THE UNIVERSITY OF CALGARY

THE INFLUENCE OF LOCUS OF CONTROL ON THE PROBLEM-SOLVING ABILITIES OF STUDENT NURSES

by

Maureen Joan Peszat

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF MASTER OF SCIENCE

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

CALGARY, ALBERTA

DECEMBER, 1987

ISBN 0-315-42446-X

THE UNIVERSITY OF CALGARY

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled, "The Influence of Locus of Control on the Problem-Solving Abilities of Student Nurses" submitted by Maureen Joan Peszat in partial fulfillment of the requirements for the degree of Master of Science.

Supervisor, Dr. J. Hritzuk
Department of Educational Psychology

Dr. W.R. Unruh
Department of Educational Psychology

G.D. Labercane
Department of Curriculum and Instruction

(Date) Dec 10/82

ABSTRACT

The purpose of this study was to explore the influence of locus of control on the problem-solving abilities of student nurses in a simulated clinical setting.

The sample consisted of 40 senior nursing students enrolled in a college nursing programme. Rotter's I-E Scale was used to discriminate the internals from the externals using a median split of the scores. A computer-simulated nursing problem was used to examine the problem-solving ability of student nurses. Indices of competency, proficiency, efficiency, errors of commission, and errors of omission were calculated within the computer programme based on options and choices made by the students.

The findings of the study suggest that locus of control did not significantly influence the problem-solving ability of nurses in the clinical area in the composite indices of proficiency, efficiency, competency, and errors of omission and commission. However, in the discrimination aspect of choosing high priority items, the option of "Pain" was significant ($p<.039$). The option "Hydration" approached significance ($p<.065$). The similarity of the errors of commission and omission suggests a common deficit in the problem-solving skills of both internally and externally oriented students.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION AND STATEMENT OF PROBLEM

Nursing has been influenced by social forces and political structure throughout its history. From its unstructured beginning in ancient times to the structured educational form of today, nursing has reflected the growth and turbulence of society (Frank, 1959).

Many changes occurred in the practice of nursing during the 1960's. The most significant changes were the restructuring of nursing programmes in location and content. Programmes were moved from hospital affiliation to college independence. Accompanying this change in location, the length of the programmes decreased from three years to two years. The introduction of the nursing process, a problem-solving approach to nursing practice, also occurred at this time. These changes have altered the orientation of nursing practice from a procedural and functional nature to one of problem solving. The changes have also produced a level of dissatisfaction with the graduates of the programmes by their employers.

The competency of graduate nurses is a concern amongst employers (A.H.A., 1978; Bolin & Hogle, 1984; Field et al., 1984; A.A.R.N. Manpower Study, 1980; Rouleau, 1980). Products of the two-year college programmes, the new graduates, are the targets of this censure (Armstrong, 1974; Morgan, 1978; Steed, 1974). The controversy centers on the limited amount of clinical experience and the strong emphasis on theory in the college curricula (Armstrong, 1974; Hammerstad, 1977; Nursing Manpower, 1980). The concern of employers regarding the

graduate nurse's competencies can be directly related to problem-solving ability which is the basis of clinical practice (Bergman, 1974; Kubrick, 1963; Mussalem, 1964; Task Force, 1975). However, the level of competency achieved in solving a problem rests on many factors. Research in nursing and other applied fields suggests that college grades bear little relationship to a measure of later accomplishments (Bolin & Hogle, 1984; Olson, 1977). Schwirian (1977), in a national United States survey of success in nursing practice stated:

> ... subjects relevant to health and illness is the sine qua non for really good clinical performance. But it is eminently clear, that there is 'something else' that differentiates levels of nursing care -- probably many 'something else's'. (p. 10)

One trait which has been related to performance in problem-solving situations is locus of control (Duke & Norwicki, 1974; Lefcourt, 1976; Rotter, Liverant, & Crowne, 1961; Wareheim, 1972; Williams & Stark, 1973).

The Problem

Since the advent of two-year nursing programmes, criticism regarding the clinical nursing performance of new graduates, that is, the ability to problem solve in the clinical area, has been leveled by employers. This criticism obliges nurse educators to conclude that successful completion of licensure examinations by nursing students does not guarantee a satisfactory level of performance in the clinical area. Student performance in the clinical area is related to problem-solving ability. Problem-solving ability is used as a measure of clinical performance. Locus of control has been associated with performance in problem-solving situations. Therefore, the focus of this study is to

determine if locus of control is related to the clinical nursing performance of senior nursing students in the clinical area.

Importance of the Problem

The improvement of the level of competency of graduating nurses has implications for the total health system. The system is composed of the client, the employer, the educator, and the employee, specifically the graduate nurse. The client will benefit in two ways: first, a higher quality of nursing care and secondly, better utilization of the health care dollar. The employer, health agencies, will save budget dollars in terms of orientation time of new graduates that is, the ability to give complete nursing care more quickly. Lastly, nurse educators could assess the student at a pre-entry point and adjust the clinical teaching for the students in terms of their locus of control orientation, thus presumably improving their performance.

Definition of Terms

1. A college nursing program is a two-year course of study within a community college.
2. A college nursing student is a person who is currently registered in a college programme which leads to eligibility for licensure as a registered nurse in Canada.
3. Nursing process is a problem-solving process consisting of assessment, planning, implementation, and evaluation of a patient problem.
4. Competency is the composite of proficiency and efficiency. It represents the problem-solving effectiveness of the student nurse in a nursing simulated problem (McGuire et al., 1976).

5. Proficiency is the product of problem solving. It represents the discrimination and thoroughness of the problem solving process of the student nurse in a nursing simulated problem (McGuire et al., 1976).
6. Efficiency is the process of problem solving. It represents the decision making and actions taken by the student nurse in a nursing simulated problem (McGuire et al., 1976).
7. Errors of omission are choices not made by the student nurse that are considered important by the experts (McGuire et al., 1976).
8. Errors of commission are choices made by the student nurse that are considered harmful by the experts (McGuire et al., 1976).
9. Internal control is "the perception of positive and/or negative events as being a consequence of one's own actions and thereby under personal control" (Rotter et al., 1962, p. 499).
10. External control is "the perception of positive and/or negative events as being unrelated to one's own behaviors in certain situations and therefore beyond personal control" (Rotter et al., 1962, p. 499).

CHAPTER II

LITERATURE REVIEW

The purpose of this section is to review the literature that is pertinent to the areas of locus of control and problem solving in the clinical performance of student nurses.

Locus of Control

Rotter (1966) isolated a belief system, locus of control, which is derived from his theory of social learning. Social learning theory was constructed by Rotter (1972) based on four concepts: freedom of movement, need potential, need value, and the psychological situation. Freedom of movement refers to one's expectancy of a reward for certain behaviors while need value focuses on the importance and types of rewards. The probability of a given behavior occurring again relates to need potential. The psychological situation involves all past and present perceptions of the individual which account for individuality and variability of responses to stimuli.

> In social learning theory, a reinforcement acts to strengthen an <u>expectancy</u> that a particular behavior or event will be followed by reinforcement in the future. Once an expectancy for such a behavior-reinforcement sequence is built up the failure of the reinforcement to occur will reduce or extinguish the expectancy. (p. 2)

The locus of control construct is based on the degree to which a person believes that her actions can influence her outcome in life. An internal orientated person believes her behavior to be decisive in determining her fate. An external orientated person believes her behavior to be less decisive in this respect with causation related to

chance, luck, or other people. This influence supercedes any effects due to her own actions.

Rotter (1966) believes that in addition to specific beliefs about personal control over outcomes, there is a generalized expectancy of internal versus external locus of control. These generalized beliefs exert their greatest influence when put into novel or unfamiliar situations about which specific beliefs are likely to be weak or uncertain. For example, the internal tends to assume that her behavior will be the dominant factor in the grades she receives. The external, by contrast, will be impressed by the instructor and the patient assignments upon which the grade is based.

Although a literature review did not reveal studies directly related to the question posed in this study, several studies were cited which provide insight into the problem. Phares (1957) tested the general hypothesis that expectancies for success will differ under chance and skill conditions. He found that subjects tended to increase their expectancy following failure, or decreased their expectancy after success in the chance instruction rather under skill instruction. The implication is that when reinforcement is seen as being under one's control, the past should have direct implications for the future. In nursing, the quantity and quality of practice in a certain area of patient care is variable, thus the ability to use past experiences is vital.

Joe (1971), in his review of locus of control research, reports that several studies showed that internals perform better than externals under conditions where skill controls the outcome; and, conversely,

externals perform better than internals in chance-determined conditions. The latter rationale is that internals become anxious in situations where they feel no control and thus, stress influences their level of performance. Externals, on the other hand, do not find the situation stressful.

Davies and Phares (1967) reported that internals sought more information than externals and persisted in an activity even under experimental conditions of failure. Additional findings (Gagne & Parshall, 1975; Haines, McGrath & Pirot, 1980) corroborate the view that internally oriented individuals persist longer than their counterparts on achievement or skill related tasks. Lefcourt, Lewis, and Silverman (1968) report that internals' attentiveness, concern, and interest changed with the involved task. The more difficult the task, the more deliberate becomes the decision-making process while less demanding tasks elicit some carelessness and impulsive behavior. Starnes and Zinser (1983) found that task persistence did not vary with locus of control in relationship with problem difficulty. Information recall on both intentional and incidental learning was superior for internals (Wolk & Ducette, 1974). Internals made more rational application of information than externals (Lefcourt, 1976) and were more likely to make use of the information for drawing estimates of their subsequent performance than externals.

Rotter (1975) suggests that there is a second type of external individual, a "defensive external". In some achievement situations, externals "act in internal fashion in competitive situations" (p. 60). Nowicki (1982) investigated the effect of competition and cooperation in

situations involving internals and externals. He hypothesized that internals would achieve higher levels of performance in the competitive situation and lower levels of performance in the cooperative situation. He found that internals achieved high levels of performance in both competitive and cooperative situations. Externals, however, demonstrated different levels of performance under the same conditions. In cooperative situations, the externals demonstrated performances comparable to those of internals, whereas in the competitive situations the level of performances fell.

Generally, internally oriented individuals were less conforming (Strickland, 1965) and preferred self-directed learning environments and nontraditional evaluation methods (Goldman, 1976; Owie, 1983). These findings are consistent with the theory that internals need less cue explication and are more persistent in their approach to tasks.

Cue Explication

Cue explication has been related to the performance of internally and externally oriented individuals (Owie, 1983; Witkin et al., 1977). Lefcourt (1965) reported that cue explication is a major discriminating factor between the internally oriented group and the externally oriented group. Internally oriented individuals react marginally to the level of cue explication, while externally oriented individuals' reactions are directly related to the level of cue explication; the greater number of cues, the higher level of performance. This finding is corraborated by Williams and Stark (1973) and Ducette and Wolk (1973). Dollinger, Greening, and Tylenda (1985) in their study of judgement task and cue explication found no support for the internals' greater ability to use

and interpret cues. They found that internals and externals did equally as well in all conditions. In addition, the externals showed superior recognition of which cues were diagnostic and the value of the cues.

Relevance of Cue Explication to Nursing Practice

The relevance of cue explication is of particular significance to nurse educators. Academic performance, in theory and practice, has not been a significant predictor of success in job performance (Bolin & Hogle, 1984; Olson, 1977). The gap between theory and practice, a reality gap, can be related to the assessment procedures used in the evaluation of student nurses. Multiple-choice questions are the standard theory test format. Recall is the prime element for one's success. In the clinical practice area, evaluation is influenced by instructor cuing due to the factors of patient safety and comfort and the time limitations inherent within an acute hospital setting.

In the job situation, the cues presented are not highlighted by an instructor, through her presence or selection of patients the previous day and subsequent research by the student, but are dependent upon the nurse's ability to recognize them and then assess, plan, implement, and evaluate them, in other words, to problem solve.

Cue awareness is problem awareness. A problem that is not recognized is a problem unsolved and, thus, patient care is jeopardized. It is suggested that the internally oriented nurse would be better equipped to act and react to cues in the patient environment.

The Female Role and Locus of Control

Internally oriented individuals "show more overt striving for achievement" (Rotter, 1966, p. 21) than externally oriented

individuals. Generally women do not "attribute their success to high ability" (Frieze et al., 1982, p. 336) an external view. Women comprise 98% of all nurses in Canada (Statistics Canada, 1980) and, thus, nursing can be considered to be a sex-segregated profession (Greenleaf, 1980). The sex role orientation of women may have implications for the expectancies of women.

Past socialization and stereotyping have been identified as factors in women's career aspirations and performance (Josefowitz, 1980; Muff, 1982). Society, in general, views the nurse as the handmaiden of the doctor or, at best, one who follows the doctor's orders. She is the conveyor of care and is praised or chastised for the method of conveyance. Her role is one of dependence rather than interdependence. Ashley (1976) and Wilson (1971) suggest that schools of nursing perpetuate this view -- conformity is rewarded and originality is penalized or, at best, tolerated. On a macroscopic level, the health care system, this view is reinforced as nurses are usually at the lower levels of the bureaucratic hierarchy.

Bledsoe and Baber (1978) studied personality correlates of locus of control among college women (N=205). Internal women were found to be controlled, conscientious, shrewd, and emotionally stable; whereas the external women were found to show the characteristics of insecurity and excitability.

Young (1984) researched the vocational choices and values of 590 adolescent women with a mean age of 17.6 years. Those women classified as traditional (N=399) valued cleanliness and helpfulness, whereas the innovative and moderately innovative women valued

independence, imagination, and courage. Burlin (1976) investigated the career aspirations of high school students. She reported that the externally oriented students aspired to traditional occupations while the internally oriented students preferred nontraditional occupations.

Brehony and Geller (1981) found that traditional females were externally oriented while the nontraditional females were internally oriented. Brown (1983) examined the locus of control and sex role orientation of female graduate students (N=114). Traditional women received reinforcement from internal sources (family and social forces) while the nontraditional females showed an internal orientation and personal control of their lives. Maracek and French (1977) found in their study of college women that traditional views of careers and lives were held by externally oriented women. They expected to work for a short time period and then follow the traditional female life style of marriage and family. External forces appears to control their aspirations and perceived roles.

Research Related to Locus of Control

In an investigation of students' (N=120) perceptions of their success or failure, Krovetz (1974) found that students, designated as internal, stressed skill attributes as the explanation for their outcomes; whereas, subjects in the external group indicated that chance played an important part in their outcomes. In contrast to the college students cited above, Davidhizar & McBride (1985) found that student nurses (N=191) attributed their success in nursing care and mastery of theory to their instructor's availability, personality traits, and knowledge (external attributes). The instructor was also identified as

the major reason for failure. Data were classified as internal responses or external responses rather than the locus of control of the students. Internal responses reflected personal qualities such as knowledge, confidence, study habits, and preparations. External responses related to instructors, patients, staff, clinical experiences, and teaching techniques. The use of the "attribution" perspective (Heider, 1958; de Charms, 1976; Weiner, 1979) is essentially describing behavior similar to that used in social learning theory.

Munro (1980) studied high school students who were planning to enter two and four year nursing programs in the fall of that year. The study focused on a theoretical model of college nursing student dropouts. One of the variables studied was locus of control. It was found that internals scored higher on measures of academic integration and institutional commitment. They were also more likely to persist in nursing.

Christenson, Lee, and Bugg (1979) assessed the relationship of locus of control, learning styles, and motivational needs of 53 graduate nurses using Levenson's locus of control scales. The relationship between control and performance was not significant, although hospital duties were positively related to control by others. This would be in keeping with the real lack of control a nurse experiences due to hospital policy and physicians' responsibilities. In the area of health screening, where activities are self-directed by the nurse, locus of control significance was shown.

Kissinger and Munjas (1981), using a sample of 210, investigated therelationship among student attributes, teaching methodologies, and

ability to use the nursing process. They posited that impulsivity-reflectivity and locus of control influence performance at each stage of the nursing process. Their findings indicate that students who were high on nursing process skills (problem solving) scored high on inference ability and were internally controlled. The tests were administered at the beginning and the end of the students' first clinical nursing course. Confounding variables not included in the study were: the nursing process is constantly referred to and used by instructors during first year courses; the practice effect of the nursing process during this time should provide students with an increased ability to solve problems.

Summary

Locus of control, a belief construct, is derived from Rotter's (1966) social learning theory. It describes the potential for predicted behavior as a function of the individual's degree of expectancy, based on past reinforcements. The degree of expectancy is the measure of internality. Internals believe that their own actions control reinforcements. Externals, on the other hand, believe that reinforcements are a result of control by others.

Research findings strongly suggest major behavioral distinctions between internals and externals in performance and personality. Generally, internals seek more information, demonstrate greater task persistence, recall information more readily, rationally apply information, and make use of the information in the future, are less conforming, are more self-directed in their learning, and need less cue explication.

Personality differences, as they pertain to the female gender, show internals as having: 1) greater control of their lives, 2) more stability, 3) greater innovative skills, 4) higher degree of independence, and 5) nontraditional views. The distinctions between internals and externals are as numerous as their implications in a performance area such as nursing practice, a problem-solving environment.

Problem Solving

Problem solving has been described as "the most complex of recognized activities" and "as broad as behavior itself," (Guilford, 1967, p. 312).

Problem solving is the essence of nursing practice. Therefore, the ability of the nurse to solve patient problems is crucial to the patient's welfare. Rotter (1966) suggested that the internally oriented individuals may be more capable of responding to both internal and external sources of stimulation for problem solving. If this is the case, internally oriented nurses problem solve at a higher level of competence than externally oriented nurses which is one of the assumptions of this study.

Problem Solving Theories

The activities of problem solving have been theorized with associated models for many years. Dewey (1910) developed the classic model, a linear time series. The series consists of 1) a difficulty is experienced; 2) it is analyzed or defined; 3) possible solutions are reviewed; 4) their consequences are considered, and 5) one alternative

is accepted (p. 72). Hullian psychologists interpret problem solving in terms of the positions of the appropriate response in a habit-family hierarchy. Gestaltists focus on the processes of restructuring and insight that lead to recognition of the solution as relevant (Wertheimer, 1959). The information-processing or process-tracing model is based on the act of problem solving. It focuses on the collection of information processes and combines a series of means to an end.

Newell and Simon (1972), forerunners in the process-tracing theory development, define a problem as the situation occurring when a person wants something and does not immediately know what series of action to perform to attain it. They state that

> he must encode these problem components -- defining goals, rules and other aspects of the situation -- in some kind of space that represents the initial situation to him, the desired goal situation, various intermediate states, imagined or experienced, as well as any concepts he uses to describe these situations to himself. (p. 59)

They suggest that organization of the problem-solving process occurs in the problem space and problem formulation. The problem space consists of 1) a set of elements that represent a state of knowledge of an existing state of knowledge about the task; 2) a set of strategies that produce new states of knowledge from an existing state of knowledge; 3) an initial state of knowledge; 4) a problem posed by specifying a set of final desired states to be reached, and 5) the total knowledge available to the problem solver when in a given knowledge state.

The knowledge state includes reference information that is constant throughout the course of problem solving, access information to other knowledge paths that have been previously used and held in

long-term memory; path (prior) information about how a given knowledge state was arrived at and what other actions were taken in this state if it has already been visited on prior occasions; access information to the additional symbol structures held in the long-term memory or the extended knowledge state; the knowledge state itself (the dynamic information about the task); and temporary dynamic information created and used exclusively with a single knowledge state.

Expediency is of the essence for the problem solver and, thus, must be addressed in keeping with individual characteristics of the human mind. Newell and Simon (1972) address these concerns with four fundamental propositions:

1. A few, and only a few, gross characteristics of the human processing style (IPS) are invariant over task and problem solver.

2. These characteristics are sufficient to determine that a task environment is represented (in the IPS) as a problem space, and that problem solving takes place in a problem space.

3. The structure of the task environment determines the possible structures of the problem space.

4. The structure of the problem space determines the possible programs that can be used for problem solving. (pp. 788-789)

The concept of expediency is of major importance to nursing practice. Problems cannot be pondered upon and philosophized about in the clinical area. They must be resolved as quickly as possible for the welfare of the patient. Thus, any individual characteristics that enable a nurse to problem solve more effectively are critical to nursing education.

Nursing as Problem Solving

Nursing has been described as both an art and a science; however, the primary requisite is knowledge, a content orientation, and knowing, a process orientation. The knowledge is the technical, intellectual, and communication components of nursing practice. The knowing is the problem-solving component of nursing. It is the knowing component that distinguishes the 'good' nurse from the 'mediocre' nurse. The ability of the nurse to recognize and solve problems is related to her competency in the clinical area. The nursing process can be strongly related to the problem-solving process. Page and Saunders (1978) state that nursing is a process of problem solving and the foundation of nursing education programs. Marcinek (1978) suggests that, "Application of nursing process in clinical practice necessitates interaction between substantive nursing knowledge and higher cognitive skills ..." (p. 1).

The Nursing Process

The utlization of the nursing process by nurses, in clinical situations, determines the level of performance, that is, the quality of care. It is defined as:

> ... an orderly, systematic manner of determining the clients' problems, making plans to solve them, initiating the plan and assigning others to implement it, and evaluating the extent to which the plan was effective in resolving the problem (Yura & Walsh, 1978, p. 20).

The nursing process consists of four stages classified as: 1) assessment; 2) planning; 3) implementation; and 4) evaluation. In that the actions of each stage are a direct result of the previous stage, nurses' levels of performance are only as effective as the actions taken in each stage.

The first stage of the nursing process is assessment. In this stage, the nurse identifies and defines the problems of the patient. It begins with the collection of data about the patient's health status. Inferences are made from the data and ends with a definition of the patient's problems. The depth of data collection and the inferential process of the nurse is based up on her experience, knowledge, and ability to perceive the human condition. Therefore, the level of insight into the problems is a determining factor in the level of performance.

Following the assessment of the patient, planning is done to establish the priority of problems. Consideration of the physical, psychological, spiritual, cultural, and economic needs are part of this stage. Goals and objectives are set for each problem with interventions. In that the planning stage is a direct result of the assessment stage, the planned nursing interventions are only as thorough as the identification of problems.

The third stage, implementation, involves the carrying out of nursing actions as determined in the planning stage. Alterations in the interventions may become necessary as patients' conditions vascilate in an unpredictable manner.

The fourth and final stage of the nursing process is the evaluation of the nursing care. Evaluation is a comparison of the results of the care given with the outcome stated in the objectives of the nursing plan. This comparison shows which problems have been solved and those left unsolved. The unsolved problems are reassessed and replanned indicating that the nursing process is a continuous process.

The first step in the nursing process is to assess the situation and obtain data necessary to define a specific problem or make a nursing diagnosis. During the diagnostic step, data are weighed as to their priority and approaches to the problem are planned to stabilize or neutralize it. The action taken, the implementation step, is the result of the problem-solving process. The product is then evaluated and, depending on the results, the process is repeated, modified, or terminated.

Problem-Solving Assessment of Student Nurses

Assessment of students' clinical performance is usually conducted in one or a combination of two ways: direct observation and simulation. The assessment tool most widely used is that of direct observation of performance. This method is used by the nursing faculty in the school under study in the form of the critical incident technique, developed by Flanagan (1947) as cited in Fivars and Gossell (1964) who adapted it for nursing education.

Assessment by the Critical Incident Technique

> An incident is any observable bit of human behavior sufficiently complete in itself to permit inferences to be made about the person performing the act (Flanagan in Fivars & Gossell, 1964, p. 16).
>
> In order to be critical, an incident must make a significant difference in the outcome of the behavior; it must contribute either positively or negatively to the accomplishment of the aims of the activity (Fivars & Gossell, 1964, p. 16).

The clinical instructor records the effective and ineffective incidents for each day the student is in the clinical area. The incidents will reflect the orientation of the instructor, be it the process of learning or the product of learning of the student. The

final grade for clinical performance is based on the quality and quantity of the incidents for the evaluation period.

Assessment by Simulation

Simulation, as an instruction and assessment tool, is a method of enhancing and evaluating professional competence. In the 1960's, McGuire, Solomon, and Bashook (1976) introduced the technique in written form, as an examination tool to test medical students. They stated

> Reduced to its essence, simulation consists in placing an individual in a realistic setting where he or she is confronted by a problematic situation that requires a sequence of inquiries, decision, and actions. (p. 1)

The use of clinical simulations began in the 1960's. McGuire and Babott (1967) developed written patient care problems for Medical Education at the University of Illinois. They outlined five essential characteristics of patient simulations:

1. It must be initiated by information which is typical of the type and language which the student will encounter in a real situation.
2. It must require sequential, interdependent decisions.
3. It must be realistic in terms of the results of each decision.
4. It must be designed so that, once data are obtained, they cannot be retracted.
5. It must permit variation in nursing approaches and patient responses. (p. 1)

Simulations with imbedded measurements provide the student with an equal opportunity to demonstrate her knowledge and ability to implement the nursing process, that is, solve a problem/problems. The advantages of a clinical simulation evaluation are: enables the instructor control variables such as patient safety, availability of learning experiences

(quantity and quality); consistency of student evaluations, critical care elements are defined; greater realism than traditional tests; and interpersonal and personality elements.

The disadvantages associated with simulations lie in the area of validity and reliability of the instruments (Barro, 1973; Page & Fielding, 1980). As Cronbach (1971) wrote, "To study the validity of a test interpretation is to study how behavior in one situation is related to behavior in another" (p. 488). The contextual nature of clinical problem solving makes parallel comparisons questionable. For example, multiple-choice examinations and anecdotal records, the current modes of evaluations, describe or test a product behavior as compared to simulations which test or describe a process behavior. Sedlacek and Nattress (1972) describe simulation performance as indicating "knowledge of the principles involved in solving a problem even though the actual behavior of the subject in a clinical situation cannot be measured" (p. 264).

Research Related to Simulations

Several simulations for the purpose of evaluating students' performance have been developed in the field of nursing (de Tournay, 1971; Gover, 1971; McIntyre et al., 1972; Sweeny et al., 1982).

McIntyre, McDonald, Baily, and Claus (1972) examined the problem-solving skills of baccalaureate nursing students at the University of California, San Francisco School of Nursing. Problem solving was measured with a written simulation. The three groups involved in the research were students of the newly developed curriculum based on stimulating and developing problem-solving skills by providing practice

in decision making and strategy evaluation. The experimental curriculum groups scored significantly higher in proficiency and competency indices means than the control group.

Sumida (1972) used computer simulation techniques in evaluating nursing students' application of the nursing process. She developed and constructed clinical situations in each of the major areas of clinical practice. The results of the students' performance were not published.

Marcinek (1978) evaluated the clinical problem-solving ability of 36 graduating baccalaureate nursing students using a computer simulated problem. The subjects yielded an efficiency index of 75 percent; a mean proficiency index of 30 percent; and a competency index of 26 percent. She concluded that "levels of performance indices indicated that subjects' problem-solving styles were either constricted or undiscriminating;" (p. 11) and "...students did not demonstrate a competent problem-solving style," (p. 119).

Elstein, Shulman, and Sprafka (1978) conducted a five-year research program on medical problem solving. The studies included high-fidelity simulations (use of actors to portray patients), moderate-fidelity simulations (patient management problems) and lower-fidelity simulations (fixed-order simulations). Experienced physicians (N=24) were studied over a variety of clinical problems using different levels of fidelity. They concluded that "competency may be case related" and there is a "...need to think in terms of <u>profiles</u> of competence, in which individuals are regarded as being effective with particular types of problems, in particular situations" (p. x). Also, that "information and experience appear to be basic to competence" (p. x).

Kleinmuntz (1968) studied diagnostic decision making among clinical psychologists and clinical neurologists. Using the Minnesota Multiphasic Inventory (MMPI), the psychologists were tape recorded while thinking aloud as they sorted 126 test profiles. A computer program was written based on their problem-solving processes and reproduced similar results to those of the psychologists.

The neurologists were presented with a few symptoms or biographical features in a Twenty Questions format. The sequence of questions used to diagnose a patient were analyzed and found to conform to a binary tree structure. The length of the decision chain varied as a function of the expertise and experience of the subjects. Hayes (1968) in a critique of Kleinmuntz' work pointed out that the Twenty Questions format requires a sequencing format from the general to the specific and thus branching in the process was to be expected as a result of the experiment rather than the problem-solving processes of the sample.

Summary of Problem Solving

Problem solving is a complex activity. It has been described in many models, in terms of product and process. Essentially, a problem is recognized, alternatives are evaluated, a choice is made, and action taken. The evaluation of the solution results in further action or in termination of the process. The level of sophistication of the process and ultimately, the product, is determined by the knowledge of the solver. Thus, it is the competency of the solver that will determine the level of performance in the problem-solving process.

The problem-solving process in nursing practice is called the nursing process. The nursing process consists of four stages. These

stages are: 1) assessment; 2) planning; 3) implementation; and 4) evaluation. Each stage is dependent upon existing knowledge and knowing what to do with the knowledge. The degree of interaction determines the quality of the outcome, that is, the quality of patient care.

The quality of patient care or, in other words, the quality of problem solving is determined by many methods. One of these methods is patient simulations. Simulations provide nurse educators with a tool that is objective, tests problem-solving ability, and is safe in terms of patient care.

Patient care is the essence of nursing practice. Competent nursing practice requires two components: 1) content knowledge; and 2) knowing the problem-solving component. It is within the problem-solving component that individual differences influence the process and may account for the varying levels of nursing performance.

Summary of Chapter

The literature review has discussed those items considered to be relevant in determining the constituents of quality nursing performance. The nurse is a complex and multi-faceted individual. In reacting to the nursing environment, behavioral constituents such as locus of control may influence the level of performance attained by the nurse. Performance is related to problem-solving ability and, hence, is used as a measure of clinical performance.

CHAPTER III

RATIONALE AND HYPOTHESES

Rationale

Elements of nursing practice were outlined by Nightingale (1820-1910), in her treatise Notes on Nursing in which she wrote that knowledge is an essential ingredient in nursing and the nurse must use intellectual skills in the practice of nursing. From this beginning, nurse educators have emphasized the need for the development of intellectual ability and technical skills of nurses (King, 1971; Orlando, 1961; Peplau, 1952). It is the intelligent application of knowledge in the practice area which is the substance of nursing. Intelligent behavior implies an organization and control by cognitive processes such as long and short-term memory traces, immediate perceptions, and any other raw material employed to solve a problem (Charlesworth, 1976).

One trait which has been related to performance in problem-solving situations is locus of control (Duke & Norwicki, 1974; Lefcourt, 1976; Rotter, Liverant & Crowne, 1961; Wareheim, 1972; Williams & Stark, 1973). Locus of control refers to whether reinforcement depends on one's own behavior (internally controlled) or control by external forces (externally controlled). Internals seek more information than externals (Davis & Phares, 1967), recall information more readily (Wolk & Ducette, 1974), extract clues more quickly that facilitate the making of accurate judgement (Williams & Stark, 1973), make more rational applications of information (Lefcourt, 1976), and were likely to make use of the

information for drawing estimates of their subsequent performance than externals. As Heckhausen (1967) stated

> ...the sine qua non for the origin of the (achievement) motive is cognitive maturation, which causes the outcome of performance to be referred to the self and, thus to be explained as an effect of one's own competence. (p. 148)

It could be argued that student nurses who are internally oriented would demonstrate a higher level of competency in solving patient problems than those externally oriented. Nurses practice in an environment which is comprised of ambiguity, complexity, and uncertainty. It is within this environment that the student nurse must learn to integrate and to apply the knowledge learned in the safe, controlled atmosphere of the classroom. Her ability to control herself and thus be more analytical in her approach to nursing care suggests that clinical performance is dependent upon her degree of control in the problem-solving situation.

Hypotheses

For purposes of statistical inference, five hypotheses were developed.

HO1 There is no significant difference between the internal and external nursing student groups in the decision making and actions taken in the process of problem solving as indicated by their efficiency indices.

H1 There is a significant difference between the internal and external nursing student groups in the decision making and actions taken in the process of problem solving as indicated by their efficiency indices.

H02 There is no significant difference between the internal and external nursing student groups in the discrimination and thoroughness of problem solving as indicated by their proficiency indices.

H2 There is a significant difference between the internal and external nursing student groups in the discrimination and the thoroughness of problem solving as indicated by their proficiency indices.

H03 There is no significant difference between the internal and external nursing student groups in the agreement with the experts on the value of process and product important items as indicated by errors of omission.

H3 There is a significant difference between the internal and external nursing student groups in the agreement with the experts on the value of important process and product items as indicated by errors of omission.

H04 There is no significant difference between the internal and external nursing student groups in the agreement with the experts on the value of harmful process and product items as indicated by errors of commission.

H4 There is a significant difference between the internal and external nursing student groups in the agreement with the experts on the value of harmful process and product items as indicated by errors of commission.

H05 There is no significant difference between the internal and external nursing student groups in the effectiveness of problem solving as indicated by their competency indices.

H5 There is a significant difference between the internal and external nursing student groups in the effectiveness of problem solving as indicated by their competency indices.

CHAPTER IV

METHOD

The purpose of this study is to explore the influence of locus of control on the clinical nursing performance of student nurses. Clinical nursing performance is essentially problem-solving performance. This chapter describes the subjects, procedure, instruments, and method of data analysis.

Subjects

Fifty senior students in a southern Alberta two-year college nursing programme were chosen for the study. The programme consisted of six sequential semesters. The subjects were in the last week of the fifth semester. The sixth semester is a consolidation of the programme and a bridge for graduation status. The sample was limited to senior nursing students for four reasons. Firstly, only senior students were adequately exposed to the clinical area. From the first semester of the nursing programme to the last, clinical experience is additive in both theory and application. Secondly, a higher concentration of clinical hours and more complex patient assignments occur in the latter part of the programme. Thirdly, the students have experience in utilizing the nursing process and fourthly, all theoretical components were completed by the end of the fifth semester.

Three students withdrew, for personal reasons, from the study prior to completing the computer simulation section. Another seven students were eliminated from the final data analysis as a result of their Locus of Control Scores. Of the remaining 40 subjects, 38 were female and

two were male. The age distribution was 18 to 47 years with a mean of 24.29 years. The mean G.P.A. was 2.527, the mean clinical grade was 2.7553, and the mean theory grade was 74.0425.

Instruments

Rotter's I-E Scale

The scale is a forced-choice test which consists of 29 items, six of which are filler items. Scoring is in the external direction, that is, the higher the score the more external the individual. A median split is used to determine internal subjects from external subjects. To achieve greater discrimination between the two groups, subjects with scores one above and one below the median are dropped, and the remaining subjects are determined to be internal or external subjects.

Variances in scores from study to study are reported in the literature. Means tend to be in the range of 10.38 (Schneider, 1971). Lefcourt and Steffy (1970) report a mean of 7.97 with female nursing students (N=37). Dufault (1985) reports a mean of 9.187 with post R.N. baccaulaureate students (N=32). Kissinger and Munjas (1981) in their study of baccalaureate nursing students (N=201) record a mean of 9.85. Phares (1976) indicates an external shift in the means of college populations of between two and four points.

The scale has an internal consistency coefficient range of 0.65 - 0.070 and a test-retest reliability of 0.49 - 0.83 (Rotter, 1966). Anastasi (1976) reports a desirable construct validity.

The Nursing Simulated Computer Program

The nursing simulated computer program was developed by Marcinek (1978). A letter of permission for the use of the program was obtained from S. Marcinek (Appendix A). The simulation is based on the work by McGuire, Bashook, and Solomon (1976) at the University of Illinois School of Medicine. They developed the technique to evaluate medical students' decision-making ability in clinical situations. Three indices were used to quantify performance. The indices were: Proficiency, Efficiency, and Competency. The proficiency index describes the thoroughness and discriminating ability of the subject in choosing options. The efficiency index indicates the process of problem solving: the directness of resolution of the problem. The competency index is a combination of the efficiency and proficiency indices.

$$\text{Proficiency Index} = \frac{\text{the sum of + points - sum of negative points}}{\text{maximum points x 100}}$$

$$\text{Efficiency Index} = \frac{\text{the number of + choices made}}{\text{total number of choices made x 100}}$$

$$\text{Competency Index} = \frac{(\text{Proficiency x Efficiency}/100 + \text{Proficiency}}{2}$$

Within the proficiency index, errors of omission and commission are calculated. The errors of omission score indicates the level of agreement of the student with the nursing experts in the field on important items. The errors of commission score is the number of harmful errors committed by the student as determined by the experts in their assignment of values to the options. The error scores may indicate deficiencies of the student, and therefore instructional and learning approaches. Commission errors indicate the student's need in the assessment area and setting of priorities. Those students with

omission errors need assistance with cue awareness, that is, going beyond the obvious.

Incorporated within the simulation are values, based on the knowledge of a criterion group of experts, for each option within the program. The values are used to calculate the efficiency, proficiency, and competency indices which are presented on the monitor following the completion of the program by the student. Values were assigned to each branch of the program and the options contained with the branch. The categories of values used were:

Important	+4
Helpful	+1
Optional	0
Useless	-1
Harmful	-4

The decision as to the value of each option, in the simulation, was determined by a panel of experts, a group of four nursing clinicians teaching medical-surgical nursing. The average value of each option was incorporated within the program. A total of 243 points were available within the simulation. Interrater reliability scores indicated a high strength of agreement between the four raters.

A Diplomat of the American Board of Colon and Rectal Surgery and two nurse educators were the major consultants for accuracy and validity of the simulated patient's disease process and the nursing content and nursing process respectively (Marcinek, 1978).

The program presents a young female spending her first night in hospital, following several days of severe gastro-intestinal disease.

The program consists of 12 sections, designated A-L. All subjects enter Section A, with Sections B-K presenting possible problems of the patient. The possible problems of the patient are: History of Diarrhea, Trip to Mexico, Emotional Status, Pain, Dietary History, Temperature, Pulse and Respirations, Blood Pressure, Perianal Care, and Hydration Status. Within each option, the choices are based on the elements of the nursing process (problem-solving): assess, plan, implement, and evaluate. Options chosen by the subjects lead to further options or a termination of the program. The content of the simulation was approved by four members of the second year faculty serving as criterion experts. All four nurses are medical-surgical clinicians with 10 - 20 years of teaching experience.

Test-retest reliability cannot be determined because the subjects have the option of omitting parts of the test. Internal consistency using a split-half technique was not considered in view of the weighting of items, sections, and the interdependence of the sections.

Construct validation using the known-group technique was utilized. A comparison of a means between Registered Nurses group (N=14) and student nurses' (N=47) scores on proficiency ($t=-3.52$, $p=.001$), efficiency ($t=-3.79$, $p=.007$), and competency ($t=-3.74$, $p=.001$) demonstrate that differences exist between the two groups (Appendix B). A further breakdown of the analysis between internally oriented student nurses and externally oriented student nurses indicate similar results (Appendices B-C).

Criterion-related validity was tested by correlating the proficiency, efficiency, and competency indices with the theory grade

and clinical grade as determined by the School of Nursing (Appendix D). The criterion measure was administered at approximately the same time as the simulation. The low correlation was expected as the theory grade consisted of a series of objective tests which are less direct measures of problem solving and skills. McGuire (1972) reports a correlation in the range of .20 - .40 between multiple-choice examinations (theory grade) and simulations. In addition, the clinical ratings suffer from a number of defects; low inter-rater reliability, relatively few observations, situational constructs (the need to consider patient safety and lack of identical patient problems), and contamination by variables such as interpersonal skills and manual dexterity. As Gennaro et al. (1982) stated "Assigning a number grade to a student's clinical performance is indeed a difficult task." (p. 27)

Adaptation of the Simulation

The simulation was adapted, with permission of Marcinek (1978), in three ways: 1) programming; 2) regional nursing practice; and 3) value of the options. Firstly, the original simulation was written in BASIC language to accommodate the Dec-10 Computer System of the University of Texas. All applicable BASIC commands were revised to allow the use of Apple IIe computers. The addition of a 'welcome' statement, a student identifier, and BASIC statements to record the subject's answers on disk were added to the program.

Secondly, substitutions in the following areas were made to reflect regional nursing practice: 1) Temperatures - Celsius replaced Fahrenheit readings; 2) Medications - Imodian for Paregoric; 3) Measures - Metric for Apothecary; 4) Time - to the 2400-hour clock.

Thirdly, to adequately reflect the nursing curriculum of the subjects, the option values were changed using the average of the experts' ratings. This resulted in a total of 243 points as opposed to the original 301 points. A notable change occurred in the placing of values by this study's group of criterion experts. The assessment value given to each option was not exceeded in the values given to choices within that option. For example:

Assessment Phase	Original	Revised
History of Diarrhea	+1	+3
B1. Based on the data you now have about Tammy, at this time you decide this (Choose one of the following):		
1. Presents a potential need for nursing care; you need more specific data RE:diarrhea	+4	+3

Procedure

An appointment was made with the Chairperson of the Department of Nursing to discuss the study. During the discussion, the intent of the study, test procedures, time commitments, and schedules were reviewed. A request for clinical and theory grades and G.P.A.'s of the participating students was granted. Oral consent was given for the study at this time and followed by a written consent. The voluntary participation of members of the second year faculty in the analysis of content validity and coding of the items of the nursing simulation problem was requested and granted.

A meeting with four members of the second year faculty was held. A hard copy of the nursing simulation computer program with written instructions, as to the assignment of values to the options, was given to them. Suggestions and comments, in terms of student applicability, were to be written on the hard copy of the program. Students' time schedules were reviewed and time periods for meeting with the students was organized. Arrangements were made, through the nursing department, to access a classroom of 17 Apple IIe computers and a single room with one Apple IIe for individual testing.

Student participation was organized into three phases: 1) explanatory and consensual; 2) demographic information and Locus of Control Scale administration; and 3) nursing problem computer simulation administration. During the first phase, the initial meeting with the students, an explanation of the study, its general value to nursing, time commitments, and a list of scheduled times to complete all phases of the study was given. It was also indicated that additional testing periods could be arranged on a one-to-one basis for those desiring it. Questions were answered regarding time schedules. Consent forms, (Appendix E) with verbal recitation and explanation, were then handed out to the students. The students were assured of their anonymity by the assignment of a code number attached to the consent form which was to be used for identification on all further testing items. Students were asked to indicate, on the consent form, their preferred times of participation.

The second phase, completion of the demographic data sheet and the Locus of Control Scale, was completed in two scheduled class periods. The average time spent in this phase was thirty minutes.

The third phase, the nursing simulation computer problem, was completed by two groups of 17 and 13 and individual sessions.

Demographic Data Sheet

Demographic variables have been identified by various authors as impacting the locus of control of an individual. Females are more externally controlled than males. Internality increases in later years (Steitz, 1982; Wolk & Kurtz, 1975; Costello, 1982) and middle-aged are more internal than high school students (Duke, Shaheen, & Nowicki, 1974). Locus of control in individuals stabilizes in the middle years and internality did not decrease with old age. Phares (1976) posited that life experiences, rather than age itself, affects the locus of control belief. Data was obtained on age, marital status, number of children, level of previous education, and years of employment.

Locus of Control Scale

The internality or externality of the subject was assessed by the use of Rotter's I-E Scale. The standard instruction sheet was attached to the test and therefore students were only reminded to attach their assigned code numbers to the test. The tests were hand-scored by the researcher, using the standard scoring criteria. Subjects were then divided into external and internal groups.

Nursing Problem Computer Simulation

A verbal explanation of the computer covered the use of numerical keys; the method of advancing throughout the program, the collection of input; recording of the answers on the disk; and the method of correction prior to "doing".

The students were then asked to proceed with the computer exercise which was preloaded with a programmed exercise, unrelated to nursing, but using a similar option selection protocol as was in the nursing simulation program. They were to indicate when they wished to proceed with the nursing simulation program. Questions were answered and assistance given throughout the practice period. A time limit was not imposed during this period thus allowing the students to practice to their comfort level. In general, the average time taken during this period was 25 minutes.

Following the practice period, the nursing simulation program was loaded into each terminal. The investigator reviewed, on the blackboard, the assumptions he/she could make during the simulation. These assumptions were: 1) act as the decision-maker, that is, a Registered Nurse; and 2) vital signs are routinely taken at 0600 hours.

The subjects were then asked to read the 'Opening Scene' (Appendix F). The information contained within the 'Scene' approximates a change-of-shift report and, accordingly, highlighting of information using their normal procedure was encouraged. During the period of the simulation, the investigator was available for questions related to the operation of the computer and clarification of information previously reviewed.

On the completion of the computer program, the subjects' scores (number of choices, number of positive choices, number of positive points, number of negative points) and efficiency, proficiency, and competency indices appeared on the screen. An interpretation of the simulation results was given to each subject. The subjects' average time to complete the simulation was forty minutes.

The subjects were asked to write their comments and impressions regarding the simulation on a sheet provided for this purpose.

At the completion of all testing, hard copies of the subjects' responses to the simulation were made available for their perusal.

Treatment of Data

Consent forms were signed by 50 nursing students, 48 female and two male. Three students withdrew from the project prior to completing all tests.

Following the analysis of the I.E. Scale, a mean of 11.766 and a median of 11.0 was calculated. Seven subjects with scores of 11 and 12 were removed from their respective groups for better differentiation of groups. The statistical analysis was then based on a total number of 40 subjects, 19 in the internal group and 21 in the external group.

In order to affirm the assumption that differences between the two groups in problem-solving ability was due to locus of control, a t-test was conducted on the demographic variables of age, marital status, number of children, degrees, and health-related work experience. Since no difference was found, between the internals and externals, on the aforementioned variables, it was concluded that group differences in problem-solving ability would be attributed to their locus-of-control orientation.

Nondirectional t-tests were used to test hypotheses one through five. The assumptions, underlying the t-test of normality and homogeneity of variance, were assumed for the analysis.

A statistical level of .05 was used for significance in testing all hypotheses.

CHAPTER V

RESULTS

The purpose of this investigation was to explore the construct of locus of control on the problem-solving ability of student nurses in a simulated clinical setting.

Descriptive Statistics

Original Sample

The sample consisted of 47 senior nursing students enrolled in a two-year nursing program. The mean, standard deviation, minimum and maximum scores, and degree of skewness of locus of control scores, competency, proficiency, and efficiency indices are presented in Table 1 (p. 41).

The locus of control scores as seen in the frequency of distribution (Table 2) (p. 42) indicate a mean of 11.766, a standard deviation of 3.708, and a median of 11.

Revised Sample

To provide a more distinct discrimination between the internal group and the external group, all scores 12 and above were designated as externals and 11 and below were designated as internals. The internal group (N=19) had scores of 10 and lower. The external group (N=21) had scores of 13 and higher. The sample of 40 was used for further data analysis.

The study sample consisted of 40 subjects. Nineteen subjects were designated as internal students and 21 subjects were considered as external students.

Table 1

Descriptive Statistics for Original Samples' Locus of Control, Competency, Proficiency, and Efficiency Scores (N=47)

Variable	Mean Score	Standard Deviation	Minimum Score	Maximum Score	Skewness
Locus of Control	11.766	3.708	5	19	.083
Competency	42.167	13.673	5.84	73.95	-.513
Proficiency	46.990	14.410	7.51	81.42	-.575
Efficiency	77.718	6.671	55.56	88.14	-.992

Table 2

Frequency Distribution of Original Samples' I-E Scores

Score	N	Cumulative Frequency
19	1	47
18	1	46
17	3	45
16	5	42
15	4	37
14	3	33
13	4	30
12	2	26
11	5	24
10	3	19
9	4	16
8	5	12
7	5	7
6	1	2
5	1	1
4	0	0
3	0	0
2	0	0
1	0	0
Total	47	

Median 11

Mean 11.766 Standard Deviation 3.708

There was variability on scores of competency and proficiency indices between the internals and externals. Variability of scores on efficiency were similar between the two groups. Scores indicate an asymmetrical distribution with a clustering toward the upper end of the variables. (Tables 3 & 4) (pp. 44-45).

Demographic variables of age, marital status, number of children, degrees, and health-related work experience were assumed to be independent of the locus of control of the subjects, as determined by t-tests (Table 5) (p. 46). The age variable indicated a mean age of 25.632 years for internals and 22.952 years for externals. The external group, however, has 80.1% in the 18-23 year category as compared to 36.8% of the internal group. In viewing the category of children, 90% of the external group were childless, while 68% of the internal group were childless. The remaining categories of degrees and health-related work experience showed similar results for both groups. (Table 5) (p. 46)

Hypotheses

H01 There is no significant difference between the internal and external nursing student groups in the decision making and actions taken in the process of problem solving as indicated by their efficiency indices.

Efficiency represents the decision making and actions taken by the student in resolving the problem. To determine whether significant differences existed between the efficiency index for the internal and external groups, t-tests were utilized. No significant difference in the means of the efficiency index of the internal group and external

Table 3

Descriptive Statistics for Externals' Locus of Control, Competency, Proficiency, and Efficiency Scores (N=21)

Variable	Mean Score	Standard Deviation	Minimum Score	Maximum Score	Skewness
Locus of Control	15.333	1.713	13	19	.261
Competency	44.867	13.672	5.84	73.95	-.725
Proficiency	49.651	14.398	7.51	81.42	-.774
Efficiency	79.222	7.443	55.56	88.14	-1.624

Table 4

Descriptive Statistics for Internals' Locus of Control, Competency, Proficiency, and Efficiency Scores (N=19)

Variable	Mean Score	Standard Deviation	Minimum Score	Maximum Score	Skewness
Locus of Control	8	1.374	5	10	-.264
Competency	40.583	14.785	9.05	60.65	-.474
Proficiency	45.801	15.627	11.08	66.80	-.540
Efficiency	76.236	6.115	63.63	86.44	-.654

Table 5

Comparison of Means, Frequencies, and Percentages on Demographic Variables

Variables	Internal mean	Internal sd	Internal N	Internal %	External mean	External sd	External N	External %	t-value*	p
Age (Years)	25.63	5.33			22.95	5.78			-1.53	.14
18 - 20			3	15.8			8	38.1		
21 - 23			4	21.0			9	42.8		
24 - 26			6	31.6			1	4.8		
27 - 30			1	5.3			2	9.5		
31 - 33			4	21.0			-	-		
34 - 36			-	-			-	-		
37 - 39			1	5.3			-	-		
40+			-	-			1	4.8		
Total			19	100			21	100		
Marital Status	1.52	0.61			1.33	0.48			-1.10	.28
Single			10	52.6			14	66.7		
Married			8	42.1			7	33.3		
Widowed			-	-			-	-		
Divorced/ Separated			1	5.3			-	-		
Total			19	100			21	100		
Children	0.74	1.24			0.14	0.48			-1.96	.06
0 - 2			17	60			21	100		
3 - 4			2	40			0	0		
			19	100			21	100		
Degrees	2.0	0.30	0	100	1.91	0.00	2	100	-1.45	.16
			0	100			2	100		
Work Experience (Health Related)	0.79	1.32			0.81	1.33			0.05	.96
0			12	63.2			15	71.4		
1 - 2			6	31.6			4	19.0		
3 - 4			-	-			1	4.8		
5+			1	5.2			1	4.8		
			19	100			21	100		

*two-tailed test

Table 6

t-test on Competency, Proficiency, and Efficiency for Externals and Internals

Variable	Mean		Standard Deviation		t-value*	p
	Internal	External	Internal	External		
Competency	40.00	44.80	14.70	13.70	-1.03	0.31
Proficiency	45.10	49.60	15.80	14.40	-0.93	0.36
Efficiency	76.14	79.16	6.28	7.47	-1.37	0.18

*two-tailed test

group was shown. (Table 6) (p. 47) The null hypothesis was accepted. It was suggested that internals were different in the resolution of the problem but were not significantly different ($p<0.18$).

The efficiency index indicates the directness of problem resolution: the number of positive choices divided by the total number of choices made by the student. Variability on total choices and number of positive points accumulated in the simulation was noted. Although the influence on the level of performance is negligible, it does have substantial influence on the variation in performance. (Table 7) (p. 49)

H02 There is no significant difference between the internal and external nursing student groups in the discrimination and thoroughness of problem solving as indicated by their proficiency indices.

Proficiency addresses the thoroughness and discrimination of the problem solver. To determine whether significant deficiencies existed between the proficiency index for the internal and external groups, t-tests were utilized. H02 is accepted since no significant difference was found for the mean scores of proficiency between internal and external groups. (Table 6) (p. 47) The components of the proficiency index, the sum of positive points and negative points, showed a difference in the variances. The variance in the number of positive points was different for the internal group as compared to the external group in an upward direction. The reverse was true in the negative points category. (Table 8) (p. 50) In the category of negative points, the interval of 0 - 14 showed 71.43% of the external group in this group as compared to 57.9% of the internal group. (Table 9) (p. 51)

Table 7

Frequencies and Percentages of Internals' and Externals'

Choices and Positive Choices

	Number of Choices				Number of Positive Choices			
	Internal		External		Internal		External	
Interval	N	%	N	%	N	%	N	%
0 - 24	1	5.26	1	4.76	2	10.53	1	4.77
25 - 34	1	5.26	-	-	2	10.53	2	9.51
35 - 44	2	10.53	1	4.76	4	21.05	3	14.28
45 - 54	3	15.79	5	23.81	6	31.58	8	38.10
55 - 64	5	26.32	5	23.81	4	21.05	5	23.80
65 - 74	3	15.79	6	28.57	1	5.26	1	4.77
75 - 84	3	15.79	2	9.52	-	-	1	4.77
85 - 94	1	5.26	-	-	-	-	-	-
94 - 100	-	-	1	4.76	-	-	-	-
Total	19	100%	21	100%	19	100%	21	100%
Mean	57.4		61.5		44.2		49.6	
Standard Deviation	16.80		15.2		14.5		13.8	

Table 8

Difference Between Means of Choices and Points

On Internals and Externals

	Internal		External			
	Mean	Standard Deviation	Mean	Standard Deviation	t-value*	Sig.
Total Choices	56.68	17.28	61.52	15.22	-0.55	ns
Number of Positive Points	45.26	14.79	49.57	13.76	-0.95	ns
Total Points	134.11	39.25	140.71	34.99	-0.56	ns
Negative Points	18.00	6.77	17.33	7.16	-0.30	ns

*two-tailed test

Table 9

Frequencies and Percentages of Internals' and Externals'

Positive Points and Negative Points

Positive Points					Negative Points				
Interval	Internal		External		Internal		External		Interval
	N	%	N	%	N	%	N	%	
0 - 49	1	5.26	1	4.76	3	15.79	3	14.29	0 - 4
50 - 99	3	15.79	1	4.76	3	15.79	5	23.81	5 - 9
100 - 119	2	10.53	1	4.76	5	26.32	7	33.33	10 - 14
120 - 129	2	10.53	3	14.29	5	26.32	2	9.52	15 - 19
130 - 139	1	5.26	2	9.52	2	10.54	3	14.29	20 - 24
140 - 149	3	15.79	5	23.81	1	5.24	1	4.76	25 - 29
150 - 159	1	5.26	5	23.81	19	100	21	100	Total
160 - 169	2	10.53	-	-					
170 - 179	2	10.53	2	9.52					
180 - 189	2	10.53	-	-					
190 - 199	-	-	-	-					
200+	-	-	1	4.76					
Total	19	100	21	100					

Table 10

Difference Between Means On Options Chosen and Number of Choices

In Options Between Internals and Externals

		Internals			Externals				
Options (Value)		N	Mean	Standard Deviation	N	Mean	Standard Deviation	t-value*	p
History of Diarrhea	(3)	10	8.00	3.50	15	8.93	3.86	-.616	.55
Trip to Mexico	(2)	14	5.64	2.59	15	5.33	2.38	.335	.74
Emotional Status	(3)	13	10.62	4.15	13	9.70	3.98	.578	.2843
Pain	(4)	19	8.00	1.35	21	10.29	3.24	-2.132	.0394
Dietary History	(1)	5	11.8	4.97	15	8.33	5.05	1.334	.1990
Temperature	(1)		-	-		-	-	-	-
Pulse and Respirations	(1)	15	3.33	2.65	14	4.71	4.27	-1.053	.301
Blood Pressure	(1)		-	-		-	-	-	-
Perianal Care	(2)	13	5.0	.707	14	5.29	1.38	-.668	.511
Hydration Status	(4)	17	14.06	2.86	21	12.52	2.32	1.829	.064

*two-tailed tests

In the selection of option categories (10) within the program, Pain was significant ($t=2.132$, $p<.039$). (Table 10) (p. 52) Approaching the significance level of .05, was the option Hydration Status with a t-value = 1.829 ($p<.064$). The use of these options by the internal group suggests a greater insight into their value in terms of this problem. The remaining eight did not show significant difference between the means of the two groups.

H03 There is no significant difference between the internal and external nursing student groups in the agreement with the experts on the value of important process and product items as indicated by errors of omission.

There were no significant differences between the two groups in terms of Omission Errors ($t=.61$, $p<.54$) (Table 11) (p. 54). An error level of 40% was considered acceptable. Internals (36.85%) omitted a greater number of significant choices than externals (57.14%) (Table 12) (p. 55). This level was based on the programme's passing grade of 60%.

H04 There is no significant difference between the internal and external nursing student groups in the agreement with the experts on the value of harmful process and product items as indicated by errors of commission.

To determine whether significant differences existed between the errors of commission index for the internal and external groups, t-tests were carried out for the indices.

The null hypothesis was accepted since no significant difference was found for the mean score of errors of commission between the internal and external students. (Table 11) (p. 54) The insignificant

Table 11

Differences Between the Means of Errors of Commission and Errors of Omission For Internals and Externals

	Internals		Externals			
Errors	Mean	Standard Deviation	Mean	Standard Deviation	t-value*	p
Omission	44.747	16.235	41.701	15.31	.61	.54
Commission	7.30	6.74	6.74	2.994	.603	.54

*two-tailed test

Table 12

Frequencies and Percentages on Errors

of Omission for Internals and Externals

Interval	Internals		Externals	
%	N	%	N	%
0 - 19.9	0	0	1	4.76
20 - 29.9	4	21.05	2	9.52
30 - 39.9	3	15.80	9	42.86
40 - 49.9	5	26.32	6	28.58
50 - 59.9	4	21.05	0	0
60 - 69.9	1	5.26	2	9.52
70 - 79.9	1	5.26	0	0
80 - 89.9	1	5.26	1	4.76
90 - 100	0	0	0	0
Total	19	100	21	100

Table 13

Frequencies and Percentages on Errors

of Commission for Internals and Externals

	Internals		Externals	
Interval	N	%	N	%
1 - 2.99	1	5.76	2	9.52
3 - 5.99	5	26.32	8	38.10
6 - 8.99	7	36.84	6	28.57
9 - 11.99	5	26.32	4	19.05
12+	1	5.26	1	4.76
Total	19	100	21	100

result suggests that both groups were prudent in the selection of harmful options. The externals committed less errors at the six error and less levels (48% versus 32%). (Table 13) (p. 56)

H05 There is no significant difference between the internal and external nursing student groups in the effectiveness of problem solving as indicated by their competency indices.

The competency index represents the process and product of problem solving. A t-test was utilized to determine differences between the internal and external groups on their respective competency scores. H05 is accepted since no significant difference was found for the mean scores of competency between the internal and external students. (Table 6) (p. 47) In that the proficiency and efficiency indices comprise the competency index and were determined to be nonsignificant, the result is acknowledged.

Post Hoc Results

Locus of Control and Cue Explication

In Section A of the computer simulation, the subject had the option of seeking more data or proceeding directly into Section B. Exernals (71%) entered this option as opposed to 42% of the internals. A chi square value of 3.51 ($p<.061$) was obtained. (See Table 14) (p. 59) Although the value is not significant, it is suggested that the externals were prompted by the programme to gather more clues.

Ranking of Internals and Externals

Table 15 (p. 60) indicates that the external group were ranked higher than the internal group by the nursing faculty in the upper

two-thirds category - 71.43% versus 52.64%. A similar result was seen in ranking the competency scores of the groups (80.96% versus 62.58%). (Table 16) (p. 61)

Table 14

Chi-Square Test on Selection of Additional Information by Internals and Externals

Observed Frequency Table

Locus of control		Data Required	Data Not Required	
	I	8	11	19
	E	15	6	21
		23	17	

Expected Values

		Data Required	Data Not Required	
	I	10.93	8.07	19
	E	12.07	8.93	21
		23	17	

$x^2=3.51$ $p=.061$

Table 15

Percentage Ranking by Faculty of Internals and Externals

	Internals		Externals	
Class Interval	N	%	N	%
Upper Third	5	26.32	11	52.38
Middle Third	5	26.32	4	19.05
Lower Third	9	47.36	6	28.57
Total	19	100	21	100

Table 16

Percentage Ranking by Competency Scores

of Internals and Externals

	Internals		Externals	
Class Interval	N	%	N	%
Upper Third	7	36.42	8	38.10
Middle Third	5	26.16	9	42.86
Lower Third	7	36.85	4	19.05
Total	19	100	21	100

CHAPTER VI

DISCUSSION, RECOMMENDATIONS, AND SUMMARY

The purpose of this study was to explore the influence of locus of control on the problem-solving ability of nurses in clinical performance. Formulations of Hypotheses 1 through 5 addressed the quantifiable results of the student nurses' problem-solving processes.

This chapter will include a discussion of the hypotheses, recommendations, and conclude with a summary.

Discussion

Hypothesis 1 reflected the decision making and action taken by nurses in solving the problem. Hypothesis 2 demonstrated the discrimination and thoroughness of the nurse in the problem-solving process. Hypotheses 3 and 4 illustrated the level of agreement between the students and clinical experts on option selection. Hypothesis 5 focused on the overall effectiveness of solving the problem by nurses.

H01 There is no significant difference between internal and external nursing student groups in the decision making and actions taken in the process of problem solving as indicated by their efficiency indices.

The null hypothesis was accepted as no significant difference was noted between the internal and external groups on the basis of the efficiency index ($p<.18$). This result suggests that both groups chose a greater number of options which resulted in direct resolution of the problem.

H02 There is no significant difference between the internal and external nursing student groups in the discrimination and thoroughness of problem solving as indicated by their proficiency indices.

The mean proficiency index of the internals and externals was statistically nonsignificant. This result suggests that both groups were deficient in assessing the components of the problem, or were lacking discrimination skills in analyzing the options presented to them.

Section B of the simulation presented the student with a menu consisting of ten option categories. The option 'Pain' with a value of 4, indicating a high priority in terms of the problem, was recognized by the internals as a necessary component in assessing and implementing care for the simulated patient. By making a greater number of choices in this category, the internals demonstrated a better understanding of the relationship between the patient's symptoms and the administration of nursing care. A similar result, but not significant ($p<.06$), was seen in the 'Hydration' category, another high priority item.

H03 There is a significant difference between the internal and external nursing student groups in the agreement with the experts on the value of process and product important items as indicated by errors of omission.

The analysis of the errors of omission demonstrated a common deficit of both the internals and the externals. The number of errors of omission suggest that the student nurses were failing to react to cues in the simulation. This deficit is noted by nurse educators and

staff in the clinical setting. A frequent question to students and new graduates is, "Why didn't you see .....?" and "Why didn't you check .....?". The omission of aspects of patient care can be related to the assessment phase of the nursing process. Implementation of care cannot occur if the assessment and subsequent planning of priorities for patient care is superficial.

The externals tended to make fewer errors of omission than the internals. Descriptive data revealed that externals (58%) made up to 40 errors as compared to 37% of the internals. This suggests that the simulation presented the externals with cues which were acted upon in the resolution of the problem. This is a characteristic of the externally oriented individual (Lefcourt, 1965).

The tendency for the internals to make more errors suggests that they are more willing to take risks to achieve their goals or they found the simulation undemanding and were careless and impulsive in their choices (Lefcourt et al., 1968).

A post hoc analysis of a list of options at the commencement of the simulation revealed marginal evidence of cue usage by externals. Section A of the simulated problem offers the student the option to seek more information or proceed with the information obtained from the 'Opening Scene'. Although a significant result was not obtained ($x=3.51$, $p<.061$), there is the suggestion that the internals felt they had sufficient information to enter the main body of the simulation, while the externals responded to the cues to satisfy their need for additional information.

The area of errors of omission is seen as problematic by employers. In a survey conducted by the school under study, concern was

expressed by employers as to graduate nurses' performances in the areas of application, planning, organizing, and assessment, (L.C.C., 1981).

The implication for nurse educators in developing learning experiences is to focus on the assessment and planning stages of the nursing process. Assisting the students in these two stages, that is, developing their problem-solving abilities, should lessen the number of errors of omission and increase their level of competency in nursing practice.

H04 There is no significant difference between the internal and external nursing student groups in the agreement with the experts on the value of process and product harmful items as indicated by errors of commission.

The externals tended to commit fewer errors than internals as demonstrated by the results at the error 6 and less levels (48% vs. 32%).

The students, both internals and externals, committed fewer errors of commission as compared to errors of omission (12% versus 90%). This result suggests that students possess the knowledge to discriminate between harmful and helpful options to resolve a patient's problems. Confirmation of this suggestion was reported in a survey of graduates by employers (L.C.C., 1981).

H05 There is no significant difference between the internal and external nursing student groups in the effectiveness of problem solving as indicated by their competency indices.

The null hypothesis was accepted as no statistical significance was noted between the internal and external nursing student groups ($p<.36$).

The effectiveness of problem solving includes the process (decision making and action taking) and the product (discrimination and assessment). In the comparison of the difference of means of the efficiency process ($p>.18$) and the proficiency product ($p<.31$), it is suggested that the internal students showed a greater propensity for directness of problem resolution than the external students.

Ranking by Performance

It is interesting to note that the externals were ranked higher than internals, in terms of their performance, by the nursing faculty. A similar result was seen in ranking competency scores for the two groups. The assumption could be made that externals, because of their dependency in the clinical area, receive greater attention from nurse educators and consequently greater learning. The internals, on the other hand, tend to proceed on their own initiative and, therefore, their learning is gained through experience rather than by cues supplied by the educator.

The locus of control orientation of the clinical instructor may influence the performance level of students. Jenzen, Becker, and Hritzuk (1973) found that the internal instructor "desires more control of his environment" than the external instructor resulting in "relative rejection of student autonomy." (p. 51). Their findings also suggest that the external instructor may be able "to consider the needs, choices, basic individuality and freedom of others." (p. 52).

Locus of control orientation of clinical instructors appears to impact the performance of students. Since the orientation of

instructors in this study is unknown, the effect on student performance is postulated.

If clinical instructors are internals, externally oriented students will fare better in terms of their learning and subsequent clinical performance as dependence is a trait of the externals. In contrast, internals may reject the control of the instructor and a combative environment exists which does not promote learning and a high level of clinical performance.

It is also suggested that familiarity with the students, either in a complementary or combative way, influences the objectivity of the instructor in facilitating learning and evaluating students' performance.

RECOMMENDATIONS

1. A replication of the study in other college nursing programmes would ascertain the "conformity" aspects of student nurses which override any individualistic attributions such as locus of control. If indeed this is the case, changes in curriculums and instructional methods could be changed to enhance the learning of both internals and externals. A follow-up of the subjects as Registered Nurses would provide additional data from employers in terms of competency with the constrictions of an educational programme.

2. Further studies on the reliability and validity of computer simulation nursing programs are required for universal usage as evaluative tools. The benefits to students, in terms of learning and the objectivity of the evaluation, would lessen the stress of students normally associated with the clinical setting.

3. An expansion of the study to include generic baccaulaureate students would provide additional information on the locus of control-competency question.

4. A longitudinal study of student nurses, from entrance to graduation to practice as Registered Nurses, would provide nurse educators with data as to nursing commitment, progression, attrition, and advancement within the profession. Specifically, these data would aid in setting admission policies for educators.

5. The development of computer simulations with a specific focus on cuing would provide data to further substantiate the difference between internals and externals.

6. A study incorporating the faculty and students as subjects may provide additional insight into the process of the students' problem-solving abilities as they relate to the locus of control construct.

SUMMARY

Evidence has been amassed regarding the internals' superior level of cognitive processing as compared to that of externals (Joe, 1971; Lefcourt, 1976; Starnes & Zinser, 1983). This evidence was obtained through the use of instruments, unrelated or not specific to the actual reality and learning of the subjects. Cronbach and Snow (1977) indicated that naturalistic settings will produce "ideas far more significant for instructional psychology than he gets from isolated and artificial instructional experiments that do not penetrate beneath the post test score." (p. 390)

The use of simulations in a research setting provides the researcher with a tool that incorporates the reality of the subjects and their environment. An evaluative simulated nursing problem is directly related to the typical clinical setting where a student nurse applies her knowledge and practices her problem-solving skills. The many advantages and disadvantages of simulations have been previously discussed and contrasted to current modes of evaluating clinical performance. Notwithstanding the acknowledged deficiencies, the nursing simulation approach does provide a viable tool with which a student's problem-solving ability can be analyzed and improved with subsequent instruction.

There is a lack of agreement amongst nurses as to the definition of nursing, its components, and an universal theory of nursing. Clinical competencies are part of this dilemma. There is little agreement in the profession as to objective criteria on which to make a quantifiable assessment of a nurse's competence, both at the student and graduate level. The paucity of research in this area, perhaps, is an indication of the quandary the nursing profession finds within itself.

One area of agreement amongst nurses is that the core of nursing practice is problem solving. Although problem-solving skills have been acknowledged as a primary ability in the administration of patient care, there has been a lack of emphasis on its development in the educational setting. In order to implement a teaching strategy to promote the utilization of problem-solving approaches, knowledge about the learner is a prerequisite.

Research has demonstrated that academic success does not presuppose occupational success; thus, the product of learning (grades) provides little insight into the future competency of the student. Students' locus of control orientation may provide nurse educators with an insight into their students' future competence in nursing.

Locus of Control Implications

Demographic variables such as age (Costello, 1982), gender (Bledsoe and Baber, 1978), and life experiences (Phares, 1978) have been identified as impacting the locus of control of individuals. Although the variables of age, marital status, number of children, degrees, and health-related work experience were statistically nonsignificant between the internal and external groups, qualitative data obtained in this study suggested that the variables might be influential in their performances.

Age

Data analysis of the students show that 80.1% of the external students are in the 18-23 age category. The assumption may be made that they have gravitated toward a traditional profession that reflects their traditional external characteristics. Furthermore, the attraction to the nursing profession may be attributed to the perceived lack of control that nurses have in the health care system, that is, the environment is a controlled one. In the 23 years and older category, 63.2% were internals which may reflect their locus of control orientation. Entering a profession that is stable in terms of employment, substantial economic benefits, flexibility in terms of

location and working hours allows the internals to control their environment. The later-in-life commitment to education may also reflect their persistence in attaining previously set goals and, or, their ability to delay gratification of needs. The expectation that externals were more likely to enter the nursing programme because of the traditional aspects of nursing, was not borne out by the split between the two groups (19 vs. 21). However, the split in terms of entrance age does show a difference in orientation.

Life Responsibilities

Life responsibilities have been cited as impacting locus of control. The responsibility of children and enrolment in a nursing programme could result in a decrease of resources resulting in a lower level of achievement. Although the Number of Children category was not significant between the two groups ($p<.06$), as determined by a t-test, there is a suggestion that the internals were affected in their educational goals by this responsibility. The external group (90%) were childless as compared to 68% of the internal group.

Cooperation versus Competition

The clinical setting is a cooperative setting, with all members of the health care team acting together for the benefit of the patient. In a cooperative situation, externals have been found to perform at a level equal to that of internals (Norwicki, 1982). There may be a "spill-over" effect of this cooperative attitude in the nursing education sector. Rotter's (1975) concept of "defensive external" is an alternate explanation. The "defensive external" acts in an internal

way, striving and competitive. Both approaches may account for the similarity of scores in proficiency, efficiency, and competency indices of the externals and internals. The externals, whether it be due to the cooperative environment of the clinical setting or their "defensiveness", have increased the level of their performance in a simulated clinical setting.

Alternately, the internals may not be performing at their highest level of performance. Culturally, externality is an approved role for females and the majority of nurses are females. The health care system sanctions the dependence of nurses, and, thus, internals may overtly conform to this role in nursing education settings. One must then question a system that inhibits the independence of behavior and characteristics that are necessary for change and progression.

This research was designed to determine if internal and external nursing students differed in the efficiency, proficiency, and competency of their performance on a simulated nursing problem. Forty student nurses served as subjects. Nineteen of the subjects were classified as internals and twenty-one as externals based on their responses to the Rotter I-E Scale.

Subjects were asked to complete a computer-simulated nursing problem. Choices were made based on their assessment of the options within the program. On the completion of the program, tables of scores and indices of competency, proficiency, and efficiency were illustrated on the monitor for each participant.

The scores of both groups, internals and externals, were analyzed for differences between them. Differences were not seen in the

competency index. This in itself is significant, since homogeneity of subjects does not support a profession that must seek and adapt to changes within the profession, the health care system, and society. The efficiency aspect of the subjects produced some variable results in the analysis of the data. Cuing appears to play a major role in the assessment phase of the problem-solving process for both the internals and externals. This was evident in Section A, the initial assessment phase of the problem, and in the Sections B - K, the options for full assessment.

The proficiency aspect of the subjects' performances were not significantly different for the internals and externals, but the similarity of both groups in the errors of commission and errors of omission does point out a deficit in their performance. The high level of errors of commission and the low level of errors of omission suggest that both groups, the internals and externals, have problems with discrimination and assessment skills. This would suggest that the nursing process needs to be emphasized and utilized throughout the nursing programme and viewed by nurse educators as an essential component of nursing education.

In order for the nursing profession to remain a viable and progressive profession, nursing education must incorporate, within its curriculum and faculty, a focus which would reflect the problem-solving basis of nursing practice. It must incorporate an individualistic approach to instruction to enhance and promote the learning of students. It is in this way, that new graduates will promote changes and adapt to changes of the future.

The students' responses to the simulated patient problem indicates their willingness to use alternate modes of learning and evaluation. A composite of their comments on the form provided for them focused on two areas: 1) the advantages of practising their problem-solving skills, particularly the assessment phase, in a nonstressful situation; and 2) the objectivity of the tool for evaluation purposes. There is a reluctance of nurse educators to quantify clinical performance and to adapt instruction based on known individual needs. This may account for the lack of research in the area of clinical performance. The implication for the future of nursing is significant. If nurse educators do not define and analyze the components of nursing practice and the characteristic performance of student nurses, the reality gap between student and graduate practice will increase. This gap will exert additional stress on the new graduate and result in a deficient performance and, in some cases, eventual withdrawal of self from the profession. The implications of both cases impact the care of the patient and, ultimately, the health care system.

REFERENCES

Anastasi, A. (1976). Psychological testing. New York: MacMillan Publishing Co.

Armstrong, M. (1974). Bridging the gap between graduation and employment. Journal of Nursing Administration, 4 (6), 42-48.

Ashley, J. (1976). Hospitals, paternalism and the role of the nurse. New York: Teachers' College Press.

Barro, A. R. (1973). Survey and evaluation of approaches to physician performance measurement. Journal of Medical Education, 48, 1047-1093.

Bergman, R., Edelstein, A., Rotenberg, A., & Milaned, Y. (1974). Psychological tests: Their uses and validity in selecting candidates for schools of nursing in Israel. International Journal of Nursing Studies, 11, 85-109.

Bledsoe, J. C. & Baber, W. C. (1978). Personality correlates of locus of control among college women. Psychological Reports, 43(3), 1129-1130.

Bolin, S. E. & Hogle, E. L. (1984). Relationship between college success and employee competency ratings for graduates of a baccalaureate nursing program. Journal of Nursing Education, 23(1), 15-20.

Brehony, K. A. & Geller, E. S. (1981). Relationships between psychological androgyny, social conformity, and perceived locus of control. Psychology of Women Quarterly, 6 (2), 204-217.

Brown, R. (1983). Locus of control and sex role orientation of women graduate students. College Student Journal, 17(1), 10-12.

Burlin, F. (1976). Locus of control and female occupational aspiration. Journal of Counselling Psychology, 23(2), 126-129.

Charlesworth, W. R. (1976). Human intelligence as adaptation: An ethological approach. In L. B. Resnick (Ed.), The Nature of Intelligence (pp. 147-168). Hillsdale, N.J.: Lawrence Erlbaum Associates.

Christensen, M. G., Lee, C. A. B., & Bugg, P. W. (1979). Professional Development of Nurse Practitioners. Nursing Research, 28, 51-56.

Costello. E. (1982). Locus of control and depression in students in psychiatric outpatients. Journal of Clinical Psychology, 38, 340-343.

Cronbach. L. J. (1971). Test validation. In R. L. Thorndike (Ed.), Educational Measurement (pp. 443-507). Washington, D.C.: American Council on Education.

Cronbach, L. J., & Snow, R. E. (1977). Aptitudes and instructional methods: A handbook for research on interactions. New York: Irvington.

Davidhizar, R. E., & McBride, A. (1985). How nursing students explain their success and failure in clinical experiences. Journal of Nursing Education, 24 (7), 284-290.

Davies, J. H. & Phares, E. J. (1967). Internal-external control as a determinant of information-seeking in a social influence setting. Journal of Personality, 35, 547-561.

Dewy, J. (1910). How we think. Boston: D.C. Heath.

de Charms, R. (1976). Enhancing motivation: Change in the classroom. New York: Irvington Press.

de Tournay, R. (1971). Strategies for teaching nursing. New York: John Wiley and Sons, Inc.

Dollinger, S. J., Greening, L. & Tylenda, B. (1985). Psychological mindedness as "reading between the lines": Vigilance, locus of control, and sagacious judgment. Journal of Personality, 53 (4), 603-625.

Ducette, J. and Wolk, S. (1973). Cognitive and motivational correlates of generalized expectancies for control. Journal of Personality and Social Psychology, 26, 420-426.

Dufault, M. A. (1985). Changing the locus of control of registered nurse students with a futuristic-oriented course. Journal of Nursing Education, 24 (8), 314-319.

Duke, M. P., Shaheen, J., & Nowicki, S. (1974). The determination of locus of control in a geriatric population and a subsequent test of the social learning model for interpersonal distances. Journal of Psychology, 86, 277-285.

Duke, M. P. & Nowicki, S. (1974). Locus of control and achievement: The confirmation of a theoretical expectancy. Journal of Psychology, 87, 263-267.

Elstein, A. S., Shulman, L. S., Sprafka, S. A. (1978). Medical problem solving: An analysis of clinical reasoning. Cambridge, Mass.: Harvard Medical Press.

Field, W. E., Gallman, L., Nicholson, R., & Dreher, M. (1984). Clinical competence of baccaulaureate students. Journal of Nursing Education, 23 (7), 284-293.

Fivars, G. & Gosnell, D. (1964). Nursing evaluation: The problem and the process. New York: MacMillan Co.

Frank, C. M. (1959). Foundation of nursing. Philadelphia: Saunders.

Frieze, I. H., Whitley, B. E., Hanusa, B. H., & McHugh, M. C. (1982). Assessing the theoretical models for sex differences in causal attributions for success and failure. Sex Roles, 8, 333-343.

Gagne, E. E., & Parshall, H. (1975). The effects of locus of control and goal setting on persistence at a learning task. Child Study Journal, 5 (4), 193-199.

Gennaro, S., Thielen, P., Chapman, N., Martin, J., & Barnett, D. C. (1982). The birth, life, and times of a clinical evaluation tool, Nurse Educator, 7, 27-32.

Goldman, D. (1976). Locus of control and self-directed versus traditional learning environments. Journal of Undergraduate Psychological Research, 3, 8-13.

Gover, V. F. (1971). The development and testing of a nursing performance simulation instrument. (University Microfilms International, Ann Arbor, MI., Catalog No. 72-10,684).

Greenleaf, N. P. (1980). Sex-segregated occupations: relevance to nursing. Advances in Nursing Sciences, 2, 23-37.

Guilford, J. P. (1967). The nature of human intelligence. New York: McGraw-Hill Book Co.

Hammersted, S. M., Johnson, S.H., & Land, L.V. (1977). New graduates orientation program. Journal of Continuing Education in Nursing, 8 (5), 5-12.

Heider, F. (1958). The psychology of interpersonal relations. New York: Wiley & Sons.

Haines, P., McGrath, P., & Pirot, M. (1980). Expectations and persistence: An experimental comparison of Bandura and Rotter. Social Behavior and Personality, 8 (23), 193-201.

Hayes, J. R. (1968). Strategies in judgmental research. In B. Kleinmuntz (Ed.) (pp. 251-259), Formal representation of human judgment. New York: Wiley & Sons.

Heckhausen, H. (1967). The anatomy of achievement motivation. New York: Academic Press.

Janzen, H. L., Beeken, D., & Hritzukk, J. (1973). Teacher attitude as function of locus of control. Alberta Journal of Educational Research, 19 (1), 48-54.

Joe, V. C. (1971). Review of internal-external control construct as a personality variable. Psychological Reports, 28, 619-646.

Josefowitz, N. (1980). Paths to Power. (2nd ed.) Don Mills, Ont.: Addison-Wesley Publishing Company.

King, I. M. (1971). Toward a Theory of Nursing. New York: Wiley.

Kissinger, J. F., & Munjas, B. A. (1981). Nursing process, student attributes, and teaching methodologies. Nursing Research, 30 (4), 241-246.

Kleinmuntz, B. (1968). The processing of clinical information by man and machine. In B. Kleinmuntz (Ed.) (pp. 149-186). Formal representation of human judgment. New York: Wiley.

Krovetz, M. L. (1974). Explaining success or failure as function of one's locus of control. Journal of Personality, 42 (2), 175-189.

Kubrick, A. K. (1963). Dropouts in schools of nursing: The effect of self and role perception. Nursing Research, 12, 140-149.

Lefcourt, H. M. (1965). The American negro: A problem in expectancies. Journal of Personality and Social Psychology, 1, 337-380.

Lefcourt, H. M. (1966). Internal versus external control of reinforcement: A Review. Psychological Bulletin, 65, 206-220.

Lefcourt, H. M., Lewis, L., & Silverman, I. W. (1968). Internal versus external control of reinforcement and attention in a decision making task. Journal of Personality, 36, 363-382.

Lefcourt, H. M. & Steffy, R. A. (1970). Level of aspiration, risk-taking behavior, and projective test performance: A search for coherence. Journal of Consulting and Clinical Psychology, 34, 193-198.

Lefcourt, H. M. (1976). Locus of control: Current trends in theory and research. New Jersy: John Wiley & Sons.

Lethbridge Community College. (1981). Curriculum Proposal. Department of Nursing.

Maracek, J. & French, C. (1977). Locus of control and college women's role expectations. Journal of Counselling Psychology, 24 (2), 132-136.

Marcinek, S. A. (1978). Evaluation of clinical problem-solving among graduating baccalaureate students using computer simulation. (University Microfilms International, Ann Arbor, MI., No. 7910995).

McGuire, C. H. & Babbott, D. (1967). Simulation technique in the measurement of problem-solving skills, Journal of Educational Measurement, 4, 1-9.

McGuire, C. H., Solomon, L. M., & Bashook, B. G. (1972). Handbook of written simulations: Their construction and analysis. Chicago: Center for Educational Development, University of Illinois, College of Medicine.

McGuire, C. H., Solomon, L. M., & Bashook, B. G. (1976). Construction and use of written simulations. The Psychological Corporation.

McIntyre, H. M., McDonald, F. J., Bailey, J. T., & Claus, K. K. (1972). A simulated clinical nursing test. Nursing Research, 21 429-435.

Morgan, D. (1978). Upgrading the work of the new graduate nurse. Dimensions in Health Service, 55, 28-33.

Munro, B. H. (1980). Dropouts from nursing education: Path analysis of a national sample. Nursing Research, 29 (6), 371-377.

Muff, J. (1982). Why doesn't a smart girl like you go to medical school? The women's movement takes a slap at nursing. In J. Muff (Ed.) Socialization, sexism and stereotyping and women's issues in nursing. St. Louis: C.V. Mosby.

Mussalem, H. K. (1965). Nursing education in Canada. Royal Commission on Health Services. Ottawa: Queens Printer.

Newell, A. & Simon. (1972). Human problem solving. Englewood Cliffs, N.J.: Prentice-Hall.

Nightingale, F. (1946). Notes on Nursing. Philadelphia: Lippincott & Co. (facsimile of 1859 edition).

Nowicki. S. (1982). Competition-cooperation as a mediator of locus of control and achievement. Journal of Research in Personality, 16 (2), 157-164.

Nursing manpower needs in Alberta - Current and future. (1980). Edmonton: Alberta Association of Registered Nurses.

Olson, D. R. (1977). The languages of instruction: The literate bias of schooling. In R. C. Anderson (Ed.), Schooling and the acquisition of knowledge (pp. 65-89). New York: John Wiley and Sons.

Orlando, I. M. (1961). The dynamic nurse-patient relationship. New York: Putnam & Sons.

Owie, I. (1983). Locus of control, instructional mode and students' achievement. Instructional Science, 12, 383-388.

Page, G. G. & Saunders, P. (1978). Written simulations in nursing. Journal of Nursing Education, 17, 28-32.

Page, G. G. & Fielding, D. W. (1980). Performance on pmp's and performance in practice: Are they related? Journal of Medical Education, 55, 529-537.

Peplau, H. E. (1952). Interpersonal relations in nursing. New York: Putnam.

Phares, E. J. (1976). Locus of control in personality. Morristown, N.J.: General Learning Press.

Position Paper on hospital needs from the nursing education system. (1978). Edmonton: Alberta Hospital Association.

Report of the Alberta Task Force on Nursing Education. (1975). Alberta: Advanced Education and Manpower.

Revised registered nurses data series. (1980). Ottawa: Statistics Canada.

Rotter, J. B., Liverant, S., & Crowne, D. P. (1961). The growth and extinction of expectancies in chance controlled and skilled tasks. Journal of Psychology, 52, 161-177.

Rotter, J. B., Seeman, M., & Liverant, S. (1962). Internal versus external control of reinforcement: A major variable in behavior theory. In N. F. Washburne (Ed.) Decisions, values, and groups (pp. 473-516). New York: Pergamon Press.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 80, (1, Whole. No. 609).

Rotter, J. B., Chance, J. E., & Phares, E. J. (Eds.) (1972). Application of Social Learning Theory. New York: Holt, Rinehart, & Winston Inc.

Rotter, J. B. (1975). Some problems and misconceptions related to the construct of internal versus external control of reinforcement. Journal of Consulting and Clinical Psychology, 48, 56-67.

Rouleau, W. I. (1890, April). A nursing dialogue. Presented at a meeting of the Alberta Association of Registered Nurses.

Schneider, J. M. (1971). College students' beliefs in personal control, 1966-1970. Journal of Individual Psychology, 27, 188.

Schwirian, P. M. (1977). Prediction of successful nursing performance. DHEW Publication No. HRA 79-15. Washington.

Sedlacek, W. E. & Nattress, L. W. (1972). A technique for determining the validity of patient management problems. Journal of Medical Education, 47, 263-266.

Starnes, D. M. & Zinser, O. (1983). The effect of problem difficulty, locus of control, and sex on task persistence. Journal of General Psychology, 108, 249-255.

Steed, M. E. (1974). An evaluation of students and graduates of college nursing programs in the province of Alberta. Department of Advanced Education for the Committee on Nursing Education, Universities Co-ordinating Council.

Steitz, J. (1982). The female life course and life situations and perceptions of control. International Journal of Aging and Human Development, 14 (3), 195-204.

Strickland, B. (1965). The prediction of social action from a dimension of internal-external control. Journal of Consulting and Clinical Psychology, 4, 319.

Sumida, S. W. (1972). A computerized test for clinical decision making. Nursing Outlook, 20, 458-461.

Sweeny, M. A., O'Mailey, M., & Freeman, E. (1982). Development of a computer simulation. Journal of Nursing Education, 21 (9), 28-38.

Warehime, R. G. (1972). Generalized expectancy for locus of control and academic performance. Psychological Reports, 30, 314.

Weiner, B. (1979). A theory of motivation for some classroom experiences. Journal of Educational Psychology, 71, 3-25.

Wertheimer, M. (1959). Productive Thinking. New York: Harper & Row.

Williams, J. G. & Stark, J. J. (1973). Internal-external control as a situational variable in determining information seeking by Negro students. Journal of Consulting and Clinical Psychology, 39, 187-193.

Wilson, (1971). An analysis of feminity in nursing. American Behavioral Scientist, 15, 213-220.

Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. (1977). Field-dependent and field-independent cognitive styles and their educational implications. Review Educational Research, 47, 1-64.

Wolk, S. & DuCette, J. (1974). Intentional performance and incidental learning as a function of personality and task dimensions. Journal of Personality and Social Psychology, 29, 29,90,101.

Wolk, S. & Kurtz, J. (1975). Positive adjustment and involvement during aging and expectancy for internal control. Journal of Consulting and Clinical Psychology, 43 (2), 173-178.

Young, R. A. (1984). Vocational choice and values in adolescent women. Sex Roles, 10 (7-8), 485-492.

Yura, H. & Walsh, M. (1978). The nursing process. (3rd ed.). New York: Appleton-Century-Crofts.

APPENDIX A

LETTER OF PERMISSION

from

SALLY MARCINEK, RN., PHD.

3900 Stoneridge Road
Austin, TX 78746
June 20, 1985

2510-20 Avenue South
Lethbridge, Alberta T1k 1G6
Canada

Dear Maureen,

We have talked about your study different times over the past several months. From our first contact you had my permission to use the computer simulation that I had authored as part of my dissertation studies.

Please accept this letter as formal consent for you to use my simulation.

I certainly wish you the best in your future in nursing.

Most sincerely,

Sally Marcinek

Sally Marcinek, RN, PhD

APPENDIX B

COMPARISON OF STUDENT NURSES' AND REGISTERED NURSES' SCORES ON EFFICIENCY, PROFICIENCY, AND COMPETENCY

COMPARISON OF STUDENT NURSES' AND REGISTERED NURSES' SCORES ON EFFICIENCY, PROFICIENCY, AND COMPETENCY

Variables	Number	Mean	Standard Deviation	t-value*	p
Efficiency					
Students	47	77.78	6.671	-3.79	0.007
Registered Nurses	14	83.93	4.91		
Proficiency					
Students	47	46.99	14.41	-3.52	0.0019
Registered Nurses	14	61.40	13.50		
Competency					
Students	47	42.167	13.673	-3.74	0.0011
Registered Nurses	14	56.50	12.500		

*two-tailed test

APPENDIX C

COMPARISON OF MEANS OF INTERNAL AND EXTERNAL STUDENT NURSES' AND REGISTERED NURSES' SCORES ON EFFICIENCY, PROFICIENCY, AND COMPETENCY

COMPARISON OF MEANS OF INTERNAL AND EXTERNAL STUDENT NURSES' AND REGISTERED NURSES' SCORES ON EFFICIENCY, PROFICIENCY, AND COMPETENCY

Variables	Number	Mean	Standard Deviation	t-value*	p
Efficiency					
Internal Students	19	76.236	6.115	-3.94	0.0005
Registered Nurses	14	83.93	4.91		
External Students	21	79.222	7.443	-2.28	0.029
Proficiency					
Internal Students	19	45.801	15.627	-3.15	0.0037
Registered Nurses	14	61.4	13.5		
External Students	21	49.651	14.398	-2.48	0.019
Competency					
Internal Students	19	40.883	14.785	-3.40	0.0020
Registered Nurses	14	56.5	12.5		
External Students	21	44.867	13.672	-2.61	0.014

*two-tailed test

APPENDIX D

CORRELATION MATRIX OF DEPENDENT VARIABLES FOR INTERNAL AND EXTERNAL STUDENTS

CORRELATION MATRIX OF DEPENDENT VARIABLES FOR

INTERNAL AND EXTERNAL STUDENTS

	Clinical Grade		Theory Grade		G.P.A.	
Variables	Internal N-10	External N-21	Internal N=19	External N-21	Internal N=19	External N=21
Efficiency	0.193	0.269	-0.011	0.110	0.137	0.225
Proficiency	0.359	0.179	0.081	-0.013	0.207	-0.003
Competency	0.346	0.178	0.075	-0.016	0.203	0.007

APPENDIX E

CONSENT FORM

Dear Nursing Student:

My name is Maureen J. Peszat. I am a nurse currently enrolled as a MSc candidate in the Department of Educational Psychology at the University of Calgary. My thesis focuses on whether locus of control, a personality characteristic, is related to performance in the practice of nursing.

You are invited to participate in this study. If you decide to participate, you will be asked to: 1) supply background information about yourself; 2) take a paper and pencil test (The Rotter Internal-External Locus of Control Scale); 3) solve a computer-simulated nursing problem; and 4) allow the Chairperson of the Nursing program to provide the investigator with your nursing grade point averages.

To participate, you would need to attend two different testing sessions lasting a total of between one and two hours. Testing sessions will be scheduled outside of class and clinical time, and at your convenience.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will not be disclosed to anyone. You will be assigned a code number to protect your identity. The master identification list will be destroyed as soon as it is no longer necessary for data collection purposes. At the completion of the study, all identifiable material will be destroyed.

You are free to withdraw your consent and to discontinue participation at any time, without prejudice.

You will be given a copy of this form to keep.

_____

Signature

_____

Date

APPENDIX F

OPENING SCENE - COMPUTER SIMULATION

You are the R.N. in charge of 25 patients in an acute care hospital. You have one aide working with you. It is 23:00 hours. You receive report on 24 patients, all of whom had been in the hospital when you worked last night. The evening nurse says, "All these patients seem stable; I think everyone should sleep through the night."

Next you are told the following:

Miss Tammy Dane, white female, age 21, 5 feet 6 inches tall, 110 pounds, was admitted at 22:30 hours tonight. She has no known allergies.

She started having diarrhea about 3 weeks ago, with 1-2 stools per day. It progressed to about 8 stools per day 3 days ago. At that time she came to the hospital, and Dr. Barr put her on Lomotil, ii, tid. The diarrhea has since increased to 10-12 stools today, and she saw Dr. Barr about 17:00 hours this afternoon. He advised her to be admitted if the diarrhea didn't let up. She called him later to say she'd decided to come in, and he called in these orders:

Imodium 4 mgm. stat
Imodium 2 mgm. after each stool - not to exceed 16 mgm./day
Morphine Sulfate 8 mgm. to 10 mgm. with Phenergan 25 mgm. I.M. for pain
Clear liquid diet
Note number, color, and consistency of stools

In the morning she's to have:

Chest film
SMA 12
CBC and urinalysis
Stool specimen for quaic, ova and parasites, fat smear, and culture

Her vital signs on admission were:

TPR: 37-88-20
BP: 120/76

She was complaining of some cramping abdominal pain, but I haven't had a chance to give her anything yet.

Oh yes, I did give her the STAT dose of Imodium. All her meds are here, and the tests are ordered. The specimen containers are in her bathroom.

She seems real nice. She brought her books with her; she said she didn't want to fall behind in her classes while she's in here.

She did mention being in Mexico some time ago.

Dr. Barr said he'd see her in the morning.

*NOTE: Reprinted with the permission of the author. (Marcinek, Sally A. Evaluation of Clinical Problem Solving Among Graduating Baccalaureate Nursing Students Using Computer Simulation. (Doctoral Dissertation, University of Texas at Austin, 1978). DISSERTATION ABSTRACTS INTERNATIONAL 1979. (UNIVERSITY MICROFILMS No. 79-10995)