FACTORS INFLUENCING IMPLEMENTATION OF INNOVATIONS IN CLINICAL NURSING EDUCATION

by

Lynn Louise Bartlett Nugent

A Dissertation Submitted to the Faculty of the

CENTER FOR THE STUDY OF HIGHER EDUCATION

In Partial Fulfillment of the Requirements
for the Degree of

DOCTOR OF PHILOSOPHY

In the Graduate College

THE UNIVERSITY OF ARIZONA

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Factors influencing implementation of innovations in clinical nursing education

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As members of the Final Examination Committee, we certify that we have read the dissertation prepared by Lynn Louise Bartlett Nugent entitled FACTORS INFLUENCING IMPLEMENTATION OF INNOVATIONS IN CLINICAL NURSING EDUCATION

and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy

Larry L. Leslie	3/4/92 Date
Sheila Slaughter	3/4/92 Date
Gary Rhoades	3/4/92 Date
	Date
	Date

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copy of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

Dissertation Director Larry L. Leslie — 3/4/92 Date

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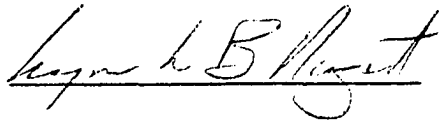
SIGNED: 

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ABSTRACT

The purposes of this study were to determine whether associate degree nursing (ADN) programs were implementing innovations in their clinical curricula, to identify recent clinical innovations in these nursing programs, and to identify attributes of innovations that influence innovation adoption.

Data were obtained from two questionnaires to all directors of ADN programs in six southwestern states. The first questionnaire asked respondents to identify clinical innovations they had considered recently. The second questionnaire used a Likert Scale to seek respondents' perception of six attributes of innovations--Relative Advantage, Compatibility, Complexity, Observability, Trialability, and Cost--that come from diffusion theory.

Analysis of data indicated that 77% of the respondents had implemented changes in their clinical curriculum during the past six years. The most frequently implemented innovations were computer assisted instruction, preceptorship experiences, clinical competency exams, initiating or increasing use of skills labs, and work-study/externship experiences. Likert Scale values for perceptions of the six attributes, along with a variable created to represent the influence of the Environment, were analyzed by principal component analysis and logistic

regression analysis. These analyses led to the conclusion that no one or two variables can be used to predict adoption of an innovation. Instead, a model with each of the attributes should be used in predicting adoption.

These findings generally supported the model provided by diffusion theory. However, the influence of Trialability was negligible. Additionally, the Environment variable was found to be an important influence in a favorable adoption decision.

Nursing program directors who seek to implement innovations could enhance successful implementation by emphasizing the positive aspects of all attributes of a proposed innovation.

CHAPTER 1

INTRODUCTION

Statement of the Problem

Nursing is an emerging profession. As such, it is striving to develop a strong theoretical base and an esoteric body of knowledge. During the course of their education, nursing students learn the profession's knowledge base, skills, values, perspectives, and ethics. In the 1940s, 50s, and 60s, nursing education programs moved from hospital settings into colleges and universities. The theory-based component of the curriculum was strengthened and the time spent in clinical experiences was reduced (Waters, Limon & Spencer, 1983: Myrick, 1988). With the change, nursing service personnel expressed concern about the clinical proficiency of new graduates and about the time and money required for longer orientation programs for the graduates they hired. Due to a lack of knowledge of the norms and values of the work setting and lack of clinical skills expected of the nurse, the graduates themselves experienced profound reality shock in their first nursing jobs (Kramer, 1974; Turkowski, 1987) and many left the profession.

Due to recent trends in health care, the demand for nurses with strong clinical skills is increasing. This situation has led to pressures from nursing leaders

(Lindeman, 1989; "'Time is Short,'" 1989) and others (Department of Health and Human Services, 1988) on nurse educators to make innovative changes in nursing education programs. These pressures impact on associate degree nursing programs. These programs prepare registered nurses to work in structured settings such as hospitals or long term care facilities, settings where strong clinical skills are valued by employers.

The study of the process of implementation is relatively recent. Pressman and Wildavsky (1979), in an extensive literature search, found little research on implementation. Their book in 1979 led to much interest and further study of implementation.

Implementation of innovation or change in an education system is "a difficult and uncertain process" (Berman and McLaughlin, 1976, p. 349). Higher education institutions tend to resist change, yet change is necessary to maintain vitality (Hefferlin, 1969). Innovations result from changes in one's environment and from a recognized need to perform in new and different ways. Many factors may influence the implementation of an innovation. Understanding these factors can assist those who recognize the need for innovation and are considering innovation implementation.

Purpose of the Study

The purposes of this study were (1) to determine whether associate degree nursing programs are implementing innovations in their clinical curricula, (2) to identify recent clinical innovations in these nursing programs, and (3) to identify attributes of innovations that influence adoption of innovation.

Research Questions

1. Are associate degree nursing programs considering and implementing innovations in the clinical component of their curricula?

2. What are the innovations that have been considered in the clinical component of the curriculum in associate degree nursing programs in the last six years?

3. Is there a difference in perception of attributes of an innovation between adopters and nonadopters of the innovation?

4. What is the relative importance of the various attributes in explaining the adoption of innovations?

5. Do the attributes that facilitate and inhibit adoption differ among innovations?

6. Does diffusion theory adequately describe the attributes of innovations that are adopted?

7. What are the implications of the answers to these questions to implementing clinical innovation successfully in associate degree nursing programs?

Hypotheses

The following hypotheses were tested:

1. Nursing programs are making changes in the clinical component of their curricula.

2. Perception of the attributes of a proposed innovation influences the decision to adopt the innovation.

3. All of the attributes reflected in Rogers' (1983) theory, plus a created variable representing the Environment, are essential to explaining adoption of innovations: however, some of the attributes may be more important than others.

Conceptual Framework

The term innovation is used in several different contexts in the literature (Aiken & Hage, 1971). Some authors limit the term to the first use of a product or an idea by an organization while others include those products or ideas that originate elsewhere and are then incorporated into another organizational setting. Levine (1980) states that innovation combines elements of "reform," implying new, and "change," implying different. Levine defines innovation as "any departure from the traditional practices of an organization." He adds, "the element of newness

inherent in innovation is a relative phenomenon--what is new in one place is old in the next... much that we call innovation is in fact renovation, trying the ideas of the past once again" (p.4).

Rogers and Shoemaker use a broad definition of innovation as "an idea, practice or object perceived as new by the individual" (1971, p. 19). Zaltman, Duncan, and Holbek (1973) expand the definition from "individual" to "units of adoption," which can range from individuals to organizations as a whole. Innovations can range from minimal, involving very small change, to major, involving large scale change. Dill and Friedman (1979) emphasize that innovation is a process. They state that innovation is oriented toward institutional improvement, such as development of the organization, faculty or instruction.

In the present work, the views of Zaltman et al. (1973) and Dill and Friedman (1979) will be combined such that innovation will be understood to mean that innovation is a process of introducing an idea or practice that is perceived as new by the nursing director and faculty in the nursing program, the unit of adoption. This definition incorporates the definition of Rogers, who provides the framework for this dissertation, and expands it to include more than one individual. This approach is useful, as the adopting unit

in a nursing program is usually a committee or the total faculty.

The study of innovation can be approached from many frameworks. Dill and Friedman (1979) and Kozma (1985) identify and critique four major frameworks for studying innovation and change. These four approaches are 1) complex organization, 2) diffusion, 3) conflict, and 4) planned change. Chapter 2 will present an elaboration of the four major frameworks, with an emphasis on the diffusion framework which will be the framework for this study.

Rogers (1983) defines diffusion as "the process by which an innovation is communicated through certain channels over time among members of a social system" (p. 34). Variables that are studied by researchers using this framework include communication patterns, characteristics of individuals or groups involved in considering innovation adoption, the innovator's social system, and the attributes or characteristics of innovations. The work of Rogers (1962, 1983) and Rogers and Shoemaker (1971) reviews previous research that used the diffusion framework and forms a basis for much of the more recent research using this framework.

In the adoption decision process described by Rogers (1983), the stage in which a decision is made about adopting an innovation is immediately preceded by the persuasion

stage. During the persuasion stage, the individuals in the adopting unit form an attitude toward an innovation, based on the unit's perception of the attributes or characteristics of the proposed innovation. Then in the decision stage, this attitude about the innovation influences the adoption decision. A favorable attitude toward an innovation tends to lead to a decision to adopt it, while an unfavorable attitude tends to lead to rejection. Zaltman, Duncan, and Holbek referred to attributes as "important mediating factors between the need and/or desire to adopt an innovation and its actual use" (1973, p. 50).

Diffusion theory (Rogers, 1983) was selected as the framework for this study principally because the interest of the researcher was in identifying the aspects of the innovation itself, rather than organizational structures or organizational power and authority relationships, that might affect innovation adoption. This interest derived from the researcher's own experience and observations as a professional nursing educator that it is the characteristics of the innovations that may be critical to adoption. Further, the researcher's interest was in developing innovation strategies that were independent of the particular characteristics of the organization in which the innovation might be applied. This is not to say that

structural or organizational variables are unimportant, but rather that the aim was to focus on what might be labeled the ceteris paribus (all else equal) conditions, i.e., the characteristics of the innovations themselves.

Definitions

Associate degree nursing program--a program of instruction, usually in a community college, leading to an associate degree with a major in nursing and eligibility to take the examination for licensure as a registered nurse.

Innovation--the process of introducing "any idea, practice, or material artifact perceived to be new by the relevant unit of adoption" (Zaltman, Duncan, and Holbek, 1973).

Instructional innovation--an innovation in education at the level of delivery of instruction, i.e., new instructional practices.

Adopting unit--the unit of analysis in this study, i.e., the associate degree nursing program.

Adopters--associate degree nursing programs that have implemented the innovation under study or plan to do so during the current academic year.

Nonadopters--associate degree nursing programs that have not implemented the innovation under study.

Preceptorship--a clinical experience during which the student is paired with and works under the supervision of an experienced registered nurse.

Computer assisted instruction (CAI)--"a method of instruction in which the computer takes on the role of the teacher" (Murphy, 1984, p. 219). In this study, CAI includes interactive videodiscs.

Clinical competency examination--an examination during which the student must demonstrate mastery of a clinical skill or skills.

Skills/simulation laboratory--a setting in which students can practice skills before or instead of practicing in a client care situation. Skills or simulation labs have been used by nursing programs as an opportunity for students to practice new skills.

Work-study/program--"a program planned to give high school and college students work experience" (Webster's, 1987).

Assumptions

1. Associate degree nursing programs have a clinical component in their curriculum.

2. Clinical preceptorships, computer assisted instruction, initiating or increasing use of skills/simulation labs, clinical competency examinations,

and work-study/externship experiences are innovations in nursing programs.

3. The nursing program is the adopting unit for program innovations.

Limitations

1. This dissertation studied associate degree nursing programs in six states; results may not be generalizable to programs in other states, especially to those states having state nursing board rules and regulations that place limitations on an innovation.

2. This dissertation studied associate degree nursing programs; results may not be generalizable to nursing programs in colleges and universities that award the baccalaureate degree.

3. This dissertation studied innovations in the clinical component of the curriculum of associate degree nursing programs; results may not be generalizable to other components of the curriculum.

4. Data were obtained from individuals, the nursing program directors, although in nursing programs the decision to adopt an innovation is usually made collectively by a group, e.g., a committee or the total faculty.

CHAPTER 2

LITERATURE REVIEW

While there is a vast amount of literature on the subjects of implementation and innovation, this review of literature will discuss innovation in higher education, in particular, the different frameworks from which innovation has been studied. The diffusion framework will be elaborated upon and then research on the attributes of innovations will be discussed. Because the field of study for this dissertation is nursing, the history of nursing education will be reviewed and some of the current issues in the health care field affecting the clinical preparation of nursing students will be presented.

Institutions of higher education have tended to resist change (Hefferlin, 1969; Berman & McLaughlin, 1976; Reitman, 1981). Some of the reasons that have been identified for this reluctance to change are comfort with the status quo, lack of resources, and conservatism of members of the organization. However, vitality of an institution is achieved by continuous change as conditions change, not by clinging to the status quo (Hefferlin, 1969).

It is widely acknowledged (Zaltman, Florio & Sikorski, 1977) that most change in the field of education is externally generated, i.e., originating in the external environment of the educational institution. Innovation is

likely to occur when there is a change or crisis in the environment and when change is consistent with the "spirit of the times" (Levine, 1980). However, for the change process to begin, an individual or group must perceive the need for change. Zaltman, Duncan, and Holbek (1973) labeled this the "knowledge-awareness" substage.

Berman and McLaughlin (1976) identified factors that initiate this first phase of the innovation process: local need, availability of funds, a good idea, and incentive of individual actors. Hefferlin (1969) studied academic reform in 110 colleges and came to similar findings. He found three dominant sources of change in higher education--resources, interested advocates, and openness of the system. However, when the decision to adopt an innovation is an individual decision, rather than a group decision, the "innovation does not derive from a contextual or organization need...Rather, the specific motivations for the change vary for individual adopters, but all were egocentric" (Kozma, 1985, p. 309-310).

Innovation can be studied from several different perspectives. DiMaggio and Powell (1983) contend that as organizational fields and professions emerge, changes within the fields are less driven by competition or efficiency than by changes that "occur as the result of processes that make organizations more similar without necessarily making them

more efficient" (p. 147). They label these changes as "isomorphic processes."

There are three of these isomorphic processes--coercive, mimetic, and normative. Coercive processes are pressures for innovation on an organization "by other organizations upon which they are dependent and by cultural expectations in the society within which organizations function," (DiMaggio & Powell, 1983, p. 150). Mimetic processes are those innovations that come about by modeling other organizations that are perceived to be more successful. This is most likely to occur in times of uncertainty.

The third process is the normative process. DiMaggio and Powell describe this as development of norms stemming from professionalization. The "legitimation in a cognitive base produced by university specialists" (p. 152) and development of professional networks through which new innovations diffuse rapidly contribute to isomorphism via the normative process.

Other approaches to the study of innovation are the four major frameworks reviewed by Kozma (1985) and Dill and Friedman (1979). The first is the complex organization framework. In this framework, innovativeness in a social system, such as an organization, is correlated with variables of that organization. Variables studied in this

framework include organizational complexity, age, size, and formalization.

Another framework, the conflict framework, also called the power-coercive approach, considers change as a confrontational process among groups or individuals in a system resulting from differing interests and needs. The case history approach is often used for the conflict framework to examine the dynamics and describe the process of a change or innovation within an institution. Issues such as power, status, control of resources, and interest groups are the variables in this framework.

The third framework is that of planned change. The change agent, his/her leadership styles, and change strategies are examined. This framework lacks a unifying theory although it has been influenced heavily by the "human relations" perspective in organizational theory (Dill & Friedman, 1979).

While the above frameworks, provide several approaches to innovation, the purposes of this dissertation are not addressed by using structuralist or conflict frameworks. Use of the diffusion theory framework, the fourth major framework, allows focus on the influence of the characteristics or attributes of an innovation on the decision to adopt the innovation. A description of

diffusion theory, with emphasis on the attributes of an innovation, is presented next.

Diffusion Framework

Rogers (1962) defines the diffusion process as "the spread of a new idea from its sources of invention or creation to its ultimate users or adopters" (p. 20). Rogers (1983) identifies five stages in the process of adoption of an innovation. The first stage is knowledge, the point at which an individual or other decision-making unit is exposed to the innovation and begins to gain information about how it functions. Next, during the persuasion stage, the individual seeks new information about the innovation and forms an attitude toward it. Information and advice about the innovation may be sought from peers at this point. It is during this stage that the characteristics or attributes of the innovation are especially important. The third stage is that of decision, when the individual decides whether to adopt the innovation. This stage often includes trying the innovation on a small scale. The fourth stage is that of implementation, when the innovation is put into use. Finally, during the confirmation stage, the individual makes a decision about continuing use of the fully implemented innovation.

When studying innovation from the diffusion framework, several different elements can be examined. These elements

include communication of the innovation, adopting unit characteristics--individuals, units of an organization, whole organizations, families, etc.,--and characteristics or attributes of the innovation. The rate of diffusion is often the dependent variable in diffusion studies. The relationship of the diffusion rate to other elements or variables is examined.

This study will briefly review other elements of the diffusion framework and then focus on attributes of the innovation. These attributes are the specific innovation features that help or hinder its adoption. They are "important mediating factors between the need and/or desire to adopt an innovation and its actual use" (Zaltman, et al., 1973, p. 50).

Communication

Zaltman et al. (1973, p. 14) describe diffusion as the "process by which an innovation is spread through communication channels to members of a social system." This dissemination occurs by formal methods such as books, journals, workshops, advertising as well as through informal means, such as personal interactions. Formal, impersonal methods lead to initial awareness of an innovation. When a potential adopter enters the persuasion stage of the adoption process, more personal interactions, usually with

peers, are actively sought to obtain specific information about attributes of the innovation (Rogers, 1962, 1983).

Opinion leaders are important to the dissemination of information about an innovation and are an essential component of the successful change process (Conrad, 1980). They are people to whom others turn for advice. They have credibility based on expertise, experience, or social role. Though "the impetus for change usually emanates from individual faculty members" (Conrad, 1980, p. 105), opinion leaders have influence in persuading others to adopt an innovation. They "'consensually validate' other individuals' perceptions of a new idea, and enhance or retard the adoption of innovation" (Rogers, 1962, p. 304).

Characteristics of Individuals

Rogers (1962, 1983) identifies an association between values of individuals and the rate at which they adopt innovations. Those who are innovators, the first to propose and try new ideas, value venturesomeness, they take risks and are "like circuit riders who spread new ideas as their gospel" (Rogers, 1962, p. 169). Academic innovators tend to be more cosmopolitan; i.e., they tend to identify with their professional groups outside the institution that employs them. The next major group to try out innovations, the early adopters, value respect from their peers. Many opinion leaders are in this category. The majority of

adopters fall into the next group, and are further divided as the "early majority" and "late majority" groups. Laggards value tradition and status quo and are the last to adopt an innovation, if they adopt it at all. They tend to be "local" in their orientation, i.e., they have contact primarily with colleagues whose values are similar to their own.

Resistance

Resistance to an innovation can occur at the individual level as well as at the organizational level. Resistance results when the innovation is inconsistent with the individual's or unit's philosophies or preferred ways of doing things. Evans (1982) found the following:

> The basic reason for resistance apparently lies in the fact that most higher educational systems are organized to accommodate a traditional instructional process. This process relies heavily on professor-centered instruction, which in turn depends primarily on the use of printed materials...Any intrusions of an innovation in this system may be regarded as controversial and threatening by many (perhaps most) individuals at each level of the system. Higher education systems are not planned, staffed, financed, built or programmed (except for a few experimental

efforts) to do more than continue the traditional approach (pp. 95-96).

Individual or Collective Adopters

Another element that is important to the implementation and success of the innovation, is whether more than one person is involved in adoption decisions. In most of the educational innovations Kozma (1985) studied, adoption of instructional innovation represents a personal decision by an individual, usually the project director. The decision to adopt an innovation is based on personal or professional development, i.e., obtaining a grant or publishing a journal article, rather than on organizational or student needs. These innovations tend to be discontinued when the adopter's personal goal is achieved or funding ends.

A small minority of the adoptions in the Kozma study were adopted as the result of a group process. These were labelled collaborative innovations. The motivation for these innovations was an identified organizational or group need. Members of the group were involved in decisions relative to adopting the innovation. Ownership of both the need and development of the innovation was shared and people were committed to the projects. Kozma found that resistance did not develop when decisions were reached by consensus of members. These projects frequently were adopted by other

colleagues and were supported by the institution when external funding expired.

Berman and McLaughlin's (1976) findings agreed with Kozma's. "Projects generated essentially by opportunism seemed to be a response to available funds and were characterized by a lack of interest and commitments on the part of local participants" (Berman & McLaughlin, 1976, p. 351). Little in the way of serious change was ever attempted. However, when innovations emerged from colleagues working together to resolve locally identified needs, members were committed to the innovations.

Another characteristic Dill and Friedman (1979) identify is one's past record of innovativeness. Those who have been innovative in the past tend to continue to remain innovative.

Attributes of the Innovation

During the persuasion stage of adoption, the potential adopter evaluates the innovation. The characteristics or attributes of the innovation form the basis on which one decides to adopt or to reject the innovation.

Rogers (1962) provided a list of attributes of innovations "which are as mutually exclusive and as universally relevant as possible" (p. 124). Rogers and Shoemaker (1971) reviewed over 1500 studies on innovation and found relationships between Roger's attributes and

adoption of an innovation. These critical attributes were relative advantage, compatibility, complexity, trialability, and observability. Rogers and Shoemaker found that relative advantage, compatibility, trialability and observability, as perceived by members of a social system, were positively related to rate of adoption of innovation. However, complexity was not related to rate of adoption. Each of the attributes will be discussed next.

Relative advantage

Relative advantage is "the degree to which an innovation is perceived as being better than the idea or practice that it supersedes" (Rogers, 1983, p. 213). Relative advantage is one of the best predictors of an innovation's rate of adoption (Rogers, 1983). Rogers and Shoemaker (1971) describe relative advantage as an indicator of the intensity of reward or punishment resulting from the adoption of the innovation. This refers to either material or nonmaterial gain and is based on the perceptions of the adopting unit. There are many components to relative advantage. These include degree of economic profitability, low initial cost, lower perceived risk, decrease in discomfort, savings in time and effort, and immediacy of the reward. Social gain is another type of relative advantage.

In education, the relative advantage of an innovation is usually a perception that it will lead to an improvement

in learning. However, it is often impossible to show in advance that an instructional innovation will give this result. This is one of the fundamental problems associated with innovation in education (Nicholls, 1983).

The element of risk is an aspect of relative advantage. Chatman (1986, p. 378) defines risk as "the degree of gamble or chance, with the possibility of loss, associated with an innovation." In reviewing studies of diffusion, Chatman finds that perception of reduced risk is associated with acceptance of innovations.

Another relative advantage for the prospective adopting unit is the perception that an innovation responds to the environmental pressures. DiMaggio and Powell (1983) identify coercive pressure from those in the organization's environment as a reason for innovation. Environmental events such as a crisis, depression, and war are factors that influence the perceived relative advantage of an innovation (Rogers and Shoemaker, 1971). Sometimes these events accelerate adoption of an innovation while at other times they slow the process. Strong promotional events by external change agents, such as offering incentives, increases the potential adopters' perception of relative advantage of an innovation.

Cost

Rogers (1962) includes profitability as a dimension of relative advantage. Rogers defines profitability as "the difference between economic returns resulting from adoption of an innovation and the innovation's economic cost" (p. 126). Others (Zaltman et al., 1973; Lin & Zaltman, 1973) separate cost as a separate characteristic of innovations. Cost includes money, time, and social costs. Both cost and the ability of a potential adopter to obtain resources to implement the innovation influence adoption. With some types of innovations, including many educational innovations, economic return is difficult to measure.

In their review of studies of innovation, on the other hand, Lin and Zaltman (1973) report a positive correlation between initial cost and adoption rate. They speculate that "there is a cost-quality relationship which states that the more expensive an innovation is, the higher its perceived quality" (Lin & Zaltman, 1973, p. 100).

Lack of resources was the reason given most often for not adopting an innovation in several studies (Kozma, 1985; Hebda, 1988; Kehr, 1986). Hebda (1988) conducted a nationwide survey of 441 baccalaureate nursing programs to determine the level of use of computer assisted instruction (CAI). Inadequate funding was given as the major reason for not using CAI among nonusers. Kehr (1986) studied adoption

of personal computers among faculty members of a university. Price and the product's attributes were found to be the variables most influential in the early phases of consideration of adoption of personal computers.

However, Berman and McLaughlin (1976) had different findings. They found "money in and of itself did not stimulate support, commitment, or interest in change" for the educational innovations they studied (Berman & McLaughlin, 1976, p. 363).

Time is necessary for planning and implementing an innovation. The extra workload involved may inhibit the implementation (Nicholls, 1983). Kozma (1985) describes the importance of time:

> "Innovations, even those not funded externally, require time and/or other resources, such as technical assistants and equipment...the innovations studied were rarely implemented in addition to faculty members' regular activities. Released time, whether in the form of a reduced course load or as summer salary, is critical to the planning, development, and implementation of the innovation (p. 308).

Another cost characteristic is the requirement for logistical support such as energy, supplies, service, etc.

(Brown, 1981). Lack of these resources inhibits adoption of an innovation requiring them.

Another cost of innovation is its social cost. This may include ridicule, ostracism or even exclusion from a group (Zaltman et al, 1973). Nicholls (1983) identifies the difficulty implementing innovations when teachers feel less secure and competent with new practices.

There may also be a social cost in not adopting an innovation. Early adopters of innovation are driven by the desire to improve performance. However, as an innovation spreads, adoption provides legitimacy rather than improvement in performance (DiMaggio & Powell, 1983).

Compatibility

Compatibility is "the degree to which an innovation is perceived as consistent with the existing values, past experience, and needs of potential adopters" (Rogers, 1983, p. 223). Congruence is another term used by some researchers (Nicholls, 1983) for this characteristic. Aspects of compatibility include socio-cultural values and beliefs, previously introduced ideas, and one's need for innovations (Rogers, 1983). Kozma (1985) reports on his study of the introduction of educational innovations in 28 higher education institutions. His findings support Rogers and Shoemaker's (1971) concept of the importance of compatibility. The most characteristic aspect of

instructional innovation in higher education is that it is evolutionary--new practices are built on old ones. The "new approaches are alternative expressions of attitudes, values, preferences and philosophies embedded in previously used techniques" (Kozma, 1985, p. 308). Kozma continues, "failure to adopt an innovation was the norm. It was not that the innovation was considered and rejected, but rather that it did not evolve from the previous experience of a colleague" (Kozma, 1985, p. 309). Inconsistency with a philosophy or with preferred techniques is the reason given for not adopting an innovation.

A change that is incompatible with concepts, theories, or values of an organization or the individuals in it is likely to meet resistance. The rate of acceptance of the innovation is slowed by the degree to which the innovation is not compatible with present procedures and by the extent to which the innovation "requires changes or adjustments on the part of other elements in the social situation" (Lin & Zaltman, 1973, p. 105).

Often, it is the innovation itself that mutates or changes over time and/or from one institution to another as it is adapted by adopters to fit their needs. This enhances the compatibility of the innovation with the adopting organization's values or experiences (Berman & McLaughlin, 1976).

The factor of compatibility is strongly linked with the social-cultural world of the potential adopter, as compatibility is based on the perceptions of the adopting unit. Acceptance of an innovation is more likely to occur if it "fits" with the adopter's attitudes, values and previous experiences.

Complexity

Complexity is "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 1983, p. 230). It is the one factor for which Rogers and Shoemaker (1971) find no correlation with adoption of an innovation. Complexity includes both complexity in ideas and complexity in the innovation's ease of use.

Berman and McLaughlin (1976) identify three aspects of complexity. The first, structural complexity, makes innovations difficult to implement. Examples of structural complexity are spanning many grade levels, including all classes in the district for a particular grade, or spanning both elementary and secondary schools. Berman and McLaughlin call the second type of complexity "treatment complexity." Innovations with treatment complexity involve a comprehensive area of the curriculum or require an overall change in teacher behavior, rather than being narrow in scope. Berman and McLaughlin find treatment complexity is

more likely to induce change. The final type of complexity involves integration of the project into ongoing procedures of the school or district. Projects are more likely to be implemented successfully when they have active support of the school or when they integrate staff development with expectations for changes in teacher behavior.

Trialability

Trialability, also referred to as divisibility, is "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 1983, p. 231). It includes the capability of dividing an innovation into smaller parts that can be tried without implementation of the whole innovation. "Changes that can be introduced piecemeal are more easily accepted than are those which require sudden, large-scale alterations" (Watson, 1973, p. 150). Also, changes that cannot be retracted or reversed easily meet more resistance than those that can be withdrawn easily if they are unsatisfactory.

While Rogers and Shoemaker (1971) identify this factor as positively related to adoption of an innovation, (Nicholls (1983) argues that this is not likely to be the case in the field of education. Many educational innovations cannot be divided but must be used on an "all or nothing" basis. They also must be used for several years before they can be adequately evaluated.

Trialability also includes the possibility of implementing the innovation for a short period of time, even if it cannot be divided into small parts. Trialability is associated with taking a risk. "There is a certain risk in trying anything new. If it doesn't work there is some comfort in knowing that the situation is reversible without undue harm to the organization" (Levine, 1980, p. 186).

Observability

Observability, also called communicability, is "the degree to which the results of an innovation are visible to others" (Rogers, 1983, p. 232). A major factor in the diffusion process is the ease and effectiveness with which information about the innovation and its results can be shared with others (Lin & Zaltman, 1973). Most change results from diffusion of ideas throughout the communication network and "most changes in colleges and universities are not innovation from within, but rather borrowing and imitations from other institutions" (Martorana & Kuhns, 1975, p. 7.) "If an innovation is unobserved and, as a result, unknown, it is quite unlikely to be thought of as a solution to the organization's need" (Levine, 1980, p. 187). Those promoting adoption of the innovation want it to appear both profitable and compatible.

Burns (1981) studied the adoption of an innovation, decentralized unit management, in hospitals. He found that

the most important factor that influenced the diffusion of the innovative practice was the presence of the innovation in other local hospitals. Dickinson (cited in Nicholls, 1983) studied innovative schools and found that innovations were accepted if they were seen to be working successfully in other schools.

Although innovations have many other attributes that have been or could be studied, the attributes of Rogers and Shoemaker (1971) discussed above are the attributes most frequently cited by writers and researchers in this area. Of the several different components of diffusion theory, many studies have been done on characteristics of adopters and communication but little effort has been devoted to analyzing how the attributes of an innovation affect its adoption. Such research "can be of great value to change agents seeking to predict the reactions of their clients to an innovation" (Rogers, 1983, p. 211).

Having discussed attributes of innovations as they affect adoption, the review of literature next focuses on the history of nursing and current issues in the field of nursing.

Nursing

Nursing is a field of study in higher education. This section will review the history of nursing education, its move from hospitals into collegiate settings, and some of

the resulting problems. Current issues in nursing include a critical shortage of nurses with strong clinical skills and a demand from nursing leaders, governmental agencies, and others for innovation in nursing education to improve the clinical preparation of nursing graduates. Nursing education programs are implementing such innovations and some of these innovations will be identified.

Nursing Education

Florence Nightingale is credited with starting the first "modern" school of nursing although a few hospitals had previously trained women to care for the sick. Appalled at the lack of knowledge of physical care and sanitation among nurses treating soldiers during the Crimean War, Nightingale started an innovative school to teach women to work as nurses and to provide better care. The Nightingale School, opened in 1860, offered a program of study that was one year in length and included both theoretical and practical study.

In the United States, the first organized nursing schools, modeled after the Nightingale School, were begun after the Civil War. Due to inadequate funds, these independent schools affiliated with large hospitals. Grippando (1986, p. 58) wrote:

> This gradually led to the exploitation of students by hospitals who had found a new source of free

labor. Formal education became secondary to nursing service in the hospital, a trend which did little to improve the quality of nursing practice. In the early twentieth century, nursing leaders, seeking professional status, developed nursing education programs in colleges and universities. "Collegiate nursing education was thought to be the remedy to upgrade nursing knowledge, education and practice" (Grippando, 1986, p. 64). Following World War II, the number of programs in colleges and universities awarding the baccalaureate degree in nursing increased dramatically. In 1952, nursing education programs were introduced in community colleges, with graduates earning the associate degree and thus becoming eligible to take the registered nurse licensing examination.

Both levels of college-based nursing programs emphasized the theoretical aspects of education more than the service orientation of the hospital-based diploma programs. College-based programs have an experiential component in the curricula, but students in these programs spend much less time in clinical experiences than students in diploma programs. Students are assigned to clinical experiences in hospitals and in other health care facilities. Working under the supervision of nursing

faculty, students learn and practice the skill of providing nursing care to clients.

One result of these changes was that employers perceived that new graduates of college-based programs were not well prepared to function as nurses. Employers claimed that the graduates had unrealistic job expectations, lacked clinical skills and were further hindered by a lack of self-confidence (Kramer, 1974; Primm, 1986; Myrick, 1988).

The graduates' lack of clinical skills has been attributed to nursing faculty. Myrick (1987) claimed that nursing faculty, especially in baccalaureate programs, focused on research and publication, for which they received rewards in the university setting. "Many nursing faculty members have let their clinical skills deteriorate while they emphasized the preparation of lectures, the designing of tests, clinical assignments, and so on" (Stuart-Siddall & Haberlin, 1983, p. 7). Kramer (1974, p. 31) found that many young faculty lack clinical experience and may be "interpersonally incompetent in the work subculture."

Other factors limit students' clinical nursing practice. Most traditional clinical experiences "have so many constraints, limitations, guidelines, rules, client selectivity controls and census or case-load controls that the student does not get a feel for the real, day-to-day world of nursing" (Stuart-Siddall & Haberlin, 1983, p. 26).

Additionally, the faculty/student ratio in clinical settings may be up to fifteen students per faculty member and these students are often spread over several units in a hospital. Teaching and evaluating in clinical settings is done on a one-to-one basis, which restricts students' access to faculty, e.g., when the faculty member becomes involved in a lengthy procedure with another student.

Another result of the move into academic settings was that students and new graduates experienced dissonance between what is taught in nursing schools and the realities of professional practice (Kramer, 1974; Turkoski, 1987). They felt inadequately prepared and had difficulty functioning as a nurse (Shamian & Inhaber, 1985). Kramer (1974) labeled this "reality shock." Failure to resolve the conflict resulted in ineffectual practice and eventually, nurses leaving the profession. This exodus was one factor in the present nursing shortage that will be discussed below.

Nursing Environment

Agencies in the environment of a nursing education program have a direct impact on the program and on adoption of innovations. Environmental events influence perception of the relative advantage of adopting an innovation (Rogers & Shoemaker, 1971).

Nursing education programs are highly interactive with other agencies in their environment. They must have approval from their state Board of Nursing, which establishes rules and regulations governing the practice of nursing and the educational preparation of registered nurses. Additionally, programs may voluntarily seek accreditation from the National League for Nursing which has its own standards.

Local advisory councils have input into nursing programs. These groups, made up of nurses, other health professionals, educators, and/or consumers, make recommendations about content, process and other aspects of the nursing program.

Nursing education programs are dependent on clinical agencies--hospitals, long-term care facilities, clinics, etc.,--for students' clinical placements. Formal agreements between the school and clinical agencies delineate the role of the agency staff, faculty and students. Agencies have control over the units where students have placements and the types of experiences in which students can participate. Student delivery of nursing care must be practiced in a way that is compatible with agency values and norms and must be carried out according to agency policy and procedures.

Nursing is a profession that is presently in a crisis. An acute nursing shortage exists. Donius (1988) identifies

current issues in nursing education that contribute to the nursing shortage. These include declining enrollments, high cost, the reality shock experienced by new graduates entering nursing practice, and the resulting high turnover rates.

The American Hospital Association supported a two-year study of the current nursing shortage. This study was considered the "most comprehensive analysis to date of the current nursing shortage" (Study reveals..., 1989, p. 2). Findings included the following:

> A key explanation for the shortage is the steady growth in hospital demand for nurses...New medical technology, sicker patients, efforts to upgrade professional standards and economic pressures have all helped to increase demand...Nursing school enrollments are down, partly due to increased career opportunities for women, and partly due to demographic changes (p.2).

The report calls for nurse educators to reexamine whom they target as prospective students, and how they educate those students.

In response to the nursing shortage, the Secretary of the U. S. Department of Health and Human Services commissioned a public advisory panel to advise him of the problems in the field and "develop recommendations on how

public and private sectors can work together to address these problems and implement immediate and long-range solutions for enhancing the adequacy of the supply of RNs (registered nurses)" (Department of Health and Human Services, 1988, p. v.). The final report of the panel identified shortages of RNs in all sectors of employment, i.e., hospitals, nursing homes, home health and ambulatory care. The report stated that the shortage was primarily due to increased demand for RNs rather than nurses leaving the nursing field. Also, this increased demand was caused by increasing severity of illness, technological advances, HIV (AIDS), the aging of the U. S. population, and shorter lengths of stay in hospitals.

The panel recommended that "schools of nursing, state boards of nursing and employers of nurses should work together to ensure that the curricula are relevant to contemporary and future nursing practice" (DHHS, 1988, p. 41). As a strategy for accomplishing this recommendation, they advised, "Schools of nursing should increase the proportion of the curriculum devoted to clinical learning experiences in all practice settings" (DHHS, 1988, p. 41). They added, "curricula revision with an emphasis on clinical learning experiences is promoted as a means of educating nurses to be prepared for the rigors of contemporary

practice and the caring aspects of nursing" (DHHS, 1988, p. 42).

New graduates, then, need better clinical preparation to care for clients. Davis ("'Time is Short,'" 1989, p. 1083), commenting on surviving the shortage, warned "The timeframe is short to...restructure education to produce a more advanced clinical competency base."

Yet, these demands and changes in hospitals and other health care organizations pose problems for nurse educators. Demographics predict increasing diversity among students in higher education in general and in nursing schools in particular (Sherman, 1987; Farley, 1987). Students will be older, be more ethnically diverse (Sherman, 1987), and will be more deficient in basic skills (Farley, 1987). Innovation will be necessary to assist these students in meeting their goals and the goals of nursing education.

Also, the increasing acuity of patients in hospitals, earlier patient discharges, and the increasing influence of third-party payers on health care cause changes in the hospital environment. Lindeman (1989) comments:

> The clinical laboratory is an essential component of nursing education, yet it is becoming increasingly difficult to find clinical placements appropriate for entry level programs...The increased acuity level of patients in the hospital

> now make [sic] the hospital a massive intensive care unit (p. 24).

A paradox in nursing education is that students are not prepared to deal with the complexity of care for these patients, yet are held to standards of professional care. Faculty must ensure safe care for patients and thus tend to give higher priority to evaluation than to learning.

Clinical learning must incorporate elements of discovery and building knowledge. Lindeman (1989) makes several recommendations as paradigms for clinical nursing education. One of these recommendations is to include the expert clinician, the staff nurse who knows the patient and current technology, as a full participant in the learning process. Another recommendation is the use of nursing arts laboratories, learning resource centers, and clinical simulation laboratories where students can learn skills in a safe environment.

"The demand for more and better prepared nurses is heard daily" (Woolery & Costello, 1988, p. 90). Woolery and Costello identify "innovations in clinical teaching (that) would best enable graduates to practice effectively in today's health care market" (p. 90). These approaches include alternative clinical settings, i.e. settings other than hospitals; computer simulation; laboratory simulation; expanded clinical teaching, i.e. clinical teaching

assistants or nurse preceptors; and changing the concept of pre- and post-conferences.

Diffusion of Innovation in Nursing Education

Diffusion theory suggests that predictable stages exist in the adoption of an innovation. The individuals in an adopting unit perceive a need for change and get information about innovations, first from mass media and then from more personal sources. After evaluating the attributes of the innovation, a decision is made as to whether to try the innovation. As described in the previous section, many nursing leaders perceive a need for change. Information about many of the innovations mentioned has existed in nursing literature for several years. The innovations discussed most frequently in recent years were preceptorship experiences and use of computer assisted instruction.

Nursing journals have contained articles about use of clinical preceptorship for students since the late 1970s. Books were published on the subject in the early 1980s (Stuart-Siddall & Haberlin, 1983: Waters et al., 1983). These publications presented research findings and described advantages of the preceptorship experience to graduates, employing agencies, and faculty.

Use of computers for computer assisted instruction, i.e., "a method of instruction in which the computer takes on the role of the teacher" (Murphy, 1984, p. 219), is used

both to replace or augment classroom learning and to provide an opportunity to learn clinical skills and practice decision-making. Thomas (1985) cites statements about computer-assisted instruction (CAI) in the literature in the early 1970s and, beginning in 1978, many application and evaluative studies. More than ten regional conferences on use of computers in nursing were held in 1983 and 1984.

Murphy (1984) reviewed literature about computer assisted instruction (CAI) and found "driving forces" and "restraints" related to implementation of CAI. Several of the driving forces Murphy identified were related to the compatibility of CAI with principles of learning such as being multisensory, providing immediate feedback, and allowing students to go at their own pace. Murphy also found the faculty had more time to spend giving individual &attention to students and for their own educational and research activities. Restraints identified by Murphy were cost of time and money, faculty lack of computer experience, and change in the teacher's role of being the provider of information and being in strict control of the learning situation. There was also little reward or incentive, especially toward promotion and tenure, for using CAI or for developing software.

Delaney (1989) used Roger's diffusion theory as the framework for her study of acceptance of computers among

nursing administrators and faculty. Overall, the perceived relative advantage, compatibility, and observability of computers were found to be positive and complexity was not perceived as a factor limiting computer use. However, few programs proceeded to the implementation stage, often due to lack of available software. Instructional uses of computers were minimal. Only 21 per cent of the programs presented nursing content by means of CAI.

Thomas (1985) surveyed deans and directors of baccalaureate and higher degree nursing programs to identify barriers inhibiting growth of instructional computing. The barrier found to be most important was faculty lack of opportunities to learn, followed by faculty lack of skills, hardware costs, software costs, and lack of useful software.

Skills or simulation labs were used by nursing programs for many years as a means of providing opportunities for students to practice new skills. As the acuity of illness and complexity of care of hospitalized individuals increased, nursing programs increased their use of these labs for simulations. McDonald (1987) elaborated on advantages of the use of labs. Some of these advantages included being able to control the setting and content of the experience, maximizing learning time, and minimizing ethical concerns. Another innovative use of such labs was

that of videotaping students as they practice skills and in role playing. Students then watched the tapes for feedback.

Conclusion

Nursing leaders and national and local agencies in the field of health care have called for reform in nursing education to strengthen the clinical competence of graduate nurses ("Study reveals...", 1989; DHHS, 1988; "Time is Short", 1989). Sherman (1987) has emphasized that nursing education must have flexibility and creativity in responding to changes in both the health care and education fields. Several innovative approaches have been implemented in nursing programs and information about them is available in nursing literature. Yet, "studies of the extent or process of innovation diffusion are infrequent in nursing" (Brett, 1989, p. 105).

Innovations are likely to be evaluated for adoption if nursing faculty recognize a need to change. Once that need is acknowledged, Rogers and Shoemaker's (1971) model suggests that the attributes of an innovation will influence one's decision as to whether or not to adopt the innovation. The model suggests that innovations that are adopted in education are those that educators perceive as having an advantage over present methods of preparing students. Adopted innovations are those that are compatible with the values of the faculty of the nursing program. Other

attributes of an innovation that should enhance its adoption are that it has been made known to potential adopters and it may be tried incrementally or discontinued easily, if desired. The financial, time, and social costs of the innovation must be within an affordable range for the adopting program. The model also suggests that complexity of understanding and/or implementing the innovation is not related to its adoption. Yet, not all innovations are adopted in all nursing programs. Diffusion theory suggests one reason for differences is that the attributes of the several innovations are perceived differently by faculty of different programs.

CHAPTER 3

METHODS

The survey method was used for this study. Two surveys were conducted. The first survey was designed to identify the innovations that associate degree nursing programs were implementing in the clinical portion of their curriculum.

The diffusion framework of implementation theory suggested that the attributes of an innovation influenced the decision to adopt or reject the innovation. This framework was tested in the area of nursing education to determine whether the attributes influencing adoption of the innovation were similar to those in other fields that have been studied by other researchers. A second survey was used in this study to identify the attributes that facilitated the adoption and implementation of innovations. The study also sought to identify those attributes that were most important to the adoption decision.

Sample

The sample for the survey was all associate degree nursing programs in six southwestern states. A list of state-approved schools of nursing, published by the National League for Nursing (1989), listed 104 programs in these states. These nursing programs were located primarily in community colleges. This region was similar to other parts

of the country, containing both metropolitan and rural areas. It represented a region of interest to the researcher. The survey was conducted in two phases.

Procedure

For the initial survey, a brief questionnaire was developed by the researcher. A pilot test of the instrument was conducted by sending it to 2 faculty colleagues of the researcher and to 12 associate degree nursing program directors from states not included in the survey.

This questionnaire and a cover letter of explanation (Appendix A) were then sent to directors of the associate degree nursing programs in the sample. This questionnaire asked directors or their designee to indicate whether the program had considered changes in the clinical portion of their curriculum during the last six years and, if so, what the changes were. The term "change" was used in the survey rather than "innovation" because, although the meanings are similar, change has a more neutral connotation. If the respondent indicated that changes had been considered, he/she was asked to indicate whether each change was implemented, was still under consideration, or was rejected. The questionnaire provided an opportunity for respondents to identify and discuss several changes. Respondents were asked to briefly identify the factors that influenced their (the unit's) adoption decision. If subjects did not respond

to the initial questionnaire, a follow-up letter and questionnaire were sent using the time frames recommended by Leslie (1970).

From these responses, the clinical innovations that had been considered most frequently were identified. This information was used in developing a second survey questionnaire. This questionnaire had three sections. First, it asked for information about each of the five innovations that had been considered by at least ten per cent of the respondents to the initial survey. Respondents were asked whether they had implemented the innovation or have specific plans to do so within the academic year. Those who had not implemented the innovation were asked to indicate if they were considering implementing it, had considered and rejected it, had not seriously considered it, or were not familiar with it.

Next, a Likert Scale instrument, developed by the researcher, was used to measure perceptions of the attributes of the innovation as they relate to implementation of the innovation in their programs. Because Rogers (1983) indicated that the perceptions of those in the adopting unit were influential in the adoption decision, respondents were asked to indicate their perceptions and those of the nursing faculty who were the members of the adopting unit. Given a list of statements about attributes

of the innovation (from the diffusion theory framework) respondents were asked whether they agree or disagree with the statement.

Last, respondents were asked to rank attributes in order of importance to their program's decision regarding implementation of the innovations. Ranking ranged from most important to least important.

The above data were sought from each program for each of the innovations under consideration. A separate page was used for each of the innovations under study. The wording for each page was identical except for changes in the name of the innovation. Thus, each director in the sample received a five page survey.

A pilot test of the second survey instrument was conducted by asking six of the researcher's faculty colleagues to complete the instrument and to consider content validity. The instrument was then sent, with a cover letter, to the directors of the programs in the sample (Appendix B). Respondents were informed that confidentiality of the responses would be maintained.

Data Analysis

Data from the initial survey were analyzed so as to identify the number of nursing programs that have implemented clinical innovations during the past six years. Also, the innovations that have been implemented, were still

being considered, or had been rejected were identified. Descriptive statistics were used to report data.

On the second survey, a Likert Scale instrument measured perceptions of the attributes of the innovation. The instrument had categories of strongly agree, agree, disagree, and strongly disagree. Each category was assigned a weight. Respondents were identified as adopters (those who had implemented the innovation or planned to do so during the current academic year) and nonadopters (those who had no plans to implement the innovation). Only data for those respondents who answered all 16 items were used. Analysis of data for each of the five innovations was performed separately.

A principal component analysis was conducted of the 16 scale items. These items were combined as seven composite variables--the six attributes of an innovation identified in diffusion theory and a seventh variable representing environmental influences. This procedure was done to determine whether the variables adequately explain the likelihood of innovation and whether a more parsimonious explanation (fewer attributes) of innovation exists.

A seventh variable or attribute was created to reflect an issue raised by Rogers (1983). Rogers spoke of how environmental forces could be instrumental to adoption. He attempted to capture these effects as subconcepts of the

Relative Advantage and Compatibility concepts. For the purposes of the present study, it was deemed useful to separate out these subconcepts and combine them into a seventh attribute. This was done and the seventh attribute was labeled, Environment. This Environment attribute reflected environmental factors external to the nursing program and to the college within which the program was housed. It allowed examination of these influences on adoption of an innovation by the nursing education program.

As the dependent variable, i.e., adoption or nonadoption of the innovation, was dichotomous, logistic regression analysis was used to predict adoption of an innovation (Hosmer & Lemeshow, 1989). This was done to answer the research question "What is the relative importance of the various attributes in explaining the adoption of the innovations?" The Likert Scale data were again used, as in the principal component analysis. The logistic regression analysis determined whether the aggregate variables (TOTAL variable) predicted adoption of an innovation and which, if any, of the variables separately were significant in predicting adoption. In the logistic regression equation, x_1, . . ., x_7, denoted the seven attribute variables, while $\overline{x}$ denoted the average of x_1, . . ., x_7, the TOTAL variable. The logistic regression equations used for analysis were $y = e^u/(1 + e^u)$, where either $u = a + b\text{-}\overline{x}$

or $u = a + b_1x_1 + \ldots + b_7x_7$. The first model, using the TOTAL variable, was obtained by setting $b_1 = \ldots b_7$. A Likelihood Ratio Test was employed to test whether the seven variable model is significantly better than the TOTAL variable model (Hosmer & Lemeshow, 1989).

Finally, for each of the attributes, the mean response for adopters and nonadopters was determined and a t test was used to determine whether there was a difference between the way adopters and nonadopters perceived the attributes of each innovation (Shavelson, 1988). The SAS computer statistical analysis program was used in these analyses.

The third section of the survey form asked respondents to rank 14 attributes in order of their importance to the decision to adopt an innovation. The means of the adopter and nonadopter groups were calculated for each of the 14 items. These means were then rank ordered from highest, i.e., most important to the adoption decision, to lowest or least important. The high and low quartiles in the rankings were identified for each innovation.

CHAPTER 4

PRESENTATION AND ANALYSIS OF DATA

Survey Respondents

The first survey instrument (Appendix A) and a cover letter were mailed to directors of the 104 associate degree nursing programs in six southwestern states, as identified in State-Approved Schools of Nursing RN:1989 (NLN, 1989). This was the entire population of ADN programs in the six states. Forty-eight surveys were completed and returned. Additionally, two were returned with indications that the nursing programs had closed. A second mailing was sent to nonrespondents and 35 of these surveys were returned. A total of 83 surveys were completed and returned, yielding a response rate of 81%.

After compilation of data from the first survey, the second survey instrument and a cover letter (Appendix B) were sent to the 102 directors of the same associate degree nursing programs. Forty-four surveys were returned after the first mailing. A post card was sent to nonrespondents requesting their completion of the instrument. The post card mailing yielded 11 responses. A second copy of the survey was sent to the remaining directors, with a letter again requesting their response. This mailing yielded 20 responses. The researcher then attempted to reach the remaining nonrespondents by telephone with little success.

Another copy of the survey form was sent and nine replies were received. Also, one mailing was returned with a comment that the program had closed. Of the remaining 101 programs, 84 nursing program directors or their designees returned the survey forms, yielding an 83% response rate.

There were some differences in respondents to the two surveys. Fifteen of those program directors who responded to the first survey did not return the second survey, while fifteen directors who had not returned the first survey did respond on the second. Only four directors did not respond to either survey.

Characteristics of nonrespondent directors' programs differed somewhat from respondents' programs on the basis of state and National League for Nursing (NLN) accreditation. On the first survey, 64% of all respondents were from the most populous state and 71% of the nonrespondents were from that state. Among respondents, 60% were from NLN accredited programs while only 19% of the nonrespondents were from NLN accredited programs. Thus, a somewhat higher percentage of nonrespondents was from the most populous state and most (81%) were from nonaccredited programs.

On the second survey, the characteristics of the groups were similar. Sixty-five per cent of all respondents were from the most populous state and 71% of the nonrespondents were from that state. More nonrespondents (82%) than

respondents (58%) were from programs that were not accredited by the National League of Nursing (NLN, 1989).

For both surveys, over 60% of respondents were from one, large state. On the first survey, 60% of respondents were from NLN accredited programs, while on the second survey approximately the same percent were from programs not accredited by NLN. All institutions in both groups were public institutions and all except a few programs were in community colleges.

Survey Results

The purpose of the first survey was to determine whether ADN programs were making changes in the clinical curricula, and if so, to identify those changes. Respondents were asked to list changes they were making. Several changes in the clinical curriculum were identified. Five changes had been considered by at least 10 per cent of the programs and thus met the criteria for inclusion in the second survey. The change identified most frequently was use of computer assisted instruction (CAI), including interactive video discs. Thirty-four programs had accepted and implemented this change and 12 were still considering it. The second most frequently identified change was a clinical preceptorship experience. The remaining three changes were clinical competency exams, initiating or increasing use of skills/simulation labs, and work-

study/externship experiences. Frequencies reported for these innovations are presented in Table 1.

Table 1.

Reported Adoption Decisions for the Five Most Frequently Implemented Innovations--First Survey

Innovation	Accepted & implemented	Still under consideration	Rejected
Computer Assisted Instruction	34	12	
Preceptorship	18	12	1
Clinical Competency Exam	12	5	
Skills/Simulation Lab	11	2	
Work-study/ Externship	6	4	

The first survey was a "feeler" to identify innovations being considered by nursing programs directors. In order to test the hypotheses of the study, the second survey sought the following specific information about the most frequently considered innovations. For each innovation, the respondent was asked 1) whether or not their program had adopted the innovation, i.e., implemented the innovation/

planned to implement it within the academic year, 2) their opinion about attributes of the innovation, and 3) their ranking of the importance of attributes in their decision related to adoption or nonadoption of the innovation. These data were not dependent on or correlated with responses to the first survey.

The 84 respondents to the second survey returned a total of 415 pages of forms. Some respondents completed only the first section with no further information about some of the innovations. Most of the incomplete forms were from those who indicated that they had not seriously considered the innovation or were not familiar with it. In analysis of the second portion of the survey, only data from those respondents answering all 16 items were used. Frequency of response for each of the three sections of the survey form, for each innovation, is presented in Table 2.

Hypothesis 1.

The first hypothesis to be tested was, Nursing programs are making changes in the clinical component of their curricula.

Table 2.

Numbers of Respondents to Sections of the Second Survey Form

Innovation	Adoption Decision	Attitude Scale	Attribute Ranking
CAI	84	69	79
Preceptorship	83	76	71
Skills Lab	84	67	66
Clinical Competency Exams	80	63	60
Work-study	84	62	65

The first survey asked whether significant changes in the clinical curriculum had been considered in the last six years, and 73 respondents (88%) indicated that such changes had been considered. Of those who indicated that changes had been considered, in 64 of the programs (77% of the total respondents) one or more changes had actually been accepted and implemented. Many of these respondents indicated that they were also currently considering other changes. In the remaining 9 programs, changes were still under consideration. Ten (12%) respondents indicated that they had not considered any changes in the last six years. The related data are presented in Table 3.

Table 3.

First Survey Respondents Considering Change Within the Last Six Years

Adoption Decision	No.	%
Accepted and implemented at least one change	64	77
Change(s) under consideration	9	11
Had not considered any changes	10	12
Total	83	100

In the second survey, respondents were asked to provide information about their program's adoption of each of the five specific innovations. They were asked to indicate whether 1) they had already implemented the change or planned to do so within the academic year, 2) were still considering the change, 3) had rejected it, 4) had not seriously considered it, 5) or were not familiar with it.

Of the 84 respondents providing information about their programs, most indicated that they had adopted innovations. In five programs, all five of the innovations had been adopted and implemented. Fifteen programs had adopted four of the innovations, 22 had adopted three, 25 had adopted two, and 13 had adopted one innovation. Eight (95%) of the programs had adopted one or more innovations while 4

programs (5%) had not adopted any of the innovations being considered. These data are presented in Table 4.

Table 4.

Number of Study Innovations Adopted by ADN Programs--Second Survey

No. of Innovations Adopted	No. of Programs Reporting	% of Programs
5	5	6
4	15	18
3	22	26
2	25	30
1	13	15
0	4	5
Total	84	100

In summary, on the first survey, 77% of the respondents reported making changes in the clinical component of their curriculum during the last six years. In the second survey, one or more of five specified innovations had been adopted in 95% of the programs. Hypothesis 1, Nursing programs are making changes in the clinical component of their curricula, was supported. Diffusion theory suggested that perception of the attributes of an innovation influenced one's decision to adopt the innovation. In order to examine this aspect of

diffusion theory and determine how innovation occurs or fails to occur, a 16 item questionnaire with Likert scale responses was used. This instrument was composed of statements representing attributes of an innovation as identified by Rogers (1983) and Rogers and Shoemaker (1971). Respondents were asked to indicate a response representative of their perceptions and program faculty's perceptions of the attributes of the innovations. Responses to the items ranged from Strongly Agree to Strongly Disagree. A weight of 4 was given to Strongly Agree, 3 to Agree, 2 to Disagree and 1 to Strongly Disagree, except for items 6, 8, 11, 13, and 14, which were worded negatively. The weighting order was reversed for these items.

Each attribute of an innovation was operationalized by two or more scale items. Scale items 1 and 3 pertained to the attribute of Relative Advantage. Items 4 and 6 pertained to Compatibility, 7 and 8 to Trialability, 9 and 10 to Observability, and 11 and 12 to Complexity. The attribute of Cost was represented by scale items 13, 14, 15, and 16. Items 2 and 5 on the survey represented attributes of Relative Advantage and Compatibility of the innovation in external agencies, the Environment that impacts on nursing education programs. Analysis was conducted to determine whether these factors were also important in the adoption of the innovation.

To determine the values for the attributes, the items representing that attribute were added and divided by the number of items composing the attribute. For example, to determine a value for the variable, Relative Advantage, the value of the respondent's answers for items 1 and 3 were added and then divided by two. This procedure created a value ranging from 1 to 4 for each variable, which was ideal for the analysis.

Principal Component Analysis

Principal component analysis was used to test whether the elements of diffusion theory in fact adequately define the conditions that lead to innovation adoption. Six elements from diffusion theory plus the (created) Environment variable were used for this testing.

Principal component analysis was performed, using a covariance matrix, on the seven variables. The SAS statistical software program was used in this analysis. This technique created different combinations, or weighting of the variables, or principal components, in an attempt to explain most of the variance among the data. Table 5 presents the results of this analysis for each of the five innovations.

Table 5.

Principal Component Analysis

Computer Assisted Instruction			
Total Variance = 1.948			
Eigenvalues of the Covariance Matrix			
	Eigenvalue	Proportion	Cumulative
PC1	0.713	0.366	0.366
PC2	0.445	0.229	0.594
PC3	0.269	0.138	0.733
PC4	0.182	0.094	0.827
PC5	0.141	0.072	0.899
PC6	0.121	0.062	0.962
PC7	0.075	0.038	1.000
Eigenvectors			
Principal Component 1			
Relative Advantage	0.499		
Environment	0.469		
Compatibility	0.406		
Trialability	-.065		
Observability	0.391		
Complexity	0.336		
Cost	0.310		

Clinical Competency Exams

Total Variance = 2.659

Eigenvalues of the Covariance Matrix

	Eigenvalue	Proportion	Cumulative
PC1	1.540	0.579	0.579
PC2	0.380	0.143	0.722
PC3	0.276	0.104	0.826
PC4	0.183	0.069	0.895
PC5	0.139	0.052	0.947
PC6	0.099	0.037	0.984
PC7	0.042	0.016	1.000

Eigenvectors

	Principal Component 1
Relative Advantage	0.468
Environment	0.413
Compatibility	0.426
Trialability	0.120
Observability	0.440
Complexity	0.377
Cost	0.281

Preceptorship

Total Variance = 2.959

Eigenvalues of the Covariance Matrix

	Eigenvalue	Proportion	Cumulative
PC1	1.718	0.581	0.581
PC2	0.420	0.142	0.723
PC3	0.299	0.101	0.824
PC4	0.179	0.061	0.885
PC5	0.135	0.046	0.930
PC6	0.109	0.037	0.967
PC7	0.097	0.033	1.000

Eigenvectors

	Principal Component 1
Relative Advantage	0.488
Environment	0.407
Compatibility	0.397
Trialability	-.068
Observability	0.354
Complexity	0.378
Cost	0.406

Skills/Simulation Labs

Total Variance = 2.449

Eigenvalues of the Covariance Matrix

	Eigenvalue	Proportion	Cumulative
PC1	1.331	0.544	0.544
PC2	0.359	0.146	0.690
PC3	0.281	0.115	0.805
PC4	0.219	0.089	0.894
PC5	0.113	0.046	0.940
PC6	0.097	0.039	0.980
PC7	0.049	0.020	1.000

Eigenvectors

	Principal Component 1
Relative Advantage	0.508
Environment	0.546
Compatibility	0.437
Trialability	0.046
Observability	0.345
Complexity	0.290
Cost	0.217

Work-Study/Externship

Total Variance = 2.670

Eigenvalues of the Covariance Matrix

	Eigenvalue	Proportion	Cumulative
PC1	1.394	0.522	0.522
PC2	0.463	0.173	0.695
PC3	0.236	0.089	0.784
PC4	0.202	0.076	0.860
PC5	0.168	0.063	0.923
PC6	0.116	0.043	0.966
PC7	0.091	0.034	1.000

Eigenvectors

	Principal Component 1
Relative Advantage	0.558
Environment	0.554
Compatibility	0.499
Trialability	0.153
Observability	0.212
Complexity	0.115
Cost	0.224

Seven principal components were created by the computer program (Table 5). The first principal component was the combination of weighted variables that contributed the most to the total variance. This was followed by other principal components in descending order of contribution. The total Eigenvalue at the top of each table reflects the relative amount of total variation in the data (the responses) accounted for, by all seven components, for the particular innovation. The Eigenvalue of each principal component represents the variance contributed by that component.

The greatest amount of total variation in the data was accounted for in the Preceptorship (Eigenvalue = 2.959) and the least was accounted for in the Computer Assisted Instruction (CAI) (1.948). Thus, it would appear that the theory fits best in the former case, the Preceptorship, and poorest in the latter case, CAI. Put another way, there may be more congruence of perception among nursing directors in the case of clinical innovation (Preceptorship) than in the case of CAI. This would be expected, since the former is associated directly with nursing whereas the latter is more "generic" to education overall.

Only the first principal component is considered because that component accounts for the maximum variation. As can be seen in Table 5, the share of total variation explained for each innovation is not large, but is fairly typical of principal component analysis. These proportions

range from 0.366 for Computer Assisted Instruction to 0.581 for Preceptorship. In the case of each innovation, five principal components are similarly required to account for at least 90% of the variance. No one or two elements had a weight that was much higher than the others. In fact, with one exception, the variable factors for all of the theorized variables (attributes) were of the same general size (weights). This is an important finding because it largely supports the theory. In other words, adoption is perceived to occur when six of the seven theorized variables are present, and each of the six variables is of more or less equal importance.

There were some noteworthy patterns among the attributes, across the several innovations. Considering the first PC, the first three attributes--Relative Advantage, Environment, and Compatibility--were weighted highest for all innovations. The remaining three attributes, on balance, were weighted fairly heavily, too. Trialability had a consistently low weight. From the PC analysis, only Trialability appears more-or-less irrelevant in regard to innovation in nursing programs.

In summary, the principal component analysis led to the conclusion that no one or two variables could be used to predict adoption of an innovation. Instead, a model with each of the variables, save Trialability, should be used in predicting adoption.

Logistic Regression Analysis

Next, logistic regression analysis was conducted to determine if adoption of innovations could be predicted by perception of the attributes of the innovation. The second hypothesis of the study was, Perception of the attributes of a proposed innovation influences the decision to adopt the innovation. The null hypothesis was tested, Perception of the attributes of a proposed innovation does not influence the decision to adopt the innovation. The third hypothesis of the study was, All of the attributes reflected in Rogers' (1983) theory, plus a created variable representing the Environment, are essential to explaining adoption of innovations: however, some of the attributes may be more important than others. Again, the null hypothesis was tested, Attributes of an innovation are equally important in explaining adoption of innovations.

Regression was first conducted on a TOTAL variable representing the seven composite variables or attributes. The TOTAL variable value was obtained by weighting each of the seven variables equally--summing the values for the seven variables and dividing by seven--a procedure that has prima facie legitimacy and one that was generally suggested by the results showing roughly equal attribute importance. Results were analyzed to determine if the TOTAL score was significant in predicting adoption. These analyses were

performed for each of the five innovations and differences were noted. These results are summarized in Table 6.

These findings led to rejection of the null hypothesis 2 (Perception of the attributes of a proposed innovation does not influence the decision to adopt the innovation). Taken together, the respondents' perception on the TOTAL (composite) variable was significant in predicting adoption for each of the five innovations. Levels of significance ranged from 0.0023 to 0.0000. These levels were highly significant and showed that the theoretical model was a good predictor for adoption of the innovations. The maximum likelihood estimates (explained variances) ranged from -4.238 to -9.648. As used in the SAS program, the greater the (negative) value, the greater the likelihood of adoption increased. Thus, responses to all questions on the survey can be used to predict adoption.

Logistic regression analysis was then conducted using the seven variables independently and comparing the results of the tests, using a likelihood ratio test, to determine if use of the individual variables improved on use of the one TOTAL variable for prediction. This comparison was made by using a Likelihood Ratio Test (Hosmer & Lemeshow, 1989). The quantities used were the "-2 Log Likelihood" for each model, as found on the final iteration in the "Maximum Likelihood Analysis" tables for the regression on the TOTAL variable and the regression on the individual variables.

Table 6.

Logistic Regression Analysis--TOTAL Variable

Computer Assisted Instruction

Maximum Likelihood Analysis

Iteration	-2 Log Likelihood
0	95.654
1	75.680
2	74.175
3	74.116
4	74.116
5	74.116

Maximum Likelihood Analysis of Variance Table

Source	DF	Chi-Square	Prob
INTERCEPT	1	8.60	0.003
TOTAL	1	9.54	0.002
LIKELIHOOD RATIO	26	24.77	0.532

Analysis of Maximum Likelihood Estimates

Effect	Parameter	Estimate	Standard Error	Chi-Square	Prob
INTERCEPT	1	11.131	3.795	8.60	0.003
TOTAL	2	-4.371	1.416	9.54	0.002

Clinical Competency Exams

Maximum Likelihood Analysis

Iteration	-2 Log Likelihood
0	87.337
1	59.285
2	56.936
3	56.808
4	56.808
5	56.808

Maximum Likelihood Analysis of Variance Table

Source	DF	Chi-Square	Prob
INTERCEPT	1	16.49	0.000
TOTAL	1	16.12	0.000
LIKELIHOOD RATIO	30	26.48	0.650

Analysis of Maximum Likelihood Estimates

Effect	Parameter	Estimate	Standard Error	Chi-Square	Prob
INTERCEPT	1	11.631	2.864	16.49	0.000
TOTAL	2	-4.238	1.056	16.12	0.000

Preceptorship

Maximum Likelihood Analysis

Iteration	-2 Log Likelihood
0	105.358
1	54.560
2	45.812
3	44.080
4	43.965
5	43.964
6	43.964

Maximum Likelihood Analysis of Variance Table

Source	DF	Chi-Square	Prob
INTERCEPT	1	21.07	0.000
TOTAL	1	21.04	0.000
LIKELIHOOD RATIO	36	26.82	0.866

Analysis of Maximum Likelihood Estimates

Effect	Parameter	Estimate	Standard Error	Chi-Square	Prob
INTERCEPT	1	22.551	4.913	21.07	0.000
TOTAL	2	-7.435	1.621	21.04	0.000

Skills/Simulation Labs

Maximum Likelihood Analysis

Iteration	-2 Log Likelihood
0	92.882
1	49.063
2	43.259
3	42.035
4	41.945
5	41.944
6	41.944

Maximum Likelihood Analysis of Variance Table

Source	DF	Chi-Square	Prob
INTERCEPT	1	7.68	0.006
TOTAL	1	9.31	0.002
LIKELIHOOD RATIO	33	31.90	0.522

Analysis of Maximum Likelihood Estimates

Effect	Parameter	Estimate	Standard Error	Chi-Square	Prob
INTERCEPT	1	12.172	4.392	7.68	0.006
TOTAL	2	-4.848	1.589	9.31	0.002

Work/Study Externship

Maximum Likelihood Analysis

Iteration	-2 Log Likelihood
0	85.950
1	44.111
2	34.705
3	31.741
4	31.235
5	31.214
6	31.214
7	31.214

Maximum Likelihood Analysis of Variance Table

Source	DF	Chi-Square	Prob
INTERCEPT	1	12.87	0.000
TOTAL	1	12.35	0.000
LIKELIHOOD RATIO	34	15.94	0.996

Analysis of Maximum Likelihood Estimates

Effect	Parameter	Estimate	Standard Error	Chi-Square	Prob
INTERCEPT	1	28.029	7.813	12.87	0.000
TOTAL	2	-9.648	2.746	12.35	0.000

The quantity obtained for the regression on the individual variables was subtracted from the quantity obtained for the regression for the TOTAL variable. "The difference in these quantities measures the amount of improvement obtained by allowing the seven individual variables to be weighted differently" (M. Trosset, personal communication, Dec. 24, 1991). The difference was referred to chi-squared distribution with six (the number of additional parameters) degrees of freedom.

Testing the null hypothesis of no difference, i.e., the variables are equally important in explaining adoption of innovations, using the likelihood ratio test, the probability was greater than .05 for four of the five innovations. Thus, the null hypothesis was retained for these innovations (Table 7). There was no evidence that the seven variable model was any better than the TOTAL model or, put another way, the seven variables collectively may be necessary to decision prediction. For Clinical Competency Exams, the significance was .001, a strong indication that the model of the seven variables introduced independently was better. For this innovation, further analysis was conducted to identify which of the seven variables contribute significantly.

Table 7.

Likelihood Ratio Tests

Innovation	Test Statistic	Significance Probability
CAI	74.116-61.876 = 12.240	p = .057
Clinical Competency Exam	56.808-34.407 = 22.401	p = .001
Preceptorship	43.964-36.983 = 6.981	p = .323
Skills Labs	41.944-38.547 = 3.397	p = .756
Work-study	31.214-27.446 = 3.768	p = .708

For Clinical Competency Exams (adopters, n = 36; nonadopters, n = 37), nested models were created between the TOTAL and the seven variable models. Logistic Regression 1 was the model using the TOTAL variable (Table 6). Regression of all seven variables, Logistic Regression 4 (Table 8), showed significance for the Environment variable (p=.014) and for the Observability variable (p=.024). In the nested regression, Logistic Regression 2 maintained the Environment variable separately, but averaged the remaining six variables, while Logistic Regression 3 maintained both the Environment and Observability variables but averaged the remaining five variables.

These tests again used the quantities "-2 Log Likelihood" for each model, as found on the final iteration in the "Maximum Likelihood Analysis" tables. Table 9 shows the Likelihood Ratio Analysis for regressions 2, 3, and 4 for the innovation, Clinical Competency Exams.

The test statistic for testing the null hypothesis that model 2, separating the Environment variable, is no better than model 1 (the TOTAL or composite variable) is referred to a chi-squared distribution with one (model 2 has one more parameter than model 1) degree of freedom, giving a significance probability of p=.0005. Therefore, it is clear that the Environment variable should be maintained separately and not be averaged with the other six variables.

The test statistic for testing the null hypothesis that model 3, separating both the Environment and Observability variables, is no better than model 2 is referred to a chi-squared distribution with one (model 3 has one more parameter than model 2) degree of freedom, giving a significance probability of p=.0250. Therefore, the Observability variable should not be averaged with the Relative Advantage, Compatibility, Trialability, Complexity, and Cost variables. Both the Environment and Observability variables are significant predictors of adoption decisions.

Table 8.

Logistic Regression Analysis, Clinical Competency Exams--Separate Variables

Maximum Likelihood Analysis	
Iteration	-2 Log Likelihood
0	87.337
1	47.552
2	38.558
3	35.192
4	34.462
5	34.408
6	34.407
7	34.407

Maximum Likelihood Analysis of Variance Table			
Source	DF	Chi-Square	Prob
INTERCEPT	1	9.32	0.002
Relative Advantage	1	0.78	0.378
Environment	1	6.08	0.014
Compatibility	1	2.07	0.150
Trialability	1	0.46	0.498
Observability	1	5.10	0.024
Complexity	1	2.15	0.143
Cost	1	1.48	0.224
LIKELIHOOD RATIO	54	34.41	0.983

Table 9.

Likelihood Ratio Analysis--Clinical Competency Exams

Model	Test Statistic	Significance Probability
2	56.809-40.422 = 16.387	p = .0005
3	40.422-35.399 = 5.023	p = .0250
4	35.399-34.407 = 0.992	p = .9111

The test statistic for testing the null hypothesis that model 4, separating all seven variables, is no better than model 3 is referred to a chi-squared distribution with four (model 4 has four more parameters than model 3) degrees of freedom, giving a significance probability of p=.9111. Therefore, it is clear that it suffices to average the Relative Advantage, Compatibility, Trialability, Complexity, and Cost variables.

One possible reason why Observability was found to be a significant variable could have been that little information was available about this innovation in traditional programs. Most of the information in nursing journals about Clinical Competency Exams related to external degree programs. Information about this innovation was disseminated several years ago among nursing programs in California via an interactive telecommunications program,

sponsored by the W. K. Kellogg Foundation. If adopters knew more about Clinical Competency Exams as a result of participating in this program or networking with others who had adopted the exams, this finding probably represented a true significance in predicting adoption. However, another possibility for the significance of Observability in this study was that in answering the questions related to knowledge of Clinical Competency Exams, respondents based their answers on present knowledge rather than knowledge at the time of adoption, as the directions for the survey requested. If they have been using these Exams, faculty would be expected to know more about them than faculty in programs that have not adopted the Exams. The problem with this logic, however, is that if this were the case, this difference would have been expected for the other innovations as well.

Principal Component Analysis had found that the attribute Trialability was of little importance to the decision to adopt innovations. This finding is further supported by the Logistic Regression Analysis. Trialability was not significant to adoption of any of the innovations. In fact, in the seven variable analysis, for four of the innovations, it was far from significant with probability values ranging from .498 (Clinical Competency Exams) to .602 (Preceptorship). Only in the case of Work-study did Trialability approach significance (p=.078).

The environment variable, not one of the six attributes of diffusion theory, contributed to the TOTAL variable and was important to decisions to adopt an innovation and, in the case of Clinical Competency Exams, contributed significantly as a separate variable. This suggested that other factors, in addition to the six attributes from diffusion theory, influenced adoption decisions.

Comparison of Perception--Adopter and Nonadopter Groups

An additional test was conducted of the null Hypothesis 2 (Perception of the attributes of a proposed innovation does not influence the decision to adopt the innovation). Of the five innovations, the largest group of adopters (n=66) was for initiating or increasing use of Skills/Simulation Labs; there were 18 nonadopters for this innovation. The smallest group of adopters (n=20) was for Work-Study/Externships; there were 64 nonadopters for Work-Study/Externships. The size of all adopter and nonadopter groups are identified in Table 10.

Means for the group of directors who had adopted the innovations (adopters) and the group who had not adopted it (nonadopters) were determined for each attribute of each innovation and were compared using t tests. The SAS statistical computer software program was used to compute the t tests.

Table 10.

Adoption Decision by Innovation

Innovation	Adopters	Nonadopters
CAI	56	28
Preceptorship	38	45
Clinical competency exam	33	47
Skills/simulation labs	66	18
Work-study/externship	20	64

Table 11 summarizes the study findings for this test by presenting the levels of significance for each attribute by innovation. Significant differences in perception between the adopter and nonadopter groups were found for all innovations for the attributes of Compatibility, Observability, Complexity, and Cost. No difference between adopter and nonadopter groups was found for four of the five innovations for the attribute of Trialability, and for the attribute of Relative Advantage for CAI. The lack of importance for Trialability was supported by the Principal Component Analysis. Additionally, significant differences between groups were found for the Environment variable for four innovations. Tables for these t tests are presented in Appendix C.

Table 11.

Significance Levels by Attribute and Innovation

Attribute	CAI	Precep-torship	Competency Exams	Skills Labs	Work/ Study
Relative advantage	ns	0.01	0.01	0.01	0.01
Compatibility	0.01	0.01	0.01	0.05	0.01
Trialability	ns	ns	ns	ns	0.01
Observability	0.01	0.01	0.01	0.01	0.01
Complexity	0.01	0.01	0.01	0.01	0.01
Cost	0.01	0.01	0.01	0.01	0.01
Environment	ns	0.01	0.05	0.01	0.01

ns=not significant

With the exception of findings related to Trialability and Complexity, these results are consistent with the expectations from the framework of the study. Rogers and Shoemaker (1971) found that Trialability was related to adoption and that Complexity was not related to adoption.

Trialability, being able to "try it out" before fully implementing the innovation, had generally lower means for both adopters and nonadopters than the other attributes. In the Principal Component Analysis, this attribute was weighted low or negatively for all attributes except Work-

study, indicating that it contributed less to the adoption decision than other variables. Respondents perceived all the innovations except Work-study as being difficult to adopt incrementally or difficult to discontinue if they wished to do so after implementation. For example, a major investment in computer hardware and software would make CAI difficult to discontinue once the equipment has been purchased. Both adopters and nonadopters perceived CAI as having high Relative Advantage.

Ranking Importance of Attributes

On the second survey respondents were asked to rank order the 14 innovation attributes, based on their perception of the importance of each to the decision about adopting the innovation. Some respondents did not rank each of the 14 items; thus, within the groups there was some variation in numbers of responses from one item to another.

The means of ranking scores of each of the scale items were calculated for adopter and nonadopter groups. This was done for each of the five innovations in the study. The means were then rank ordered from most important to the adoption decision to least important. The high and low quartiles in the rankings were identified for each innovation and are presented in Appendix D. These data are summarized in Table 12 and Table 13 which identify the high and low ranked attributes. These tables also identify the number of innovations for which the attributes were in these

quartiles. Some items, e.g., "builds on previous practices or philosophy" and "could be adopted incrementally," appeared on both the most important and least important lists. This was because they were perceived as being very high in importance for some innovations and very low in importance for others.

Items were not numbered on the survey forms so as not to influence ranking. In the following discussion, items are numbered in the sequence in which they occurred in the form.

Attributes of Relative Advantage and Compatibility were most important to the adoption decision for both adopter and nonadopter groups for each innovation. Item 7, "increases students' learning," which represented the attribute of Relative Advantage, was ranked as the highest attribute by adopters for all innovations and was in the high quartile for four innovations among nonadopters. The other item representing Relative Advantage, "advantage over present ways of accomplishing objectives," was in the high quartile among adopters for all innovations and for four innovations among nonadopters. Thus, the attribute of Relative Advantage was clearly the most important to nurse educators in making their adoption decision. Issues of Compatibility, scale items 2 and 4, were each ranked in the high quartile for three innovations among adopters and for four innovations among nonadopters. Other items in the high

quartile were represented much less frequently. Table 12 presents these rankings.

As shown in Table 13, the item ranked as least important by both adopters and nonadopters was one relating to the attribute of social Cost, "would increase the status of program." Nurse educators were little influenced to change for the sake of increased status. However, the same item was ranked among the high quartile by adopters of one innovation, Work-study experiences. Among the other items ranked low was another item of Cost, that of time, and items representing the attributes of Observability and Trialability.

Table 12.

Number of Innovations for Which Attributes Ranked Most Important to the Adoption Decision

Item*	Attribute	Adopters	Non-adopters
7.	Increases students' learning (Relative Advantage)	5	5
10.	Advantage over present ways of accomplishing objectives (Relative Advantage)	5	4
2.	Consistent with program norms and values (Compatibility)	3	4
4.	Builds on previous practices or philosophy (Compatibility)	3	4
5.	Could be adopted incrementally (Trialability)	1	2
9.	Discussion of innovation with others who have implemented (Observability)	1	1
12.	Cost--financial (Cost)	1	1
11.	Ease of implementation (Complexity)	1	0
14.	Would increase status of program (Cost)	1	0
1.	Easy to understand (Complexity)	0	1

* Items not numbered on survey form, but numbered sequentially for discussion

Table 13.

Number of Innovations for Which Attributes Ranked Least Important to the Adoption Decision

Item	Attribute	Adopters	Non-adopters
14.	Would increase status of program (Cost)	4	5
8.	Familiar with innovation from workshops, journals, books, etc. (Observability)	3	2
9.	Discussion of innovation with others who have implemented (Observability)	3	1
13.	Cost--time (Cost)	3	1
5.	Could be adopted incrementally (Trialability)	2	2
6.	Could be easily discontinued if necessary (Trialability)	2	2
2.	Consistent with program norms and values (Compatibility)	1	1
3.	Consistent with clinical agency norms and values (Compatibility)	1	1
12.	Cost--financial (Cost)	1	1
11.	Ease of implementation (Complexity)	0	2
4.	Builds on previous practice or philosophy (Compatibility)	0	1

Summary

In summary, the findings of this study showed that associate degree nursing programs were adopting innovations in the clinical component of their curriculum. Program directors' perceptions of the attributes of five innovations were measured using a Likert Scale survey tool. Scale values for perceptions of six attributes (Relative Advantage, Compatibility, Observability, Complexity, Trialability, and Cost), along with a variable representing Environment influence, were studied by Principal Component Analysis. This analysis led to the conclusion that no one or two variables can be used to predict adoption of an innovation.

Logistic Regression Analysis was conducted with an aggregate TOTAL variable, made up of the seven variables, that was found to be an accurate predictor of adoption of an innovation. When measured separately, there were separate variables that were significant to adoption for only one innovation. In this case, the Observability and Environment variables were significant predictors of adoption.

These findings were largely consistent with expectations based on the framework of the study. Diffusion theory suggested that all variables except Complexity were related to adoption, while this study found Complexity to be important as an element in the TOTAL variable. An

unexpected finding was that of negligible importance of Trialability. When asked to rank importance of attributes based on importance to their decision about adoption of an innovation, both adopter and nonadopter groups identified the attributes of Relative Advantage and Compatibility as being most important to their decisions.

CHAPTER 5

SUMMARY AND CONCLUSIONS

Summary of Conceptual Framework

The purposes of this study were (1) to determine whether associate degree nursing programs were implementing innovations in their clinical curricula, (2) to identify recent clinical innovations in these nursing programs, and (3) to identify attributes of innovations that influence adoption of innovations in these nursing programs. Diffusion theory was used as the study's conceptual framework.

Diffusion theory (Rogers, 1983) suggested that the characteristics or attributes of an innovation were important when an individual or group was at the point in the implementation process of making a decision as to whether to adopt an innovation. As the adopting unit considered the innovation's attributes, the perceptions formed about the attributes had a strong influence on the decision to adopt an innovation. Rogers (1962, 1983) and Rogers and Shoemaker (1971) categorized the attributes as Relative Advantage, Compatibility, Complexity, Trialability, and Observability. In their review of over 1500 studies, Rogers and Shoemaker found a relationship between rate of adoption and one's perception of Relative Advantage, Compatibility, Trialability, and Observability. Complexity

was the one attribute for which Rogers and Shoemaker did not find a correlation with adoption. However, Berman and McLaughlin (1976) did find a relationship for this attribute in educational settings; some aspects of Complexity appear likely to induce educational change. That is, an innovation involving a comprehensive change in the curriculum or teacher behavior or involving integration of a project into the educational institution's ongoing procedures is more likely to be implemented. While Rogers and Shoemaker included Cost as a component of Relative Advantage, others (Zaltman et al, 1973; Lin & Zaltman, 1973) identified Cost as a distinct attribute. The Zaltman studies found a positive correlation between Cost and adoption.

Summary of Method

Two questionnaires, developed by the researcher, were sent to directors of all associate degree nursing programs in six southwestern states. The first questionnaire was designed to determine whether changes in the clinical component of nursing programs were being considered and implemented and, if so, what the changes were. From responses on the first questionnaire, five innovations were identified as being most frequently considered. The second questionnaire asked for information about adoption of each innovation. A Likert Scale was used to seek the respondents' perceptions of attributes of the five

innovations. Finally, respondents were asked to rank attributes based on the importance of the attributes to their decisions whether to adopt the innovations.

Summary of Results

The results of the study are presented as answers to the research questions identified in Chapter 1.

1. Are associate degree nursing programs considering and implementing innovations in the clinical component of their curricula?

Both the first and second survey questionnaires provided information to answer this question. When asked on the first questionnaire if they had considered changes in their clinical curriculum during the past six years, 73 respondents (88%) indicated that such changes had been considered. Of these, 64 (77% of the total respondents) said one or more changes had been accepted and implemented in their programs. Ten (12%) respondents indicated that they had not considered any changes in the last six years.

In the second survey, respondents were asked to provide information about adoption for each of five specific innovations. Of the 84 respondents, 80 (95%) said that one or more innovations had been adopted in their programs while 4 (5%) had not adopted any of the five innovations being considered. These data showed a high incidence of

considering and implementing innovations in the clinical component of associate degree nursing programs.

2. What are the innovations that have been considered in the clinical component of the curriculum in associate degree nursing programs in the last six years?

Several innovations were identified as having been considered by ADN programs. Five clinical innovations were reported by at least 10 per cent of the respondents. These five were computer assisted instruction, preceptorship experiences, clinical competency exams, initiating or increasing use of skills/simulation labs, and work-study/ externship experiences.

3. Is there a difference in perception of attributes of an innovation between adopters and nonadopters of the innovation?

Six innovation attributes--Relative Advantage, Compatibility, Complexity, Observability, Trialability, and Cost--were studied in this dissertation. These attributes had been identified previously by researchers who used diffusion theory (Rogers, 1983; Rogers & Shoemaker, 1971; Lin & Zaltman, 1973). Literature suggested that clinical agencies and other groups external to the nursing education programs exerted pressure for change on the programs. A variable representing Environmental influence of attributes was also included in order to examine this possibility.

The theoretical framework led to the null hypotheses, Perception of all attributes of a proposed innovation does not influence the decision to adopt the innovation. Principal Component Analysis and Logistic Regression Analysis supported rejection of the null hypothesis. It was found that adoption of an innovation could be predicted by a TOTAL variable composed of all attributes. Therefore one's perception of the attributes did influence the decision to adopt the innovation.

4. What is the relative importance of the various attributes in explaining the adoption of innovation?

Principal Component Analysis did not indicate that one or a few variables were separately important to the adoption decision. Instead, this analysis indicated that all variables were important, with Trialability contributing less in importance than others. This was additionally supported by t tests between the mean scores of adopter and nonadopter groups on the separate variables. There was no significant difference between groups' scores on the Trialability attribute for four of the five innovations.

Logistic Regression Analysis found that a TOTAL aggregate variable was a good predictor of adoption for all innovations. Only in the case of one innovation, was there significance in prediction for separate variables. For Clinical Competency Exams, Observability and Environment

were significant predictors of adoption. Examination of the t tests between scores of adopter and non adopter groups showed that for the innovation, CAI, both groups perceived the Relative Advantage as being high, with no significant difference between groups. This finding supported the fact that the combination of other variables was important to the adoption decision. Even though nonadopters perceived advantages to adopting CAI, other attributes influenced the decision also.

When asked to rank attributes in order of importance to their decision to adopt an innovation, both adopters and nonadopters ranked components of Relative Advantage and Compatibility as being the most important attributes in the adoption decision.

5. Do the attributes that facilitate and inhibit adoption differ among innovations?

Attributes facilitated adoption of an innovation if they were perceived as being high in Relative Advantage, Compatibility, and Observability, and low in Complexity and Cost. If perception was in the opposite direction, the attributes tended to inhibit adoption. Trialability had little influence on adoption decisions. These findings were consistent across innovations both as an aggregate TOTAL variable and as separate variables.

6. Does diffusion theory adequately describe the attributes of innovations that are adopted?

Diffusion theory (Rogers, 1983; Rogers & Shoemaker, 1971; Lin & Zaltman, 1973) offers a model of the attributes of innovations that influence decisions to adopt innovations. They identified six attributes of an innovation--Relative Advantage, Compatibility, Complexity, Observability, Trialability, and Cost. Rogers and Shoemaker found that all attributes were related to adoption except Complexity. This study found high significance in predicting adoption using an aggregate TOTAL variable that included all six attributes.

Rogers (1983) suggested that factors in the environment influence perception of attributes of an innovation. In this dissertation, an Environment variable was created to examine the influence of factors at work in the external environment of the nursing program, i.e., clinical and other agencies. This Environment variable was found to be influential in the adoption decision. It was among the three highest weighted variables in the principal component analysis, an element in the TOTAL variable of the logistic regression analysis, and was perceived significantly higher by adopters than non-adopters according to the t test analysis. In logistic regression analysis, for one innovation, the separate Environment variable was

significant in predicting adoption. These findings indicate that the environmental influence is strong.

Thus, in the field of nursing, diffusion theory adequately described attributes of innovations that were adopted, with the addition of the influence of the Complexity variable. Additional research to define the influence of the Environmental variable is warranted.

Implications for Implementation of Innovations

The final question for this study was, What are the implications of the answers to these questions to implementing clinical innovation successfully in associate degree nursing programs?

The findings of the study could be useful to program directors, faculty, administrators, and others involved in associate degree nursing programs. Most (95%) of the programs in this project had implemented one or more of the five innovations under study, while only 5% had not implemented any of these innovations. As these ADN programs demonstrated a high rate of implementation of innovations and are likely to consider adopting other innovations, knowing strategies to facilitate the process of implementation would be important to change.

Knowing not only that most programs do implement innovations, but also what those innovations are could also be useful. As professionals in a rapidly changing health

care field, nurse educators need to know the trends in the profession. Networking and publication by those who have successfully implemented an innovation enhance the observability of this innovation. Sharing information and adopters' experiences with the innovation may initiate the implementation process for another program by suggesting unmet needs and possible ways of meeting those needs.

For those educators who support adoption of an innovation, knowing the innovation attributes that are most important to adopters could be used to enhance the possibility of a favorable decision by the adopting unit. The promoter of an innovation, in presenting a proposed innovation to potential adopters, probably should use a multifaceted approach and emphasize the positive aspects of several of the attributes of the innovation. It would be beneficial to identify the advantages of using the innovation. Elements of the innovation that are compatible with the norms, values, and traditions of the program should be highlighted. Observability could be increased by providing opportunities for program personnel to meet with others who use the innovation or to attend a workshop where the innovation is featured. Support, in the form of technical assistance, education, etc., could be provided to reduce the complexity of implementing an innovation. Trialability could be addressed by providing opportunities

for "trying out" a proposed innovation, if possible. However, knowing that this attribute is not perceived as high as other attributes, less attention need be directed to it. The cost of the innovation is another attribute. A change agent should consider the price in terms of money, time, personnel, etc., and the available resources. If necessary, one can seek a lower price or ways to increase resources, such as grant writing or using release time for faculty. Measures such as these would increase the probability that those involved in making the adoption decision would perceive the attributes of the innovation favorably and thus increase the probability of adoption of the innovation.

Directors in the few programs that nave not made any changes could find information in this study useful. If these directors identify a need for change, they may first look at their own needs and then seek information about innovations that other programs are implementing.

Suggestions for Further Research

This study explores innovation in the clinical component of the curriculum in associate degree nursing programs in the southwestern United States. There are several possibilities for determining whether the findings generalize to baccalaureate nursing programs or to other fields of study.

This study identified specific innovations adopted in the associate degree nursing (ADN) programs and determined the frequency of implementation of these innovations. The study also explored the differences in perception of attributes of innovations between adopters and nonadopters. Additional research could be conducted to determine whether these findings generalize to programs in other regions of the United States or internationally. Also, the results of this study of ADN programs could be compared to results of a similar study of baccalaureate nursing programs. Are baccalaureate programs implementing the same innovations? Do the directors of baccalaureate programs have the same perceptions toward the innovations as ADN directors?

The classroom or nonclinical component of nursing curricula could be included to determine if there is a difference in perceptions between clinical and nonclinical innovations. Additionally, these findings in nursing could be compared to educational programs in other health care professions and other disciplines.

Each attribute of an innovation can be divided into many components and examined in greater detail than was done in this study. For example, the attribute of Cost includes financial, time, personnel, and social costs. Compatibility has components that included norms, values, tradition,

policies, objectives, and philosophy. Each provides an opportunity for in-depth research.

The findings in this study regarding the attributes of Complexity were not consistent with those of Rogers and Shoemaker (1971) although Berman and McLaughlin (1976) did find that some types of high complexity were not an impediment to innovation adoption in education programs. As few studies in nursing education have used this framework, further research could explore the importance of this attribute in this discipline and others.

The addition of an Environment variable in this study showed that attributes of an innovation at work in the clinical agencies used by the nursing program also influence adoption decisions. Further research could be conducted to determine the strength of that environmental influence.

Finally, while perceptions of attributes of an innovation influence decisions to adopt innovations, there are also other aspects of diffusion theory that have an effect on implementation. Some of these are examination of perceived need to change, communication channels, and characteristics of adopters.

APPENDIX A

First Survey Instrument

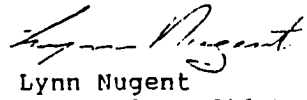
April 20, 1990

Dear Director:

I am a registered Nurse, faculty member and doctoral candidate with an interest in educational change. My dissertation will explore changes in the clinical curricula of associate degree nursing programs. The initial phase of my research is a survey of programs as to what changes have been considered and/or introduced into the programs. The second phase will be a follow-up of some respondents from this survey. For this reason, please include your name and institution on the form. Confidentiality of answers will be maintained.

I would appreciate you or a knowledgeable member of your faculty taking a few minutes to complete the enclosed questionnaire. Thank you for your assistance in my research.

Sincerely,



Lynn Nugent
Doctoral candidate
University of Arizona

529 Ellenwood Dr.
Prescott, AZ 86303
(602) 778-6615

Directions: Please complete this form. It is stamped on the reverse. Fold as indicated with the address showing and return.

Name and position _____

Institution _____

Address _____

_____

Has your associate degree program considered any significant change in the clinical curriculum, e.g. a clinical preceptorship, computer assisted instruction, skills/simulation lab, clinical competency exams, etc., in the last six years?

yes ____ no ____

If yes, please identify the changes considered and the status related to the implementation of each.

1. Type of change _____

___ accepted & implemented ___still under consideration ___ rejected

What are the major factors why this change is implemented/ still under consideration/ rejected?

_____

_____

2. Type of change _____

___ accepted & implemented ___still under consideration ___rejected

What are the major factors why this change is implemented/ still under consideration/ rejected?

_____

_____

3. Type of change _____

___ accepted & implemented ___still under consideration ___ rejected

What are the major factors why this change is implemented/ still under consideration/ rejected?

_____

_____

Comments:

I will send you a copy of results if you check here ____

APPENDIX B

Second Survey Instrument

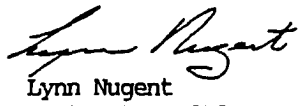
January 18, 1991

Dear Colleague:

Last spring you completed a survey I sent as part of my doctoral dissertation study, asking for identification of recent changes you have made or are considering in the clinical component of your nursing program. You indicated that you would like to receive a copy of the results. Five changes--computer assisted instruction, preceptorships, clinical competency exams, initiating or increasing use of skills/simulation labs, and work-study/externships--were identified most frequently. Each of these changes was identified by at least 15 per cent of the respondents, who were directors or faculty members in associate degree nursing programs. A complete frequency table is enclosed.

I am now in the second and final phase of my research and have mailed the second survey form to directors of ADN programs. If your director asks you to assist in completing it, I would appreciate your assistance again. I had a high response rate on the first survey and I thank you for your help with my project. I really do appreciate your assistance.

Sincerely,



Lynn Nugent
Doctoral Candidate
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COMPUTER ASSISTED INSTRUCTION (CAI)

Please indicate your program's plans regarding implementation of CAI (including interactive videodiscs):

____ already implemented or plan to implement during this academic year
____ still under consideration
____ have considered and rejected
____ have not seriously considered
____ not familiar with CAI

Please circle the letters that most nearly indicate your perceptions and those of your nursing faculty about CAI at the time you considered adopting it. If you have not considered it, please indicate your perception at the present.

SA=Strongly agree D=Disagree
A=Agree SD=Strongly Disagree

1.	CAI would provide an advantage over current way(s) of accomplishing objectives.	SA	A	D	SD
2.	People/agencies outside our department of nursing see CAI as an advantage over the current (ways) of accomplishing objectives and exert some pressure to adopt it.	SA	A	D	SD
3.	CAI would increase student learning over Present methods of instruction.	SA	A	D	SD
4.	CAI is consistent with the norms and values of nursing program personnel.	SA	A	D	SD
5.	CAI is consistent with the norms and values of clinical agency personnel.	SA	A	D	SD
6.	CAI does not follow from our previous practices or the philosophy of our program.	SA	A	D	SD
7.	CAI could be adopted incrementally/piecemeal.	SA	A	D	SD
8.	CAI would be difficult to discontinue, if desired after implementation.	SA	A	D	SD
9.	Our nursing program personnel know quite a lot about CAI.	SA	A	D	SD
10.	Our nursing personnel know personally of other programs that implemented CAI.	SA	A	D	SD
11.	CAI would be difficult to implement.	SA	A	D	SD
12.	CAI is easily understood by our nursing program personnel.	SA	A	D	SD

(over)

13. The financial cost of CAI is prohibitive to implementation. SA A D SD

14. We would need funding from sources outside our college to be able to implement CAI. SA A D SD

15. We have the time and personnel to implement CAI. SA A D SD

16. Adopting CAI would increase our status among nursing colleagues. SA A D SD

Please rank the following attributes of CAI, based on your perception of the importance each attribute contributes to your decision about adopting or rejecting CAI. Rank from 1-14, with 14 indicating the most important factor and 1 indicating the least important factor in your decision.

____ easy to understand

____ consistent with our nursing program's norms and values

____ consistent with norms and values of clinical agency personnel

____ builds on our previous practices and/or our philosophy

____ could be adopted incrementally (piece by piece)

____ could be easily discontinued if necessary

____ increases students' learning

____ familiar with CAI by means of workshops, journals, books, etc.

____ discussions about CAI with personnel in other programs that have implemented it

____ advantage over the present way(s) of accomplishing objectives

____ ease of implementation

____ cost (financial)

____ cost (time)

____ would increase status of program

APPENDIX C

Differences in Perception of Attributes Between Adopter and Nonadopter Groups

Perception of Relative Advantage by Adopter and Nonadopter Groups

Innovation-Group	N	Mean	SD	t Test	p
CAI					
adopter	51	6.35	1.18		
nonadopter	25	5.96	1.14	1.38	0.1716
Preceptorship					
adopter	36	7.47	0.81		
nonadopter	43	5.60	1.40	7.39	0.0001**
Competency exams					
adopter	28	5.82	1.42		
nonadopter	41	4.76	1.41	3.08	0.0030**
Skills lab					
adopter	59	6.71	1.23		
nonadopter	14	5.38	1.78	3.38	0.0012**
Work-Study					
adopter	19	6.79	1.23		
nonadopter	52	5.31	1.45	3.96	0.0002**

* Significant at the 0.05 level

** Significant at the 0.01 level

Perception of Compatibility by Adopter and Nonadopter Groups

Innovation-Group	N	Mean	SD	t Test	p
CAI					
adopter	54	6.13	0.83		
nonadopter	25	5.56	1.12	2.54	0.0131**
Preceptorship					
adopter	36	7.11	0.89		
nonadopter	42	5.60	1.04	6.87	0.0001**
Competency exams					
adopter	31	6.32	0.98		
nonadopter	41	4.93	1.29	5.02	0.0001**
Skills lab					
adopter	62	6.55	1.23		
nonadopter	14	5.43	1.55	2.57	0.0208**
Work-Study					
adopter	19	6.74	0.99		
nonadopter	48	5.06	1.26	5.18	0.0001**

* Significant at the 0.05 level

** Significant at the 0.01 level

Perception of Complexity by Adopter and Nonadopter Groups

Innovation-Group	N	Mean	SD	t Test	p
CAI					
adopter	54	5.61	0.88		
nonadopter	26	4.77	0.95	3.91	0.0002**
Preceptorship					
adopter	36	6.78	0.96		
nonadopter	43	5.09	0.92	7.94	0.0001**
Competency exams					
adopter	31	6.32	1.01		
nonadopter	41	4.90	1.07	5.71	0.0001**
Skills lab					
adopter	61	6.49	0.94		
nonadopter	14	5.43	1.22	3.56	0.0006**
Work-Study					
adopter	19	5.84	0.76		
nonadopter	51	4.96	1.01	3.45	0.0010**

* Significant at the 0.05 level

** Significant at the 0.01 level

Perception of Trialability by Adopter and Nonadopter\ Groups

Innovation-Group	N	Mean	SD	t Test	p
CAI					
adopter	52	5.69	0.96		
nonadopter	27	5.70	0.82	-0.05	0.9583
Preceptorship					
adopter	36	4.94	1.30		
nonadopter	43	5.23	0.87	-1.13	0.2633
Competency exams					
adopter	31	5.74	0.93		
nonadopter	40	5.33	0.94	1.86	0.0675
Skills lab					
adopter	62	5.63	0.98		
nonadopter	14	5.50	1.22	0.42	0.6722
Work-Study					
adopter	19	5.84	0.76		
nonadopter	51	5.10	0.78	3.56	0.0007**

* Significant at the 0.05 level

** Significant at the 0.01 level

Perception of Observability by Adopter and Nonadopter Groups

Innovation-Group	N	Mean	SD	t Test	p
CAI					
adopter	54	5.23	1.02		
nonadopter	27	4.11	1.01	4.87	0.0001**
Preceptorship					
adopter	37	6.78	1.08		
nonadopter	43	5.21	0.99	6.79	0.0001**
Competency exams					
adopter	31	6.00	1.18		
nonadopter	40	4.58	1.36	4.63	0.0001**
Skills lab					
adopter	62	6.52	1.16		
nonadopter	13	5.46	0.97	3.07	0.0030**
Work-Study					
adopter	18	5.56	0.98		
nonadopter	53	4.51	1.09	3.61	0.0006**

* Significant at the 0.05 level

** Significant at the 0.01 level

Perception of Cost by Adopter and Nonadopter Groups

Innovation-Group	N	Mean	SD	t Test	p
CAI					
adopter	53	12.24	1.69		
nonadopter	27	8.96	2.03	3.00	0.0036**
Preceptorship					
adopter	35	13.17	1.65		
nonadopter	42	9.67	2.01	8.25	0.0001**
Competency exams					
adopter	28	11.46	2.42		
nonadopter	39	9.77	1.87	3.22	0.0019**
Skills lab					
adopter	60	10.52	2.00		
nonadopter	12	8.75	1.29	2.93	0.0046**
Work-Study					
adopter	19	11.63	2.03		
nonadopter	50	9.30	1.68	4.85	0.0001**

* Significant at the 0.05 level

** Significant at the 0.01 level

Perception of Environment by Adopter and Nonadopter Groups

Innovation-Group	N	Mean	SD	t Test	p
CAI					
adopter	50	5.32	1.22		
nonadopter	26	5.27	1.19	0.18	0.8614
Preceptorship					
adopter	37	7.00	1.05		
nonadopter	41	5.63	1.37	4.95	0.0001**
Competency exams					
adopter	29	5.38	1.27		
nonadopter	39	4.64	1.22	2.41	0.0190*
Skills lab					
adopter	60	6.15		1.33	
nonadopter	13	4.38	1.45	4.05	0.0009**
Work-Study					
adopter	19	6.79	1.23		
nonadopter	51	5.08	1.23	5.18	0.0001**

* Significant at the 0.05 level

** Significant at the 0.01 level

APPENDIX D

Items Ranked Most Important and Least Important Between Adopter and Nonadopter Groups

Items Ranked as Most Important and Least Important in Adoption Decisions

Computer Assisted Instruction

Adopters				Nonadopters			
Scale Rank	Item	Mean	No.	Scale Rank	Item	Mean	No.
Highest							
1	7	10.23	53	1	7	9.56	25
2	10	9.06	51	2	10	8.72	25
3	12	8.86	51	3.5	6	8.60	25
4	5	8.45	53	3.5	12	8.60	25
Lowest							
10.5	6	6.92	51				
10.5	8	6.92	52	11	2	7.40	25
12	3	6.37	52	12	3	7.20	25
13	14	6.35	51	13	4	7.00	25
14	9	6.23	52	14	14	6.08	25

Preceptorship

Adopters				Nonadopters			
Scale Rank	Item	Mean	No.	Scale Rank	Item	Mean	No.
Highest							
1	7	10.21	33	1	10	9.12	38
2	2	8.81	32	2	7	9.00	38
3	10	8.73	30	3	4	8.82	38
4	4	8.56	32	4.5	2	8.34	38
				4.5	9	8.34	38
Lowest							
11	13	6.52	31	11	11	6.92	38
12	5	6.47	30	12	5	6.74	38
13	14	6.32	31	13	6	6.37	38
14	6	6.311	29	14	14	6.13	38

Clinical Competency Exams

Adopters				Nonadopters			
Scale Rank	Item	Mean	No.	Scale Rank	Item	Mean	No.
Highest							
1	7	9.68	25	1	2	9.29	34
2	2	9.04	26	2	4	8.94	34
3	4	8.92	26	3	7	8.31	35
4.5	10	8.50	26	4	1	8.12	33
4.5	11	8.50	26				
Lowest							
11	13	7.19	26	11	5	7.39	33
12.5	8	6.46	26	12	8	7.18	33
12.5	14	6.46	26	13	6	6.84	32
14	9	5.88	25	14	14	5.45	33

Skills Lab

Adopters				Nonadopters			
Scale Rank	Item	Mean	No.	Scale Rank	Item	Mean	No.
Highest							
1	7	10.00	55	1	2	9.70	10
2	4	9.11	56	2	10	9.60	10
3	10	8.84	55	3	4	8.80	10
4	2	8.77	56	4	7	8.70	10
Lowest							
11	8	7.46	56	11	11	6.10	10
12	9	6.82	55	12	12	5.40	10
13	6	6.56	55	13	13	4.90	10
14	14	6.42	55	14	14	4.10	10

Work Study

Adopters				Nonadopters			
Scale Rank	Item	Mean	No.	Scale Rank	Item	Mean	No.
Highest							
1	7	8.78	18	1	7	9.85	46
2	10	8.33	18	2	4	8.41	44
3	14	8.18	17	3	5	8.36	45
4	9	8.11	18	4.5	2	8.29	45
				4.5	10	8.29	46
Lowest							
11	5	7.06	17	11	1	7.20	45
12	2	6.79	18	12	9	6.89	45
13	12	6.78	18	13	8	6.53	45
14	13	6.28	18	14	14	6.09	45

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