td>
<td>8</td>
<td>12.75</td>
<td>12.10</td>
<td>4.72</td>
</tr>
</tbody>
</table>

The Mann-Whitney U was calculated to determine if these differences were the result of random variation or due to some difference between the groups. No statistically significant difference was found between the baccalaureate degree and the associate degree student groups' percentages of cognitively high level questions asked before the intervention (U = 23 with p = .9497). The difference between the two groups before the intervention probably occurred as a result of random chance. Data from students in the two program types were combined within the treatment and control groups for all subsequent analyses.

Faculty Questioning

Hypothesis 1 stated that:

Nursing faculty who participate in a program designed to increase the cognitive level of their questions will ask a higher percentage of cognitively high level questions in clinical post-conference when compared with faculty who did not attend such a program.
The descriptive data indicated that the control group faculty asked a higher percentage of cognitively high level questions than treatment group faculty before the intervention. For the 10 treatment group faculty, the median percentage of cognitively high level questions asked was 17.25% with a mean of 21.39%. Median percentage of cognitively high level questions asked by the four control group faculty was 28.30% with a mean of 26.05%. The median percentage was 11.05 percentage points lower for the treatment group faculty than for the control group faculty before the intervention. The mean percentage was 4.66 percentage points lower for the treatment group faculty than the control group faculty. These data are presented in Table 15.

**TABLE 15**

PERCENTAGE OF COGNITIVELY HIGH LEVEL QUESTIONS ASKED BY FACULTY BEFORE AND AFTER THE INTERVENTION

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>PRE-INTERVENTION</th>
<th>POST-INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MEDIAN</td>
<td>MEAN</td>
</tr>
<tr>
<td>Treatment</td>
<td>10</td>
<td>17.25</td>
<td>21.39</td>
</tr>
<tr>
<td>Control</td>
<td>4</td>
<td>28.30</td>
<td>26.05</td>
</tr>
</tbody>
</table>

The Mann-Whitney U was calculated to determine if these differences were the result of random variation or due to some difference between the groups. No statistically significant difference was found between the treatment group faculty and the control group faculty's percentage of cognitively high level questions asked.
questions asked before the intervention (U = 17 with p = .7333). The difference between the two groups before the intervention probably occurred as a result of random chance.

The descriptive data indicated the treatment group faculty asked a higher percentage of cognitively high level questions than control group faculty after the intervention. For the ten treatment group faculty, the median percentage of cognitively high level questions asked was 30.60% with a mean of 30.61%. Median percentage of cognitively high level questions asked by the four control group faculty was 16.90% with a mean of 17.85%. The median percentage was 13.7 percentage points higher for the treatment group faculty than for the control group faculty after the intervention. The mean percentage was 12.76 percentage points higher for the treatment group program faculty than the control group program faculty. In addition, the treatment group faculty increased their percentage of cognitively high level questions asked when compared to their pre-intervention percentage while the control group faculty decreased their percentage of high level questions. These data are included in Table 15.

The Mann-Whitney U was calculated to determine if these differences were the result of random variation or due to some difference between the groups. A statistically significant difference was found between the treatment group faculty and the control group faculty's percentage of cognitively high level questions asked after the intervention. The U was found to be equal
to 4 with a two tailed p of 0.024. Since the hypothesis was directional, this figure was halved, resulting in a p of 0.012. There was a statistically significant difference in the percentage of cognitively high level questions asked by members of the treatment and control groups after the intervention. Hypothesis 1 was accepted.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>PRE-INTERVENTION</th>
<th>POST-INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>10</td>
<td>12.60 ± 6.78</td>
<td>9.10 ± 6.22</td>
</tr>
<tr>
<td>Control</td>
<td>10</td>
<td>9.99 ± 5.95</td>
<td>13.25 ± 11.77</td>
</tr>
</tbody>
</table>

**Student Questioning**

Hypothesis 2 stated that:

Students of nursing faculty who participate in a program designed to increase the cognitive level of their questions will ask a higher percentage of cognitively high level questions during clinical post-conference when compared with students of faculty who did not attend such a program.

The descriptive data indicated the control group students asked a slightly higher percentage of cognitively high level questions than treatment group students before the intervention. For the 10 treatment student groups, the median percentage of cognitively high level questions asked was 12.50% with a mean of 12.22%. Median percentage of cognitively high level questions asked by the four control student groups was 13.95% with a mean of 14.05%. The median percentage was 1.45 percentage points lower for the treatment student groups than for the control student groups before the intervention. The mean percentage was 1.83 percentage points lower for the
treatment student groups than the control student groups. These data are presented in Table 16.

**TABLE 16**

PERCENTAGE OF COGNITIVELY HIGH LEVEL QUESTIONS ASKED BY STUDENTS BEFORE AND AFTER THE INTERVENTION

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>PRE-INTERVENTION</th>
<th></th>
<th>POST-INTERVENTION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MEDIAN</td>
<td>MEAN</td>
<td>SD</td>
<td>MEDIAN</td>
</tr>
<tr>
<td>Treatment</td>
<td>10</td>
<td>12.50</td>
<td>12.22</td>
<td>6.78</td>
<td>8.10</td>
</tr>
<tr>
<td>Control</td>
<td>4</td>
<td>13.95</td>
<td>14.05</td>
<td>3.99</td>
<td>13.25</td>
</tr>
</tbody>
</table>

The Mann-Whitney was calculated to determine if these differences were the result of random variation or due to some difference between the groups. No statistically significant difference was found between the treatment and control student groups' percentages of cognitively high level questions asked before the intervention (U = 15 with p = .5395). The difference between the two groups before the intervention probably occurred as a result of random chance.

The descriptive data indicated the control group students asked an even higher percentage of cognitively high level questions than treatment group students after the intervention. The percentage of cognitively high level questions asked by the treatment group students dropped from the pre-intervention analysis and the percentage for the control group students increased.
For the 10 treatment student groups, the median percentage of cognitively high level questions asked was 8.10% with a mean of 9.70%. Median percentage of cognitively high level questions asked by the four control student groups was 13.25% with a mean of 15.38%. The median percentage was 5.15 percentage points lower for the treatment student groups than for the control student groups after the intervention. The mean percentage was 5.68 percentage points lower for the treatment student group than the control student group. These data are included in Table 16.

The Mann-Whitney U was calculated to determine if these differences were the result of random variation or due to some difference between the groups. No statistically significant difference was found between the treatment and control student groups percentage of cognitively high level questions asked after the intervention (U=16 with p = .6354). The difference between the two groups after the intervention probably occurred as a result of random chance. Although a lower p value might be expected due to the increase in the range between the percentages of high level questions asked by students in the treatment and control groups, this did not occur. When the data from the individual groups presented in Table 12 were examined it was found that the control group contained the two highest values. These values had a large effect on the mean but no effect on the rankings. Hypothesis II was not supported.
Supplemental Analysis

The percentage of cognitively high level questions asked by two members of the treatment group decreased after the intervention. The raw data from the analysis of their audiotapes were further examined.

Subject 013 asked 43.7% cognitively high level questions before the intervention. This figure was well above the mean percentage of 21.4% for the treatment group before the intervention. The percentage of cognitively high level questions asked by this faculty member after the intervention fell to 38.7% but was still higher than the treatment mean after the intervention. Since the percentages of cognitive level of questions asked by this subject were always high, it is possible that what was measured was normal variation in questioning patterns.

Subject 011 also decreased the percentage of cognitively high level questions asked over the course of the study. When this subject's individual tapes were examined, two observations were made. First, this subject's post-conference discussions often focused on detailed examination of client response to illness and the nursing and medical care implemented. While some of this discussion fell into the application, analysis and evaluation categories, most of the questions were at the memory/recall level. If the difficulty of the memory questions was rated, many would have been scored as very difficult. A number of the specific questions were excellent examples of how to help students recall knowledge in specific client
situations. However, there was limited application of this knowledge to the planning and evaluation of nursing care.

Second, subject 011 had one post-conference in the post-intervention set of audiotapes during which the only activity was a test review based on content covered in class. To check if this single tape caused the low percentage of post-intervention cognitively high level questions, the percentage of cognitively high level questions was recalculated using only the two remaining audiotapes. The percentage of cognitively high level questions increased from 11.76% to 19.67%, but the percentage remained below the subject's pre-intervention level of 32.9%. The reason for this decrease was unclear.

**Conclusion**

Faculty participating in this initial study viewed critical thinking ability as an expected outcome of nursing education. Associate degree educators were more likely to believe that critical thinking was an outcome of associate degree education. The post-conferences used in the analyses were conducted in an environment which was conducive to group discussion. Length ranged from 10 to 68 minutes with treatment group post-conferences longer than control group post-conferences.

Questions asked before the intervention were predominately at low cognitive levels. Before the intervention, 77.2% of the faculty questions were at the interpretation level or below. For students,
87.3% were at the interpretation level or below. No synthesis questions were asked by faculty or students at any point.

The data analyses indicated that Hypothesis 1 can be supported. Faculty who attended a program designed to increase the cognitive level of their questions asked more cognitively high level questions in clinical post-conference than faculty who did not complete such a program. This finding was significant at the p = .012 level.

Hypothesis 2 was not supported. There was no significant difference in the percentage of cognitively high level questions asked by students of faculty who attended the intervention program when compared with students of faculty who did not attend the program. The descriptive data indicated that students of faculty in the treatment groups actually decreased their percentage of cognitively high level questions after their faculty attended the intervention program.

Hypothesis 1 stated that:

Nursing faculty who participate in a program designed to increase the cognitive level of their questions will ask a higher percentage of cognitively high level questions in clinical post-conference when compared with faculty who did not attend such a program.

Prior to the intervention, faculty in the control group asked more cognitively high level questions than faculty in the treatment...
CHAPTER V
DISCUSSION AND RECOMMENDATIONS

This initial study assessed the effect of one program designed to increase the cognitive level of faculty questions. The direct effect of the program on the cognitive level of faculty questions and the indirect effect on the cognitive level of student questions were used as outcome measures. This chapter presents discussions of each hypothesis, compares study findings with prior research, and discusses additional observations made during data analysis. Suggestions for the design of research about clinical laboratory education and recommendations for further research are presented.

Discussion

Hypothesis 1

Hypothesis 1 stated that:

Nursing faculty who participate in a program designed to increase the cognitive level of their questions will ask a higher percentage of cognitively high level questions in clinical post-conference when compared with faculty who did not attend such a program.

Prior to the intervention, faculty in the control group asked more cognitively high level questions than faculty in the treatment
group. However, this difference was not statistically significant.

After faculty in the treatment group participated in an intervention designed to help them increase the cognitive level of their questions, their percentage of cognitively high level questions increased. The percentage of cognitively high level questions asked by treatment group faculty was also higher than that of the control group. The difference was statistically significant (p = .012). Hypothesis 1 was accepted.

Eight of the ten faculty in the treatment group increased the cognitive level of their questions. In five cases, this increase was 15 percentage points or more. Three of the four members of the control group decreased their percentages of cognitively high level questions.

In addition to the intervention, several factors may have contributed to the increase in the percentage of cognitively high level questions asked by the treatment group faculty. One factor may have been a difference in the level of commitment of treatment group faculty which caused them to pay more attention to the quality of their post-conferences. At the time they signed the consent, they committed themselves to a full day inservice, the follow-up audiotape, and a seminar, in addition to the study audiotapes. Their level of commitment was further manifested by the fact that no members of the treatment group dropped from the study. The longer average length of their conferences may have been a further
indication of their commitment and desire to record "good" post-conferences.

The differences in results could also be attributed to the high level of interaction between treatment group members and the investigator during the intervention program. However, this treatment effect is expected in an intervention where person-to-person interaction is a part of the design. In addition, treatment group faculty knew that questioning was being studied after the intervention inservice was presented.

The percentage of cognitively high level questions asked by two members of the treatment group decreased after the intervention. Supplemental analysis indicated that the percentage of cognitively high level questions asked by one subject was consistently higher than the post-intervention percentage for the treatment group. No reason for the drop in the percentage of cognitively high level questions for the second subject could be determined.

Limited analysis of changes in the percentage of cognitively high level questions in the control group was possible because of the small sample (n=4). Overall, the percentage of cognitively high level questions asked by faculty in this group decreased from 26.1% to 17.9%. Three of the four control group faculty decreased their individual percentages. This drop may reflect a normal decrease in cognitive level of questions asked over the course of a semester.
Hypothesis 2

Hypothesis 2 stated that:

Students of nursing faculty who participate in a program designed to increase the cognitive level of their questions will ask a higher percentage of cognitively high level questions during clinical post-conference when compared with students of faculty who did not attend such a program.

Prior to the intervention, students in the treatment group asked less cognitively high level questions than students in the control group. This difference was not statistically significant. After treatment group faculty participated in an intervention designed to help them increase the cognitive level of their questions, the percentage of cognitively high level questions asked by students in their clinical groups dropped. However, the difference between percentages of cognitively high level questions asked by students in the treatment and control groups was still not statistically significant. Hypothesis 2 was not supported.

Several factors may have contributed to this finding. First, although systems theory states that a change in one part of the system (faculty) should result in a change in another part of the system (students) it does not predict the direction of that change. As the faculty increased the cognitive level of their questions, this many have decreased the students' ability or opportunity to ask questions. As the faculty asked more cognitively high level
questions, they may have asked questions the students would normally have asked. The faculty may also have become more controlling as they attempted to use the questioning strategies taught in the program. In addition, the time between the intervention and the post-intervention analysis may not have been long enough for the student-faculty system to undergo reorganization and a return to a new stable state.

Change theory suggests that new procedures must be learned, refrozen, and then actively supported if they are to be maintained. While the faculty were integrating the skill into their repertoire of teaching strategies, they may not have been able to encourage similar questioning from their students. Since the study design did not include a direct intervention with the students, it was necessary for the students to observe the faculty modeling the new questioning behaviors in order to learn them. This may not have been a sufficiently powerful event to cause a change in the time allowed.

As adult learners, the students needed to see the value of learning to ask cognitively high level questions and feel safe asking them. Students may have needed to unlearn patterns of interactions they had used throughout their educational careers. Dillon (1988) suggested that there are rules of talk in the classroom which every student learns. One of these is that the teacher controls all talk and another is that the only person who asks questions is the teacher. These rules also dictate that students do not ask challenging or analytical questions (Dillon, 1988). If students had
internalized these rules, they needed to challenge and then discard them before they could ask higher level questions. If faculty can be taught to increase the cognitive level of the questions they ask, as this study indicates is possible, changes in student questioning behavior may become evident one to two semesters later.

Comparison with Other Research

The percentage of cognitively high level questions asked in clinical post-conferences has clearly risen above the 8.1% level found in Scholdra and Quiring's 1973 study. The data presented in this study demonstrated that, for the faculty members studied, the percentage of cognitively high level questions (application and above) asked by all participants before the intervention was 22.72%. After the intervention, the percentage of cognitively high level questions rose to 30.61% for members of the treatment group while decreasing to 13.9% for members of the control group.

The results of the current study are similar to those obtained by Craig and Page (1981) for faculty participants. Prior to their intervention, the faculty subjects asked 19.1% cognitively high level questions. Following the completion of a self-instructional module on the classification and design of questions at all levels of Bloom's taxonomy, faculty in their treatment group asked 35.1% cognitively high level questions in comparison to the 20.3% asked by the control group. Five of the six members of their treatment group increased their individual percentages of cognitively high level
questions while only four of the eight members of their control group made such a change.

Craig and Page (1981) reported that less than 1% of the students' questions were cognitively high level prior to the intervention. After the intervention, students of faculty in the treatment group asked no cognitively high level questions and the percentage for students of faculty in the control group remained at 1%. The current study found that 12.8% of the students' questions were cognitively high level prior to the intervention. After the intervention, students of faculty in the treatment group asked fewer cognitively high level questions (9.7%) while the percentage for students of faculty in the control group increased to 15.4%.

Malcomson (1990) reported a significant increase in the percentage of cognitively high level questions among members of a treatment group who used a self-instructional module on the design and use of questions at all levels of Bloom's taxonomy of cognitive objectives. The percentages of cognitively high level questions asked by members of the treatment and control groups both before and after the intervention were higher than those reported by Craig and Page (1981) or this study. The percentage of cognitively high level questions asked by treatment group faculty was 39.3% and the percentage asked by the control group faculty was 41.7% before the intervention. These percentages increased to 49.5% for the treatment group and decreased to 41.5% for the control group faculty after the intervention. Students in all groups asked 56.1% cognitively high
level questions prior to the intervention. This percentage increased to 64.2% for the treatment group and decreased to 52.7% for the control group after the intervention. Malcomsom suggested that the high cognitive level of student questions may have been caused by the relative scarcity of student questions, and student interest in asking questions about the care they have just implemented.

The higher percentage of cognitively high level questions asked by participants in the Malcomsom study could have been caused by three differences in study design. First, the Malcomsom intervention focused entirely on questioning. This may have made participants use questioning as a teaching strategy even if not otherwise appropriate for the post-conference. In fact, Malcomsom noted what was called cognitive-affective discord in some of the pre- and post-intervention audiotapes. There were at least three instances when students asked affective domain questions which were redirected into the cognitive domain by the faculty. Malcomsom suggested that the faculty may have been trying to ask cognitive questions for the sake of the study. Second, members of the treatment and control groups were draw from the same school and were aware of other study participants. This could have caused contamination of the data. Finally, the description of the study given to the faculty before the start of data collection stated that:

although the level of objectives for post-clinical conferences are at the highest level of Bloom's taxonomy, faculty questioning is primarily at the lowest levels. The purpose of this study is to test the effectiveness of a Faculty Development Program, designed by the researcher, to increase the level of faculty questioning (Malcomson, 1990, p. 211).
In addition, both the faculty and student consents said the purpose of the study was to "test the effectiveness of a faculty development program on the level of faculty questioning in post clinical conferences" (Malcomson, 1990, p. 214). Telling the participants the desired outcome before the start of the study may have skewed the results.

Conclusions

This initial study supported prior research on the promotion of the use of cognitively high level questions in that it documented the effectiveness of a specific faculty development program designed to change the percentage of cognitively high level questions asked in clinical post-conferences. In addition, the data collected for this study indicated that while faculty are capable of including cognitively high level questions in their post-conferences, most did not do so before they were actively encouraged, or taught, to do so.

At the beginning of the study, there was no statistically significant difference in the percentage of cognitively high level questions asked by faculty or students in the treatment and control groups. Following faculty participation in an intervention which included lecture, discussion, practice of questioning techniques, and feedback on subsequent performance, treatment group faculty asked a significantly greater percentage of cognitively high level questions (p = .012) when compared with control group faculty. There was no difference in the percentage of cognitively high level questions between treatment and control group students after the intervention.
Because of the limited number of subjects in this sample and the lack of random selection of study sites and participants, results cannot be generalized beyond the study subjects. However, due to the similarity between the study sites, faculty, and students, and the sites, faculty, and students in other nursing programs, the findings can provide direction for future research and program development in the use of questioning in clinical laboratory post-conferences.

Additional Observations

Several additional observations were made in the course of the data analysis. These included observations on the effect of the audiotaping, the presence of a guest at a conference, and the timing of the conference in relation to the number of weeks the faculty had been with a student group. The absence of synthesis questions, the scarcity of evaluation questions, and the usefulness of the TPQI will also be discussed.

Effect of Audiotaping on Post-conferences

Only anecdotal data were collected on the effect of audiotaping on the environment of the post-conference. Faculty expressed some discomfort in being recorded and stated that they felt that students occasionally limited discussion due to the presence of the recorder. However, they reported that this behavior decreased as the study progressed. One subject commented that it was very inconvenient to bring a tape recorder to the clinical laboratory since everything needed for the clinical day normally fit in the pockets of a lab
coat. Students occasionally directed comments to the tape recorder or the researcher, but these events were rare. On one audiotape, a student expressed fear of the tape recorder because of a negative association with depositions taped during divorce proceedings. However, after saying this, the student went on to present an excellent analysis of a client care problem and the solution she had implemented.

Effect of a Guest on a Post-conference

Only one conference had a guest in attendance. In this case, the program director participated in the clinical laboratory to help a student who was having difficulty and stayed for the conference. The conference was longer than average for the faculty member (60 minutes instead of 32) and the percentage of cognitively high level questions for that single conference was 22.2% although the percentage for that faculty member's tapes at that point averaged only 11.54%.

This observation has implications for both research and faculty evaluation. It supports the suggestion that sessions in which an outsider is present (such as occurs with a study where the researcher does direct classroom observations) will be different from the norm (Croll, 1986). And, if the presence of a potential evaluator, even in a non-evaluation role, can alter a faculty member's performance, the likelihood that faculty performance during a planned evaluation session would be usual is open to question.
Effect of Time of Faculty Members with Students on Questioning Level

Six of the ten faculty members in the treatment group and two of the four members of the control group taught different student groups at the time of the pre- and post-intervention audiotaping. As a result, although all faculty recorded the first set of audiotapes during the first three to four weeks they were with a student group, some also recorded the second set during the first few weeks of their rotation with a group of students. Data were collected on the post-conference data sheet about the number of weeks each faculty member was with a student group in order to see if this was an important variable related to the cognitive level of questions asked.

The number of faculty working with students at each point in their rotation was too small to do a detailed analysis. However, several observations were made. Faculty asked and answered more procedural questions (not a part of this study) in the first few days with a student group. Since these questions were not used in the data analysis, they did not effect the percentage of cognitively high level questions asked in any conference. However, they did take up time which could have been used for discussion about clinical topics. The students seemed to draw on learning from early in the semester and prior clinical experiences during the post-conferences. When the faculty member had been with the student group all semester, they were able to participate more fully in those discussions.

Differences in the dynamics between faculty and students were also noted in some instances where the faculty changed student
groups. In one case, a treatment group faculty member seemed to have more control in the second group of the semester. This may have contributed to the increased percentage of cognitively high level questions asked by this subject on the post-intervention audiotapes.

Lack of Synthesis and Scarcity of Evaluation Questions

There were no synthesis questions asked by the faculty or students in this sample. This differed from Malcomsom's (1990) finding of 6.7% questions at the synthesis level from the faculty and 11.4% from the students before the intervention.

The absence of questions categorized as synthesis may have been the result of the use of a very rigid definition of synthesis:

- Respondent puts together elements and parts to form a whole.
- Solves a problem that requires original, creative thinking.
- Includes production of a unique communication, plan, set of operations or derivation of a set of abstract relations (Bloom, 1956; Hunkins, 1972; Sanders, 1966)

Simple application of the nursing process to plan care without the use of a high degree of creativity would not be sufficient for a question to be coded at the synthesis level.

A low number of synthesis questions from students (but not their complete absence) is to be expected because students are at the novice stage of professional development described by Benner (1984). Students first need to learn and follow rules which describe and predict care. They manifest this process through the asking of questions at the lower cognitive levels.

However, the omission of synthesis questions by faculty should be of concern. In order to help students seek solutions beyond the
obvious, some synthesis questions must be asked. Even if the students can not answer at a level beyond application, the asking of synthesis questions should help them see alternatives beyond those in use. The development of synthesis questions needs to receive greater emphasis in faculty development programs.

A scarcity of evaluation questions, from both faculty and students, was also noted. This is of concern because of the importance of evaluation in the nursing process. During the post-conferences analyzed, the nursing care given or planned was described and the reasons behind the care were analyzed but the questions, "Did it work" and "How will you know it worked" were asked with relative rarity, especially in relation to the number of application questions. In the few role playing sessions recorded, there was little evaluation of the effectiveness of the interventions demonstrated and non-therapeutic interactions were neither identified nor critiqued.

When the use of evaluation questions was discussed with faculty during the inservice class, they offered several reasons why they were not used. One is that the faculty just forgot to ask evaluation questions. Another reason was that the students do not see the clients long enough to tell if interventions were effective. Faculty also verbalized a reluctance to critique, or have students critique, their nursing care in a public forum like a post-conference. Some faculty felt that they did a lot of their evaluation discussion in pre-conferences. Pre-conferences were not included in the study.
These issues must be addressed if students are to become comfortable with the evaluation process. More evaluation questions can be asked. Faculty who attended the program did increase their use of evaluation questions. This indicates that increasing faculty awareness of their use of evaluation questions can increase their number.

The scarcity of opportunities for students to care for a client long enough to evaluate effectiveness of care was evident on the audiotapes. Often this was caused by rapid client turnover. However, another major cause was the faculty practice of moving students from setting to setting within an agency. This caused the student's assignment to change from week to week, or day to day, even when the client they were working with remained at the agency. While the practice of moving students increases the breadth of the students' experience, its effect on the depth of the experience, and its impact on the students' ability to evaluate client response, must be considered. The effect of more stable assignments should be investigated.

Usefulness of TPQI

The TPQI (Davis & Tinsley, 1967), the tool used for analysis of the audiotapes, allowed adequate documentation of the cognitive level of the questions asked by both faculty and students. However, although there are differences between translation and interpretation questions identified by this tool, they are small enough that the two categories could be reduced to the category of comprehension used by
Bloom (1956). The TPQI did not allow clear differentiation between responses to questions, and statements made not in response to questions. This was not an issue in this study because responses were not analyzed. If they were to be included, a tool such as Flanders Interaction Analysis Categories (Croll, 1986; Flanders, 1979) might be a better choice. Such a tool would also document faculty teaching, an activity which dominated the faculty statements in some conferences.

Recommendations

Design of Research on Clinical Teaching

The audiotapes used for data collection provided a great deal of data on the process of post-conferences, only a portion of which was analyzed for this study. Audiotapes can be used more extensively for faculty development, faculty self-evaluation, and research on faculty/student interactions. Because faculty reported that the recorders can be cumbersome, small, light recorders which could be easily carried should be used where possible. The added expense of a recorder which picks up low voices would also facilitate recording discussions where some participants speak softly.

Student resistance to being recorded (a factor which caused the loss of one control group) may be decreased by the researcher meeting with the students prior to the start of the study. Students in the clinical groups recorded for this study also seemed to believe that
the tapes were being used for evaluation despite faculty telling them that was not the case.

Instructions on which conferences to tape and when to turn on the recorder should be explicit. During this study, faculty were told to record the entire post-conference from the time of their arrival. Some faculty took this instruction literally and started the recorder before the conference actually started. Instructions on which conferences to tape and what to do if a conference can not be taped should be clearly communicated to the study subjects to prevent faculty skipping conferences.

Self-instructional modules, computer assisted instruction, and formal inservice classes have all been documented as being effective methods to teach faculty to ask more cognitively high level questions. Faculty should be encouraged to seek out the methodology which best fits their learning style. Since synthesis and evaluation questions are not asked frequently, they should be emphasized in these programs. In addition, since students have not been shown to improve as a result of these programs, other methodologies to help them ask better questions, including presentation of the programs directly to the students, should be considered.
Suggestions for Future Research

Based on the results of this initial study, the following suggestions for future research are made:

1. Replication of this study with a larger, randomly selected sample.

2. Replication of the study with the focus on student responses to faculty questioning.

3. Case study research examining interaction patterns of faculty or students who demonstrate an ability to ask a high percentage of cognitively high level questions.

4. Longitudinal research which evaluates student performance after exposure to faculty who ask cognitively high level questions.

5. Descriptive research on the structure, process, and questioning patterns of clinical conferences, including pre- and post-conferences.

6. Correlational research examining faculty questioning patterns and their relationship to factors such as the:
   - Clinical focus of the conference
   - Week in the semester and number of weeks the faculty member has been with the student group
   - Level of education of the student
   - Experience of the faculty member as clinician and as faculty member
   - Development of critical thinking in students.
REFERENCES


Tlessen, J. C. (1983). The contribution of selected variables to the critical thinking abilities of students enrolled in a four year baccalaureate accredited program in nursing. Dissertation Abstracts International 44, 3592A.


APPENDIX A

Consents
Consent Form: Control Group Faculty

Study Title: Interaction Patterns in Post-Clinical Conferences

Investigator: Diane M. Wink RNC, MA, MSN

Ms. Diane Wink is a doctoral candidate at the University of Central Florida, College of Education. She is studying the interaction patterns of faculty and students during post-conferences following clinical laboratory experiences. She believes this study will provide insight into the usual patterns of interactions and that analysis of these interactions could provide data which may help nursing faculty improve the effectiveness of their interactions with students.

I understand that I will be audio-taped during post-conferences and that these audio-tapes will undergo analysis by the investigator and at least one other evaluator. My voice, as the clinical instructor, will be distinguished from those of the students by the use of a brief introductory paragraph which I will read onto the beginning of each tape. However, all tapes will be coded to ensure my anonymity. I realize that if I agree to participate in this study, I will need to complete a demographic data form, tape designated post-conferences, complete a Post-Conference Data sheet for each conference recorded, and send the tapes and data forms to the investigator via postage paid envelopes.

I know that my participation in this study is strictly voluntary. I know that I have the right to withdraw at any time. If I have any questions about the study or about being a subject, I may call Ms. Wink, collect, at XXX-XXX-XXXX.

I agree to participate in this study, and I have received a copy of this consent form. I have been assured that my identity will not be revealed at any time.

_________________________  ___________________________
Date  Subject’s Signature

_________________________
Investigator’s Signature
Consent Form: Treatment Group Faculty

Study Title: Interaction Patterns in Post-Clinical Conferences

Investigator: Diane M. Wink RNC, MA, MSN

Ms. Diane Wink is a doctoral candidate at the University of Central Florida, College of Education. She is studying the interaction patterns of faculty and students during post-conferences following clinical laboratory experiences. She believes this study will provide insight into the usual patterns of interactions and that analysis of these interactions could provide data which may help nursing faculty improve the effectiveness of their interactions with students.

I understand that I will be audio-taped during post-conferences and that these audio-tapes will undergo analysis by the investigator and at least one other evaluator. My voice, as the clinical instructor, will be distinguished from those of the students by the use of a brief introductory paragraph which I will read onto the beginning of each tape. However, all tapes will be coded to ensure my anonymity. I realize that if I agree to participate in this study, I will need to complete a demographic data form, tape designated post-conferences, complete a Post-Conference Data sheet for each conference recorded, and send the tapes and data forms to the investigator via postage paid envelopes.

In addition, I agree to participate in a one day workshop during early Fall of 1991 and a one hour follow-up seminar later in the semester. The topic of the workshop and seminar will be techniques to develop more effective faculty-student interaction during clinical post-conferences.

I know that my participation in this study is strictly voluntary. I know that I have the right to withdraw at any time. If I have any questions about the study or about being a subject, I may call Ms. Wink, collect, at XXX-XXX-XXXX.

I agree to participate in this study, and I have received a copy of this consent form. I have been assured that my identity will not be revealed at any time.

___________________________    ____________________________
Date                                 Subject's Signature

__________________________
Investigator's Signature
APPENDIX B

Faculty Demographic Data Form
Participant Demographic Data for Student/Faculty Interaction Study

In order to describe the faculty participants in the faculty/student interaction study, information about selected demographic variables is needed. I would appreciate it if you could provide the following information. When you have completed this form, please mail it immediately in the attached stamped, self-addressed envelope.

Thank you. Diane M. Wink

**Identification Number:** (Used to associate faculty subjects with specific audiotapes)

### Professional Work Experience

**Current Position:** Please check applicable item in each column.

<table>
<thead>
<tr>
<th>Academic Rank</th>
<th>Tenure Status</th>
<th>Full or Part Time</th>
</tr>
</thead>
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<td>Instructor</td>
<td>Tenured</td>
<td>Full time</td>
</tr>
<tr>
<td>Assistant Professor</td>
<td>Tenure earning</td>
<td>Part time</td>
</tr>
<tr>
<td>Associate Professor</td>
<td>Visiting</td>
<td></td>
</tr>
<tr>
<td>Professor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total number of years you have worked part or full time in Clinical Practice: ___ years

Total number of years you have worked part or full time in Nursing Administration: ___ years

Total number of years you have worked full or part time in Nursing: Education: ___ years

**Note:** Some of your work as an educator could have been simultaneous with your work in clinical practice or nursing administration.

What is (are) your area(s) of clinical expertise?

Are you currently teaching clinically in one of these areas?

Yes ___ No ___

If NO, how many semesters have you taught in the clinical area to which you are now assigned? ___ semesters

Have you taught (clinically or in lecture) members of your current clinical group before this semester?

Yes ___ No ___
Are you currently presenting any lectures attended by your current clinical group?

Yes ___   No ___

Educational Background:

Are you currently enrolled in a formal degree granting program?
Yes: _____   No: _____

If YES: Degree sought: _____   Major: _________________

Clinical focus: _____   Functional focus: _____

Please check all of the following programs you have completed. For advanced degrees, indicate your major and your clinical and functional focus.

Diploma in nursing ___
Associate Degree in Nursing ___
Bachelors Degree in Nursing ___
Bachelors Degree, non nursing ___   Major: _________________

Masters Degree in Nursing ___   Clin. Focus: _______

Functional Focus: ______

Masters Degree, non nursing ___   Major: _________________

Educational Specialist ___   Focus: _________________

EdD, nursing ___   Clin. Focus: _______

Functional Focus: ______

EdD, non nursing ___   Focus: _________________

PhD, nursing ___   Clin. Focus: _______

Functional Focus: ______

PhD, non nursing ___   Focus: _________________
Have you taken or taught courses in any of the following areas? Please place an asterisk next to any which were taken/taught in an inservice format of two hours or less:

<table>
<thead>
<tr>
<th>Course</th>
<th>Taken</th>
<th>Taught</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum Theory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Teaching Strategies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation of Student Clinical Performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Teaching Practicum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student/Faculty Interaction Techniques (communication, use of questions etc.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Personal Data:**

Your Age: ____

Year of initial licensure as a registered nurse: ____

Racial/ethnic background

Please check the group to which you belong:

- Native American: ____
- Asian or Pacific Islander: ____
- Hispanic: ____
- Black (non hispanic): ____
- White (non hispanic): ____
The following three statements relating to the development of critical thinking were drawn from publications on nursing education. For each statement, indicate if you strongly agree, somewhat agree, agree, somewhat disagree, or strongly disagree.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Somewhat Agree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The curriculum should emphasize the development of critical thinking and of progressive independent decision making.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduates of nursing programs should possess the nursing intervention and clinical skills necessary to make clinical judgments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The practice of a graduate of an Associate Degree in Nursing program is characterized by critical thinking, clinical competence, accountability, and a commitment to the value of caring.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thank you for taking the time to complete this demographic data form.

Please return demographic data form in the attached envelope.

Diane M. Wink
APPENDIX C

Student Demographic Data Forms
Baccalaureate Degree Program Demographic Data
for Student/Faculty Interaction Study

Fall 1991

School Name: ________________________________

1. Number of Nursing majors enrolled: Total Juniors Seniors
   (This is the number of students actively taking clinical courses. Do not include students taking nursing courses prior to admission to the major or students not currently active in the program.)

2. Among the above students, how many are RN --> BSN Students?

3. What was the average GPA for nursing majors prior to Fall 1991 term: All Students 1st year 2nd year

4. What is the average age of the students currently in the nursing major?

5. What is the age range for this group of students?
   ___ years to ___ years

6. On enrollment in your program, how many of the above students had already earned any of the following degrees?
   1st year 2nd year
   Associate Degree Nursing ___ ___
   Diploma in Nursing ___ ___
   Bachelor's Degree ___ ___
   Master's Degree ___ ___
   Doctorate ___ ___

Thank you.
Diane M. Wink
1. Number of Nursing majors enrolled: (This is the number of students actively taking clinical courses. Do not include students taking nursing courses prior to admission to the major or students not currently active in the program.)

Total 1st year 2nd year

2. Among the above students, how many are LPN --> RN Students?

3. What was the average GPA for nursing majors prior to Fall 1991 term:

4. What is the average age of the students currently in the nursing major?

5. What is the age range for this group of students?

___ years to ___ years

6. On enrollment in your program, how many of the above students had already earned any of the following degrees?

1st year 2nd year

AD

AA

Bachelor's Degree

Master's Degree

Thank you.
Diane M. Wink
APPENDIX D

Objectives and Content for Intervention Inservice Class
FACULTY/STUDENT INTERACTION STUDY
Promoting Faculty-Student Interaction in Clinical Post-Conference Through the Use of Cognitively High Level Questions

Objectives

During this program, the participants will:

1. Discuss their goals and objectives for the clinical laboratory experience.
2. Discuss their goals and objectives for the clinical laboratory post-conference.
3. Explore how the clinical laboratory and the clinical laboratory post-conference can be used to promote the development of critical thinking abilities in nursing students.
4. Examine research on student/faculty interaction in the clinical laboratory and clinical laboratory post-conference.
5. Explore personal use of questions in the clinical laboratory.
6. State both positive and negative effects of the use of questions in a learning situation.
7. Review the classification of questions according to Bloom's taxonomy.
8. Classify questions used by self and peers according to Bloom's taxonomy of cognitive objectives.
9. Analyze the dynamics of the use of questions in a learning situation.
10. Discuss how questions can be used to facilitate critical thinking in nursing students.
11. Explore personal reactions to change in approach to student/faculty interaction in the clinical laboratory and the clinical laboratory post-conference.
12. Practice the use of specific questioning strategies believed to increase the depth and scope of student critical thinking in the clinical laboratory and clinical laboratory post-conference.

Program Outline

9:00 - 9:15 Introduction
9:15 - 10:15 The Clinical Laboratory
10:15 - 10:30 Break
10:45 - 10:45 The Clinical Laboratory (cont.)
10:45 - 12:30 Questioning
12:30 - 1:15 Lunch
1:15 - 2:30 Dynamics of Questioning
2:00 - 2:30 Practice Session
2:30 - 2:45 Break
2:45 - 3:45 Questioning in the Clinical Laboratory
3:45 - 4:00 Closure and Evaluation

Opportunities to practice the use of the techniques discussed will be integrated throughout the day.
Participants earning seven contact hours will participate in program as outlined.
Participants earning ten contact hours will participate in program as outlined and complete nine post-conference audiotapes and attend a one hour follow up seminar in three weeks.
FACULTY/STUDENT INTERACTION STUDY
Promoting Faculty-Student Interaction in Clinical Post-Conference Through the Use of Cognitively High Level Questions

Content Outline

I. Introduction: Student/Faculty Interaction in the Clinical Laboratory and the Clinical Laboratory post-conference.

II. The Clinical Laboratory Experience
   A. Placement of Clinical Laboratory within total nursing curriculum
   B. Definition of Clinical Laboratory
   C. Goals of the Clinical Laboratory
   D. Some thoughts about Student/Faculty Interaction in the Clinical Laboratory
   E. Interaction patterns in the clinical laboratory
   F. Clinical conferences

III. Faculty/Student interactions to increase student critical thinking ability
   A. Critical Thinking Defined
   B. Desired results of use of critical thinking abilities by professional nurses
   C. Process of critical thinking in clinical settings

IV. Questioning
   A. Definition
   B. Goals of questioning
   C. Positive aspects of questions
   D. Negative aspects of questions
   E. Research on questioning
   F. Classification of Questions
      1. Positive aspects of classification systems
      2. Negative points of classification systems
      3. Classification systems
   G. Dynamics of questioning
      1. The Question's Environment
      2. The Question's Source
      3. The Question's Construction
      4. The Question's Delivery
      5. The Question's Response
   H. Planning for Questioning in the Clinical Laboratory
   I. Practice of Questioning Techniques
APPENDIX E

Sample Teacher Pupil Questioning Inventory
(T.P.Q.I.)
Teacher Pupil Questioning Inventory Rating Form

| Tape Number: _____ | Date: _______
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. MEMORY</td>
<td>4. APPLICATION</td>
</tr>
<tr>
<td>2. TRANSLATION</td>
<td>5. ANALYSIS</td>
</tr>
<tr>
<td>3. INTERPRETATION</td>
<td>6. SYNTHESIS</td>
</tr>
</tbody>
</table>

Teacher Q

R

Student Q

R

Teacher Q

R

Student Q

R

Teacher Q

R

Student Q

R

Q - Question  R - Response
APPENDIX F

Instructions for Audiotaping Post-conferences
Instructions for
Recording Post-Conferences for Faculty/Student Interaction Study

1. Only post-clinical conferences are to be taped.

2. Each tape is 90 minutes long, 45 minutes per side.

3. A new tape is to be used for each post-conference.

4. Complete a "Post-Conference Background Data" sheet for each tape.

5. Before beginning post-conference, turn on tape recorder and allow to run for 5 seconds before reading the following statement aloud:

   This is a post-conference being recorded for Diane Wink, a doctoral candidate at the University of Central Florida. The date of this conference is _____________. The purpose of this brief statement is to allow the individuals doing analysis of this tape to discriminate my, the faculty member's, voice from that of the students.

6. Rewind the tape and play back the above statement to verify proper operation. Allow tape to play for 5 seconds after completion of statement and then stop tape but do not rewind.

7. Start recording at beginning of post-conference.

8. You do not need to rewind the tape at the end of the post-conference.

9. When all four post-conferences are completed, place in box provided with the four completed "Post-Conference Background Data" sheets, seal box, apply tape provided, and mail.

Suggestions:
   a. Record the identifying statement before the time of the post conference.

   b. Assign a student to monitor the tape recorder and turn the tape over if the conference lasts longer than 45 minutes.

If you have any questions, please call the investigator, Diane Wink, at XXX-XXX-xxxx.

Thank You
APPENDIX G

Post-conference Background Data Sheet
Post-Conference Background Data for Faculty-Student Interaction Study
Baccalaureate Degree Programs

SERIAL NUMBER FROM LABEL ON TAPE USED: __________________

Date of post-conference: ______________

Level of Student:
Junior, generic 1st sem. _______ Senior, generic 1st sem. _______
Junior, generic 2nd sem. _______ Senior, generic 2nd sem. _______
Junior, generic 3rd sem. _______ RN → BSN student ______
Level of RN → BSN ______________

Note: If the group has both generic and RN → BSN students, check
the appropriate generic line and place a star next to the check.

Course Name: _______________________

Focus of Clinical Laboratory associated with this post-conference:
Health Promotion: _________ Adult Acute Care: _________
Critical Care: ____________ Community Health: ____________
Family Nursing (OB): ________ Family Nursing (Peds): _______
Psych/Mental Health: ________ Introductory Concepts: _______
Other (please state): __________________________

Week this clinical falls in semester for students: Week ___ of ___ weeks.

If same faculty not with student the whole semester, which week of your rotation with this group
is this? Week ___ of ___ weeks.

Timing of post-conference in relationship to clinical laboratory experience:
Immediately after _______________ The next day _______________

Will this student group attend over one post-conference this week?
Yes _____ No ______
If yes, will you (did you) conduct the other conference? Yes ___ No ___

Will you conduct (did you conduct) a post-conference with another group of
students this week? Yes _____ No ______

Are there any pre-planned objectives for this clinical week/day/conference?
Yes _____ No ____ If yes, state briefly on back or attach copy.
Number of students in post-conference: _____  Number of guests: _____
Identify (i.e. CNS, staff nurse, social worker) ____________________

Room Arrangement:
Table with chairs __________ Chairs only ________________
Desks, facing front ________ Other _______________________
Desks arranged by participants: __________

Was there anything exceptional about the clinical day which you feel may impact this conference?
(i.e. death of a client, first day on unit)

Was entire post-conference taped from time the faculty member arrived?
Yes ___  No ___ If no, state reason: Failure of tape recorder: _____
Forgot to turn on tape: ______
Other (describe): __________
Post-Conference Background Data for Faculty-Student Interaction Study
Associate Degree Programs

SERIAL NUMBER FROM LABEL ON TAPE USED: ______________________

Date of post-conference: ______________________

Level of Students:
Generic 1st sem. ______ Generic 4th sem. ________
Generic 2nd sem. ______ Generic 5th sem. ________
Generic 3rd sem. ______ LPN → RN student ________

Level of LPN → RN ______

Note: If the group has both generic and LPN → RN students, check the appropriate generic line and place a star next to the check.

Course Name: ______________________

Focus of Clinical Laboratory associated with this post-conference:
Health Promotion: ________ Adult Acute Care: ________
Critical Care: ________ Introductory Concepts: ________
Family Nursing (OB): ________ Family Nursing (Peds): ________
Psych/Mental Health: ________ Other (please state): ________

Week this clinical falls in semester for students: Week ___ of ___ weeks.

If same faculty not with student the whole semester, which week of your rotation with this group is this? Week ___ of ___ weeks.

Timing of post-conference in relationship to clinical laboratory experience:
Immediately after ____________ The next day ____________
The next week ____________

Will this student group attend over one post-conference this week? Yes ___ No ___
If yes, will you (did you) conduct the other conference? Yes ___ No ___

Will you conduct (did you conduct) a post-conference with another group of students this week? Yes ___ No ___

Are there any pre-planned objectives for this clinical week/day/conference? Yes ___ No ___ If yes, state briefly on back or attach copy.

Number of students in post-conference: _____ Number of guests: ______
Identify (i.e. CNS, staff nurse, social worker) ______________________
Room Arrangement:
- Table with chairs
- Chairs only
- Desks, facing front
- Other
- Desks arranged by participants:

Was there anything exceptional about the clinical day which you feel may impact this conference? (i.e. death of a client, first day on unit)

Was entire post-conference taped from time the faculty member arrived?
- Yes  
- No  

If no, state reason:
- Failure of tape recorder:
- Forgot to turn on tape:
- Other (describe):
APPENDIX H

Instructions for Audiotape Analysis
GUIDELINES FOR RATING OF AUDIOTAPES

1. For each tape:
   - Place tape number on each sheet used
   - Listen to and rate the whole tape including side 2
   - Rate each question, each response and each statement by teacher and students
   - Staple all sheets for one tape together
   - Double check to be sure the correct tape number is on each sheet
   - Maintain confidentiality for the faculty, students and any clients who are mentioned on the tape.

2. The cognitive level of each question is indicated by placing the number of the level heard on the line marked "Q" using the following code:
   - 1. Memory
   - 2. Translation
   - 3. Interpretation
   - 4. Application
   - 5. Analysis
   - 6. Synthesis
   - 7. Evaluation

3. The cognitive level of all responses to questions and the cognitive level of all other statements are indicated by placing the appropriate code number from the list above on the line marked "R".

4. Rate each question, answer and statement at one cognitive level, regardless of length. If more than one cognitive level is demonstrated in a question, answer or statement, rate it at the highest level heard.

5. Rate responses or statements at the level they demonstrate not the level of the question they follow.

6. Questions, responses and statements which reflect the affective domain should be indicated with the number 8.

7. Questions, responses and statements which are concerned with classroom procedures should be indicated with the number 9.

8. Do not consider the appropriateness of a question or the accuracy of an answer or statement when doing the rating.

9. Not all questions are in question form. Listen for the question mark at the end of the sentence and rate accordingly.

10. Do not rate random verbiage such as "Wow", "Yes!", "Ooh".

11. Brief faculty echoing of student verbiage should not be rated.
12. Rank probes the same as the original question.

13. For a pre-prepared student presentation, rate the presentation as memory. The presentation should be rated only once regardless of length. Any additional interactions (for example questions asked by other students or the faculty member during the presentation) are rated in the usual way. When the student starts up the presentation again, do not put down another "1".

14. For a verbal quiz, rate each question using the usual criteria. Each response should also be rated as usual. This applies to both student and faculty generated questions. (Note: The response may come from a student or the faculty member.)

15. If a student simply talks about what happened in a day, it is rated as memory (1).

16. Any teaching done by the teacher is rated as (1) Memory on the "R" line unless there is clearly some higher cognitive level to the statements. These higher levels are most common during detailed faculty demonstrated problem solving of specific client situations. Remember, the teacher is drawing on memory for most statements.

17. If a student restates something heard or read elsewhere, this is usually translation (2).

18. Questions asking the student to state nursing diagnosis, goals or interventions for a specific client can be rated as application. If nursing diagnosis, goals, or interventions are provided in the response, they can be rated as application (4).

19. A request to role play will usually be an application question. Rate the response of the student taking on the role of the nurse according to the cognitive level demonstrated. In most cases this will also be application.

20. To be an evaluation response (7), some rationale for the judgment must be stated. Simple one or two word responses ("Yes", "No", "Great", "It was terrible") are rated as affective (8).

21. If one student expands on the answer of another, rate that response/statement separately.

22. For any unintelligible parts put in several question marks and begin rating at the next point you can hear.
23. Questions, answers and statements about how to complete course requirements (i.e. how to complete course paperwork, when to go to an observation) are procedural (9).

24. Questions, answers and statements which relate to the profession of nursing (i.e. nursing care, the nursing role, or issues faced in practice) are rated according to the cognitive level demonstrated.

Definitions for Each Cognitive Level

Knowledge (Memory): The respondent recalls or recognizes information.
Knowledge of specifics, ways and means of dealing with specifics, knowledge and universals in the field
Sample: What is the normal body temperature?

Translation: The respondent changes information into a different symbolic form or language.
Sample: Your patient has post-ictal confusion. What does that mean in your own words?

Interpretation: The respondent knows what is being communicated and can make use of the material or idea without necessarily relating it to other material or seeing its fullest implications. The respondent states relationships among facts, generalizations, definitions, values and skills.
Sample: How is the common cold like the flu?

Application: The one questioned solves a realistic problem. The respondent uses abstractions in concrete situations and solves a lifelike problem that requires the identification of the issue and the selection and use of appropriate generalizations and skills.
Sample: How will you teach Mr. Cole to take his medicine on time?

Analysis: The respondent breaks down a communication into its constituent parts. Explores or solves a problem in the light of the conscious knowledge of the parts and forms of the problem. Includes analysis of elements, relationships and organization principles.
Sample: How does Mr. Miller's family structure influence his response to his stroke?
**Synthesis:** The respondent puts together elements and parts to form a whole. Solves a problem that requires original, creative thinking. Includes production of a unique communication, plan, set of operations or derivation of a set of abstract relations.

Sample: How will you increase the immunization rate for children in Orange county?

**Evaluation:** The respondent makes a judgment of good or bad, right or wrong, according to explicit criteria he designates based on internal or external evidence.

Sample: As you worked with John and his family, which of your nursing diagnoses were not validated?

**Affective:** The one questioned responds with a statement of feeling, emotion or opinion without a standard of appraisal.

Sample: How did you feel when you cared for Mrs. Smith?

**Procedural:** The question relates to classroom organization, student behavior or instructional management.

Sample: When is our written care plan due?

(Bloom, 1956; Hunkins, 1972; Sanders, 1966)
APPENDIX I

Intervention Inservice Class Evaluation
Promoting Student-Faculty Interaction Through the Use of Cognitively High Level Questions  
October 4, 1991  
Repeated October 11, 1991  
Program Evaluation

Please evaluate this conference based on your judgment of how well each objective was met. TOTAL NUMBER OF PARTICIPANTS: 15 *

<table>
<thead>
<tr>
<th></th>
<th>Met Fully</th>
<th>Met Well</th>
<th>Met Part.</th>
<th>Not Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Discuss goals and objectives for the clinical laboratory experience</td>
<td>14</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Discuss goals and objectives for the clinical laboratory post-conference</td>
<td>13</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Explore how the clinical laboratory and the clinical laboratory post-conference can be used to promote development of critical thinking abilities in nursing students</td>
<td>13</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Examine research on student/faculty interactions in the clinical laboratory and clinical laboratory post-conference</td>
<td>13</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Explore personal use of questions in the clinical laboratory</td>
<td>13</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. State both positive and negative effects of the use of questions in a learning situation</td>
<td>14</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(* The total number of participants exceeds the number of treatment group subjects because five additional faculty attended the inservice.)
### Program Evaluation (Continued)

<table>
<thead>
<tr>
<th></th>
<th>Met Fully</th>
<th>Met Well</th>
<th>Met Part.</th>
<th>Not Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Review classification of questions according to Bloom’s taxonomy</td>
<td>15</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Classify questions used by self and peers according to Bloom’s taxonomy</td>
<td>14</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Analyze the dynamics of the use of questions in a learning situation</td>
<td>13</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Discuss how questions can be used to facilitate critical thinking in nursing students</td>
<td>15</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Explore personal reactions to change in approach to student/faculty interaction</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12. Practice use of specific questioning strategies</td>
<td>12</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

#### Suggestions for improving program:

- More time to practice always appreciated
- Hard to add anything
- More time if anything
- Program long but all pieces fit

Excellent presentation
This was a great day
Wonderful role model
Would be difficult to leave any part out