

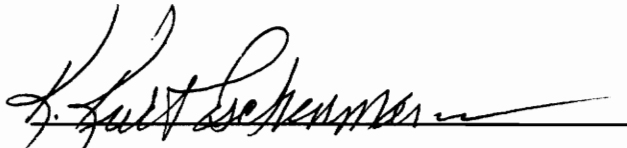
A DESCRIPTIVE STUDY OF THE RELATIONSHIPS BETWEEN LEARNING
STYLES AND DEMOGRAPHIC CHARACTERISTICS OF STUDENT REGISTERED
NURSE ANESTHETISTS AND CERTIFIED REGISTERED NURSE
ANESTHETIST CLINICAL INSTRUCTORS IN NURSE ANESTHESIA
EDUCATION PROGRAMS

by
Diane Powe

Dissertation submitted to the Graduate Faculty of the
Virginia Polytechnic Institute and State University in
partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY
in
Vocational and Technical Education

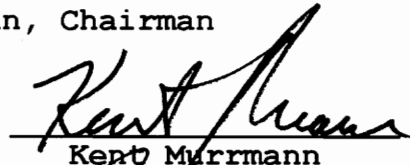
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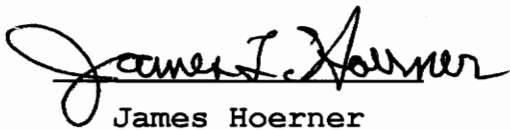
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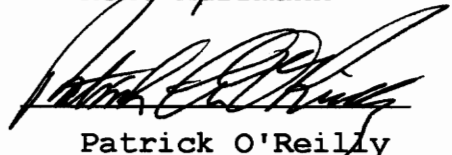
Nevin Frantz



Kent Murrmann



James Hoerner



Patrick O'Reilly

November, 1996
Blacksburg, Virginia

Key Words: Learning Styles, Learning Style Inventory,
Nurse Anesthetists, Anesthesia Education

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(ABSTRACT)

The purpose of this study was to describe the relationships between the learning styles and demographic characteristics of student registered nurse anesthetists (SRNAs) and certified registered nurse anesthetist (CRNA) clinical instructors in nurse anesthesia education programs (NAEPs). The demographic characteristics of age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, months of nurse anesthesia training, and number of anesthesia cases completed were analyzed for the students. The demographic characteristics of age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, years of nurse anesthesia experience, and years of nurse anesthesia teaching experience were analyzed for the instructors.

The participants of the study consisted of a purposive sampling of 221 students and 216 instructors. Data were collected by mailing the Kolb Learning Style Inventory and the demographic information sheet to the program directors of each NAEP who agreed to participate in the study. The response rate was 56.12% for the students and 42% for the instructors. The number of usable responses was 124 student nurse anesthetists and 90 nurse anesthesia instructors.

Frequency distribution tables were used to display the number of students and instructors having each of the four learning styles. The mean and standard deviations were calculated in order for the learning dimension scores to describe the overall learning styles of both students and instructors. The relationships between the learning styles and demographic characteristics were measured by the Chi-square and Phi correlation statistics. The overall learning styles were assimilator and converger for the students and assimilator for the instructors. No statistically significant relationship were identified between learning styles and each of the eight demographic characteristics for both the students and instructors. Thus, the researcher recommends a longitudinal study of the learning styles of SRNAs and CRNA clinical instructors using

a larger, more representative group in different geographical locations to enhance learning in the clinical setting.

Dedication

This long awaited study is lovingly dedicated to my mother, Dorothy Powe, who has always encouraged me to pursue my highest goals and have confidence in myself and to my brother, Reginald Powe, who has provided moral support throughout my life. My success is the result of their love.

Acknowledgments

The author would like to give thanks to the many individuals that provided support and guidance in the completion of this dissertation. A special thanks is extended to my advisor Dr. Kurt Eschenmann for his assistance throughout the completion of my program of study. I especially appreciated Dr. Patrick O'Reilly's advise on statistical methods used for this study. I am also grateful to Dr. Nevin Frantz, Dr. James Hoerner, and Dr. Kent Murrmann for their ideas and suggestions.

The author wishes to sincerely thank Leo LeBel, CRNA, M.Ed., JD., Program Director, Southern Connecticut State University & Bridgeport Hospital Nurse Anesthesia Program for his guidance, sound advice, and showing faith in my abilities as a nurse anesthesia educator and administrator during this past year. I would like to also give thanks to those who gave their encouragement and prayers: Dr. George Baron, Dr. Jeffrey Jones, Dr. Gennard Lanzara, Dr. William Sibley, Dr. Robert Roth, Mr. & Mrs. Codie Taylor, Dr. Charles Watson, Linda Webster, Sue Wilson, and my best friend, Carolyn Guthrie for her many words of wisdom and support during "Operation Desert Storm".

Thanks is given to the students, instructors, and nurse anesthesia education programs who participated in this study and to my many friends and colleagues at Bridgeport Hospital, CT, and Lewis-Gale Clinic/Hospital, VA.

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Chapter 1

INTRODUCTION

Background of the Problem

Recent scientific and technological advances have made administering anesthesia exceedingly more complex. Registered nurses certified in this specialty, (known as Certified Registered Nurse Anesthetists, or CRNAs), must increasingly cope with new equipment, techniques, and drugs. According to Chipas (1995), most nurse anesthetists keep pace with such changes and maintain a safe level of practice. However, Chipas also noted that nurse anesthesia educators are unlikely to rapidly incorporate these new drugs, agents, and techniques into their teaching strategies in a way that better educates student registered nurse anesthetists (SRNAs).

S. A. Griggs (1991) emphasized that educators must not only recognize the importance of the learning process, they must also appreciate its role in helping students toward higher academic achievement, productivity, and creativity. The learning process involves both how a teacher teaches

(teaching style), and how a learner learns (learning style). Each individual has a unique, optimum learning style; that is, every person learns best under certain circumstances. For example, one person may learn best using a self-study method in a quiet, autocratically controlled classroom with few students and distractions, while another may learn best in a loosely controlled, laissez-faire classroom with a large collection of students and considerable opportunities for verbal exchanges with both teacher and classmates. By accommodating student learning styles, a nurse anesthesia educator can help students maximize learning by making the teaching-learning process more efficient. This learning efficiency results since learning style is the preferred way in which an individual adapts to their environment (Kolb, 1984). "Whether it is the case of an average student striving to be above average or a student in difficulty struggling just to pass, educators have applied the findings of learning style research in an effort to identify patterns of learning that might help students increase both their understanding of information and their performance levels" (Leiden, Crosby, & Follmer, 1990, p. 395).

A number of learning style theories exist. They provide a framework for explaining the factors that

influence a person's preferred learning environment. The experiential learning model, the foundation of this research, is based on the work of Kolb (1984) that focused on how individuals perceive and process information. This learning model describes how experience is transformed into knowledge. Kolb's research in experiential learning is most applicable to nurse anesthesia education because clinical experience is essential to the development of a competent CRNA practitioner. The experiential learning that occurs during clinical practice enhances the integration of theory and practice (Iwasiw & Sleightholm, 1990). The concept of experiential learning emphasizes the role experience plays in learning and allows the student to develop decision-making, critical thinking, and problem-solving skills (Acosta, 1991). According to Acosta, using the experiential learning and critical inquiry framework, the educator acts as a facilitator providing options, posing questions, and presenting information needed for students to view a problem from all possible perspectives.

The revised Kolb (1985) Learning Style Inventory (see Appendix A) used in this study, is designed to assess and describe the preferred learning abilities (learning modes), learning dimensions, and learning styles of individuals.

The learning abilities are used by learners to perceive and transform information into knowledge. According to Kolb (1984), learning takes place in a four-stage cycle. It starts with an initial concrete experience or feeling stage. In this stage some people rely heavily on their intuition to perceive new information. This experience is followed by repeated observations of similar incidents, a stage Kolb calls the reflective observation or watching stage. Learners in the watching stage prefer to carefully watch others involved in the experience and reflect on what happened. The third stage combines the initial experience with the subsequent observations of similar incidents. This leads the individual to an abstract conceptualization or thinking stage. Here, the individual comes to appreciate the underlying basic principle(s) that makes the initial and observed experiences similar or identical. Thus, the third stage lets the individual develop one or more basic concepts that can be integrated into a unified, logical, and sound theory. During this stage, individuals analyze the learning situation. In the last stage, the individual applies that theory to personal decision making or to new situations where the same principle(s) will apply; that is, what has been learned can now be applied to new life situations.

This process of decision making is the active experimentation or the doing stage. Table 1 demonstrates how these various stages Kolb described can be applied to "real life" learning.

Learning style differences are measured along two learning dimensions. These learning dimensions are the perception dimension and the transformation dimension. The perception dimension is a combination of abstract conceptualization and concrete experience. The transformation dimension is a combination of active experimentation and reflective observation. These two learning dimensions lie opposite to one another. Kolb (1984) suggested that in the process of learning, an individual moves along these two dimensions in varying degrees, thus implying that an effective learner is flexible in applying the four learning abilities or modes to other learning situations. An analysis of one's learning abilities along a learning dimension determine the learning style. Kolb (1984) identified these learning styles as: converger, diverger, assimilator, and accommodator.

Table 1

Example of Kolb's Stages of Learning

Stages	Example
Initial Concrete Experience (Feeling)	A child burns his/her hand in a flame
Reflective Observation (Watching)	The child either observes others burning their hands in flames or observes others burning their hands on other "hot" objects, e.g. electric stove or heater, ovens, etc.
Abstract Conceptualization (Thinking)	The child begins to conclude the principle or theory that: "All 'hot' objects can harm you by burning and thus are to be avoided."
Active Experimentation (Doing)	The child either avoids burning him or herself on "hot" objects not previously encountered, e.g., boiling water, metal car surfaces exposed to the sun, etc.; or tells others to avoid such

(table continued)

Table 1 (continued)

Stages	Example
	situations. Here, the child is able to begin applying what he/she has learned to new previously unencountered learning situations. Real, lifetime learning begins on entering this stage.

Instructors must know what kind of learning occurs in the clinical setting (DeYoung, 1990). In her study of the clinical laboratory, Infante (as cited in DeYoung) noted that observation is an essential element of the clinical laboratory. Although the skill of observation can be taught in the classroom, learners need repeated experience observing patients in a variety of situations in an actual clinical setting. Though decision making and problem solving are refined in the clinical laboratory, the absolute practice in problem solving and decision making occurs in patient settings. According to DeYoung, and Thompson and Crutchlow (1993), learners need to practice these cognitive skills under the supervision of an instructor and other professional staff in real-life settings. Learners also gain management and organizational skills in the clinical setting with help from the instructor. Finally, in the clinical setting, students become socialized into the nurse anesthesia role where they are accountable and may assume consequences of their actions (Jordan, 1994).

Awareness of learning styles can help an instructor change teaching methods to accommodate each student. A review of the literature suggested that teachers tend to teach the way they learn (K. J. Dunn & Frazier, 1990; R. S.

Dunn & Dunn, 1979; Gregoric, 1979; D. Gripps, Gripps, Dunn & Ingham, 1994; Witkin, 1973). Kolb (1984) implied that preferences for instructional activities are associated with a specific learning style. For example, a person with the converger learning style prefers theoretical readings, case studies, or small group discussions. R. S. Dunn and Dunn (1979) suggested a match should be made between learning styles of students and the teaching styles of teachers. Therefore, when instructors know their own learning style, they can facilitate student and instructor interactions to enhance student learning, and academic and clinical achievement (Highland, 1988). Given that SRNAs must complete a minimum of 450 anesthetic administrations to graduate, the Kolb model seems especially pertinent to nurse anesthesia education.

Statement of the Problem

To become competent CRNA clinicians, nurse anesthesia students must learn to apply principles of critical thinking and analysis to their clinical experiences. These students must be responsible for their own learning and apply scientific theory to their clinical practice.

While nurse anesthesia students must meet a minimum number of clinical experiences (450 cases) to qualify for certification, many graduates far exceed that minimum, completing their education program with up to 800 or more clinical cases and with over 1200 hours of clinical practice. These anesthesia cases include pediatrics, obstetrics, geriatrics, open heart, neurological, plastic, otolaryngology, ophthalmology, urology, orthopedics, radiological, and transplant procedures. Several clinical sites are usually made available to students to gain a variety of clinical experiences. Regardless of the actual number, it is widely acknowledged that extensive clinical learning experiences are essential if nurse anesthesia students are to develop into competent clinicians. Though most nurse anesthesia program graduates finish with hundreds of cases "under their belt", there remain some concerns as to whether they actually develop and perfect the necessary clinical judgment and skills needed for safe anesthesia practice.

Unfortunately, few nurse anesthesia instructors are familiar with the basic principles of teaching and learning that takes place in the clinical setting (DeYoung, 1990). Consequently, they have a difficult time developing

educationally sound programs that truly meet the needs and interests of students (DeYoung). To do otherwise requires that nurse educators be aware of how they influence the achievement of students, particularly in the clinical arena. This means educators must devise more appropriate and relevant instructional techniques if they are truly to help students maximize learning. Ironically, there is a near total absence of learning style research in the literature dealing with the relationships between student and teacher learning styles in nurse anesthesia education programs. Without a research base, instructors rely on their own experience and trial-and-error tactics to teach students. To bridge this knowledge gap, this study explored the learning styles of student registered nurse anesthetists and certified registered nurse anesthetist instructors in nurse anesthesia education programs.

Research Questions

This study applied Kolb's principles of learning styles to the realm of nurse anesthesia education programs; thus the following questions were addressed:

1. What is the predominant student learning style in nurse anesthesia education programs?
2. What is the predominant instructor learning style in nurse anesthesia education programs?
3. What is the relationship between the learning styles of students and the demographic characteristics of age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, months of nurse anesthesia training, and number of anesthesia cases completed?
4. What is the relationship between the learning styles of nurse anesthetist instructors and the demographic variables of age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, years of nurse anesthesia experience, and years of nurse anesthesia teaching experience?

Rationale of the Study

Changes in health care delivery practices are creating new needs and demands in the preparation of health care professionals. If nurse anesthesia students are to succeed,

it is important that schools of nurse anesthesia make appropriate adjustments in administrative procedures, program delivery formats, curriculum design, and teaching-learning processes. Understanding how people learn is an integral aspect of program success and ultimate student achievement. According to DeYoung (1990), students learn to master problem-solving and decision-making skills best in the clinical setting. The clinical arena also allows students to become socialized into the profession by providing students with daily interaction amongst seasoned professionals.

Among the health professions, the learning styles of nursing students have been researched the most (Huch, 1981; Merritt, 1983). The Learning Style Inventory (LSI) (Kolb, 1985) is frequently used to describe the learning styles among nursing students. To date only two studies have attempted to identify the learning styles in nurse anesthesia education programs using the LSI. More nurse anesthesia learning style research is needed to enhance clinical learning; thus the purpose of this study was to describe the learning styles of student registered nurse anesthetists and certified nurse anesthetist instructors in nurse anesthesia education programs. It is important for

nurse anesthesia educators to know their optimum learning styles and to match them to those of their students in order to ensure clinical success.

Limitation of the Study

The following study limitation was identified:

1. The purposive sampling used was not representative of the students and nurse anesthetist instructors in nurse anesthesia education programs. Therefore, results cannot be generalized to the entire population of student registered nurse anesthetists and certified registered nurse anesthetist instructors.

Delimitation of the Study

1. The Learning Style Inventory (LSI) was the only instrument used in this study to identify the learning styles of students and instructors. The use of the LSI offered the advantage of simplicity, low cost, and a short time for participants to complete. These factors were considered to be important in achieving a high response rate thus allowing for more valid results.

Definition of Terms

The following are operational definitions used in this study:

Learning Ability (Mode): Adaptive orientations used by the learner to perceive and transform information into knowledge (Kolb, 1984).

Learning Dimension: Figurative representation of some learning experience (Kolb, 1984).

Learning Style: The way individuals perceive and process information or adapt to their environment (Kolb, 1984).

Cognitive Style: The characteristic way people perceive, organize, and process information from their environment (Kirby, 1979).

Teaching Style: Deals with the behavior of teachers that facilitate student learning (R. S. Dunn & Dunn, 1979).

Experiential Learning Theory: A learning process model that is consistent with the structure of human cognition and the stages of human growth and development. It conceptualizes the learning process in such a way that differences in individual learning styles and environments can be identified (Kolb, 1984).

Kolb's Learning Style Inventory: A model for classifying and measuring cognitive dimensions of learning styles (Kolb, 1985).

Student Registered Nurse Anesthetists (SRNAs): Students enrolled in an accredited nurse anesthesia education program. Prior to admission to a nurse anesthesia education program, these students must have a baccalaureate degree and a minimum of one year of critical care nursing experience, (e.g. intensive care or coronary care nursing). At graduation the typical SRNA is awarded a masters degree and is eligible to take the national certification examination to become a Certified Registered Nurse Anesthetist. He or she is then able to perform as an entry-level nurse anesthesia practitioner (Jordan, 1994).

Certified Registered Nurse Anesthetists (CRNAs): Those instructors responsible for teaching graduate coursework, including classroom and clinical experiences to SRNAs in nurse anesthesia education programs. They are required to earn 40 continuing education credits every two years to be eligible for recertification (Waugaman, 1994).

Nurse Anesthesia Education Program(s): Accredited program(s) providing graduate classroom and clinical instruction in anesthesia. Currently there are 89 nurse

anesthesia education programs in the United States. The length of these programs varies from 24-36 month (American Association of Nurse Anesthetists, 1996).

Chapter Summary

Kolb's experiential learning theory, upon which this study is based, focuses on how individuals perceive and process information, and serves to explain how one can recognize learning styles. Other researchers have attempted to deal with the question of how learning styles enhance professional health programs. To date, little research of learning style theory has been applied to students and instructors in nurse anesthesia education programs. Since a high level of critical-thinking and decision-making skills are necessary in order for students to adapt to both academic and clinical learning in nurse anesthesia education programs, students learn more quickly and effectively when learning experiences are geared to their learning needs. The goal of this study was to identify ways in which Kolb's basic theoretical framework can be adapted towards the goal of enhancing nurse anesthesia education. Educators must know the importance of the learning-teaching process to

facilitate students in increasing both their understanding of information and their performance in the clinical setting.

Chapter 2

REVIEW OF THE LITERATURE AND RELATED RESEARCH

Introduction

The goal of this study was to apply the Kolb's principle of learning styles to the realm of nurse anesthesia education. The purpose of this section is to provide a theoretical framework of how and why learning occurs, how learning is defined and measured, and provide information about relevant learning style research.

Theories About Learning

The principles of the teaching-learning process are drawn from various theories of learning (Mc Donald, 1964). Many psychologists have developed theories to explain why people learn, how learning takes place, and what is learned. Behaviorism, social learning theory, and cognitive field theory are examples of various learning theories.

Behaviorism seeks to describe the causes of human learning. Behaviorist theory was founded on the assumption

that learning is based on conditioning and can be changed by manipulation of the environment. In the behavioral approach, the learner is seen as a passive product of the environment. Behaviorists felt that learning can be transferred to new situations (McDonald, 1964).

Social learning theory explains human behavior in terms of interaction between the learner and the environment. The most important aspect of this theory is that learning occurs as the result of observing others (Bandura, 1977). Bandura's social theory contains elements of both behavioral and cognitive theories.

Cognitive theorists emphasize that the learner is actively involved with the environment. In the cognitive approach, learning occurs through a change between the stimulus and behavior using critical thinking and problem solving, thus resulting in "new insights or change in old ones" (Reilly & Oermann, 1990, p. 29).

Each of these theories of learning explains how individuals learn. No one theory of learning exists; however, the next section describes those theories/theorists that influence the nature of the teaching-learning process most applicable to the nurse anesthesia educational setting.

Behavioral Learning Theory

Behavioral learning theory involves reinforcement or conditioning of behavior. The desire to change behavior comes from the environment. This learning theory explains behavior in terms of an observable stimulus and a measurable response (Hill, 1964). The most notable behaviorists were Pavlov, Thorndike, Hull and Skinner (Hill; McDonald, 1964). They recognized conditioning of behavior as either classic or operant.

Classical conditioning involves a process of learning in which a stimulus that is initially unable to evoke a certain response is paired with another stimulus that elicits the response. After the pairing of the two stimuli, either stimulus can produce a conditioned response. For example, Pavlov's pairing of a ringing bell with food elicited salivation in dogs. After associating the two stimuli for a period of time, the bell will then elicit the response by itself (Joos, Nelson, & Lyness, 1985). Classical conditioning explains why a child who has paired a white uniform with a negative experience may elicit a response of fear or mistrust towards nurses (Joos et al.). Although classical conditioning is seldom used as a learning

process, it explains why the learning and unlearning (desensitization) of phobias or fears occurs in individuals.

Operant conditioning, developed by Skinner (Crain, 1992), explains how behavior produces an effect on the environment. In contrast to classical conditioning, the stimulus in operant conditioning follows rather than precedes the behavior. Operant conditioning is a type of learning that examines the relationship between behavior and the consequences of its actions (Crain). When studying operant behaviors, behaviorists seek to determine what effect the consequences of past behaviors may have on future behaviors. Several techniques are used to increase or decrease behavior.

Reinforcement is the process used to increase the probability of a behavior as the result of consequences under similar conditions (Redman, 1993). Positive reinforcement, often called a reward, is given following the desired behavior. Rewards may be food, water, grades, recognition, praise, or money and the effects will vary from one individual to another according to age and personality (Redman). Punishment, a form of negative reinforcement, given immediately in response to a particular behavior may

decrease that behavior. However, the results of punishment are unpredictable (Redman).

Many of the aspects of operant conditioning have been utilized in the fields of business, health, and education. Personnel management practices include recognition, monetary rewards, and promotions. Behavior modification therapy has been widely used to control smoking, manage weight loss, reduce stress, and promote relaxation (Lindberg, 1990). Classroom and clinical instructional techniques incorporate the principles of reinforcement (Redman, 1993).

Social Learning Theory

Social learning theory explains human behavior in terms of the reciprocal interaction between behavioral, cognitive, and environmental factors (Bandura, 1977). According to Bandura, people acquire information, attitudes, values, and new behavior through observing others in everyday situations.

Social learning theorists contend that the learner is very active in the environment and mediates the environmental information through a modeling process. Therefore, individuals learn behavior by observing others, films or videotape models, written accounts of a performance

(symbolic models), or sets of instruction. Infants and children model behavior with competency and continue to do so throughout their adult lives. The information obtained from modeling provides the learner with a guide for future behavior (Bandura, 1977).

According to Bandura (1977), the learner acquires a behavior, becomes capable of repeating it, and then may or may not perform the behavior. Acquisition, the first step in the social learning process, is learning how to do something through interaction with the environment. Cognitively the learner will select, code, and store the information for future use. Performance, the second step in the process, involves producing a behavior that was acquired previously. The performance of a behavior depends on the skills and physical abilities of the learner, motivation, and expectation for reinforcement or punishment (Bandura). "The social learning theory assumes that whether or not people choose to perform what they have learned observationally is strongly influenced by the consequences of such action" (Bandura, 1977, p. 39).

Modeling is used extensively in the clinical setting to enable optimum learning by students. By observing others, performing procedures, and accepting performance standards,

students develop the ability for self-direction (Iwasiw & Goldenberg, 1993).

Cognitive Learning Theory and Information Processing
Approach to Learning

The cognitive learning theory suggests that learning occurs through insight rather than by trial and error. "New insights lead to a reorganization of the individual's cognitive structure" (Redman, 1993, p. 79). According to Burgess (1990), cognition refers to obtaining, organizing, and processing sensory and perceptual information from past experiences and the environment. Cognitive learning involves the relationships assumed to exist among "biological, physical, and psychological events in the external world" (Conley, 1973, p. 199). Cognitive activities such as memory, problem solving, and thinking demonstrate intellectual skills. The information processing approach to learning involves how stimuli are transduced, selected, coded, stored, and transmitted through the central nervous system, resulting in a response. In other words, the information processing approach to learning offers a systematic and uniform framework for studying human behavior (Burgess).

Experiential Learning Theory

The experiential learning model provides a framework for explaining the linkage between the classroom and the "real world" and the role experience plays in the learning process (Kolb, 1984). The experiential learning theory is solidly based on the social and cognitive psychological theories of Kurt Lewin, John Dewey, and Jean Piaget. Lewin and Dewey fostered the integration of scientific inquiry and problem solving into the learning process. Whereas, Piaget's theory of intellectual development identified the four stages of cognitive growth that emerge from birth to adulthood (Crain, 1992; Kolb, 1984). In the first stage (birth to two years), called the sensory-motor stage, the child's learning style is predominantly accommodative. The environment plays a significant role in shaping his learning through handling, feeling, and touching. In the preoperational thought stage (two to seven years), the second stage, children learn to think and begin to use images and symbols to manipulate the environment. The child's view of the world is divergent at this stage. In the third stage (seven to 11 years), known as the concrete operations stage, children rely on concepts and theories to select their experiences. Here, the child is assimilative

in his or her learning style. In the last stage (11 to adulthood), the stage of formal operations, the individual returns to a more active orientation and engages in hypothetical and deductive reasoning. Piaget's cognitive development theory identifies the basic developmental processes that shape how adults learn. However, "it is Jung's theory with its concept of psychological types representing different modes of adapting to the world and his developmental theory of individuation that will be most useful for understanding learning from experience" (Kolb, 1984, p. 16).

Jung's (1923) typology of psychological types demonstrates the differences in an "individual's adaptation or orientation to life" (p. 412). The four pairs of Jung's psychological types describing a person's adaptive orientations are: (1) mode of relation to the world via introversion or extroversion; (2) mode of decision making via perception or judgment; (3) preferred way of perceiving via sensing or intuition; and (4) preferred way of judging via thinking or feeling. Kolb (1984) suggests that a coherence exists between learning styles and psychological types. For example, the assimilative learning style is associated with the introverted intuitive type or the

convergent learning style is characterized by the extraverted thinking type.

The process by which people learn through experience is conceived as a four-stage cycle (Kolb, 1984). As summarized in Table 1 (p. 6), these learning modes are concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). Learners who are in the concrete experience (CE) cycle must be able to involve themselves fully, openly, and without bias in new experiences. Those learners in the reflective observation (RO) cycle reflect on and observe new experiences from many perspectives. Learners in the abstract conceptualization (AC) cycle create concepts that integrate their observation into logically sound theories and use these theories to make decisions and to solve problems in the active experimentation (AE) cycle. Figure 1 depicts Kolb's (1985) Experiential Learning Model. An effective learner is flexible in applying these four learning modes to a variety of learning needs, as shown in Table 2.

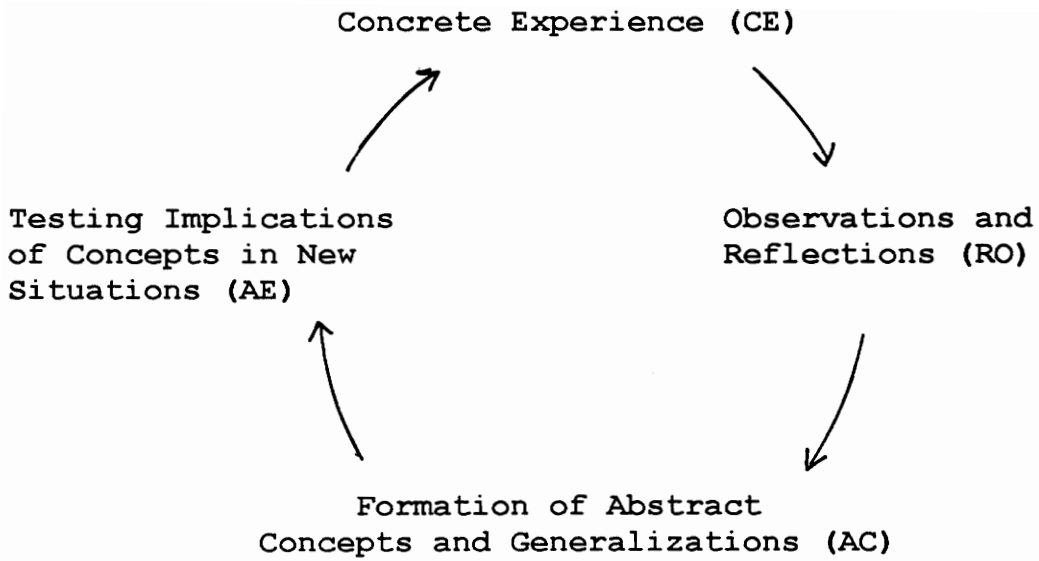


Figure 1. Kolb's experiential learning model.

From The Learning-Style Inventory: Self-Scoring Inventory and Interpretation Booklet, by David A. Kolb, 1985.

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Table 2

Kolb's Learning Modes and Learning Needs

	CE	RO	AC	AE
	Feeling	Watching	Thinking	Doing
Descriptive Adjectives	Receptive Present-oriented Accepting Intuitive	Observing Reflecting Reserved Tentative	Analytical Rational Logical Evaluative	Active Practical Responsible Experimental
Learning Needs/ Preferred Activities	Student Feedback Theoretical readings are not helpful in learning	Lectures facilitate learning Group discussions do not facilitate learning	Case studies, theoretical readings, and thinking alone Exercises, simulations, and talks by expert practitioners are not helpful to learning	Project, homework, small group discussions, and student feedback Lectures do not facilitate learning

From Messmer, P. R., Kurtyka, D., & Kelly, C. P. (1992, May/June). A theory-based computer training program. Journal of Nursing Staff Development, p. 137.

Learning Style Theory

Definition of Learning Styles

Learning style definitions reflect the various views of the researchers studying them. For purposes of this research, learning styles are defined as the predominant way in which a learner perceives and processes information, or adapts to the environment (Kolb, 1984). According to Kolb, learning styles affect the way problems are solved, how decisions are made, and how attitudes and behaviors are developed and changed. K. J. Dunn and Frazier (1990) indicated that learning style is influenced by the social environment, motivation, chronobiology, and conformity levels of the learner. In the literature, the terms learning style and cognitive style are often confused and used interchangeably. Keefe (1979) defined learning style as the composite of cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment. Grasha (1984) categorized learning styles as consisting of cognitive, sensory, interpersonal, intrapersonal, and environmental elements. Cognitive styles are information-processing habits representing the learner's

typical mode of perceiving, thinking, remembering, and problem solving (Messick & Associates, 1976). Price (1981) described learning style as being determined by environmental, sociological, and psychological factors external to the individual; whereas, cognitive style deals with the ways persons prefer to internally process information and is used to describe human behavior in situations besides the teaching-learning process. Lyons (1984) suggested learning styles are a combination of personality, cognitive style, and neural processing.

The common themes of the multiple definitions of learning style were summarized by Roberts (1986). He determined learning style is the consistent way in which individuals function in a learning environment, is influenced by a person's social, cognitive, affective, and psychological makeup, and a degree of flexibility exists even though learning styles reflect certain patterns.

Classification of Learning Style Instruments

Many instruments are available to diagnose the cognitive, social, motivational, physical, and instructional preference elements of learning style. However, no one learning style instrument assesses all elements of learning

style. Keefe (1982) and Curry (1983, 1987) have constructed typology models for classifying learning style instruments.

Keefe Model

Keefe (1979) found that none of the learning style instruments measured all the elements associated with the three domains. Keefe (1982) categorized learning style models according to cognitive, affective, and psychological domains. Cognitive learning style models assess the ways people perceive, organize, and process information. The affective domain models assess motivational aspects behind learning behavior and the results of the emotions and values of the learner. The physiological domain include biological responses relating to the physical environment. An example of learning style instrument(s) identified by Keefe's domains are as follows:

1. Cognitive Domain
 - a. Gregoric Style Indicator
 - b. Group Embedded Figures Test
2. Affective Domain
 - a. Paragraph Completion Method (Hunt)
3. Physiological Domain
 - a. Learning Style Inventory (Dunn, Dunn, & Price)

b. Learning Style Profile (Keefe and Monk)

Curry Model

In an attempt to provide a framework for evaluating the various learning style models being used to determine how people prefer to learn, Curry (1983) reviewed 21 learning style instruments based on her established standards of validity and reliability. Several instruments were found to have acceptable content validity, internal consistency, and test-retest reliability. Curry categorized nine learning style instruments as follows:

1. Instructional Preference Instruments-Instruments that identify the learners' preferred learning and teaching environment such as working at a particular pace.
 - a. Instructional Preference Questionnaire (Friedman & Stritter)
 - b. Learning Preference Inventory (Rezler & French)
 - c. Grasha-Reichmann Student Learning Styles Scales
2. Information Processing Instruments-Instruments dealing with the intellectual approach of the

learner to assimilating information, such as use of concrete experience and analysis of data.

- a. Learning Style Inventory (Kolb)
- b. Inventory of Learning Processes
(Schmeck)
- c. Cognitive Preference Inventory
(Tamir, Elstein, & Molidor)

3. Cognitive Personality Instruments-Instruments that assess the influence of personality dimension on a learner's approach for adapting information such as intuition, impulsiveness, and global perception.

- a. Myers-Briggs Type Indicator
- b. Embedded Figures Test (Witkin)
- c. Matched Familiar Figures Test (Kagan)

Curry (1983) conceived the "onion model" to demonstrate the different levels of learning style models. At the core of the "onion" are the elements associated with the cognitive personality style model. These elements are the most stable over time since they are least likely to be affected by environmental conditions. The information processing and instructional preference style models, located at the middle and outer cores respectively, are more susceptible to change and therefore, less stable over time.

Curry suggested that each of the layers represent different and separate constructs.

Popular Learning Style Instruments

The discussion on the most popular learning style instruments is limited to those used in learning style research of health care practitioners and students. The learning style instrument used most in these studies was the Learning Style Inventory. Other popular learning style instruments include Rezler and French's Learning Preference Inventory, Canfield's Learning Style Inventory, and the Myers-Briggs Type Indicator (Gripps, 1991, Merritt, 1989).

Rezler and French Learning Preference Inventory

The Rezler and French (1975) Learning Preference Inventory, according to Curry's (1983) framework, can be classified as a instructional preference model. This learning style instrument was developed to determine the learning preferences of college students (n=139) enrolled in six allied health professions. This inventory was comprised of six elements: (1) the abstract includes preference for learning theories, and generating hypotheses; (2) the concrete defines the preference for learning specific,

practical skills; (3) the individual is preference for working alone; (4) the interpersonal is preference for working in harmonious relationship with students and teachers; (5) the student-structured is defined as preferences for autonomy and self-direction; and (6) the teacher-structured is the preference for learning in a organized, teacher-directed classroom. The researchers found that the majority of students in all groups preferred concrete tasks assigned by the teacher. They concluded that knowledge of learning preferences could help educators match students to the environment in which they learn the best. The researchers indicated that the validity and internal consistency data were valid.

Canfield Learning Style Inventory

The Canfield (1980) Learning Style Inventory, another instructional preference model, was developed to examine learner preferences for various conditions of learning, modes of learning, content or subject matter, and expectations for success. Canfield defined these conditions as: (1) affiliation which is the preference for friendly relationships with peers and instructors; (2) structure which is defined as the desire for detail and organization;

(3) achievement is having preference to work independently and setting one's own learning goals; and (4) eminence is having a preference for learning from an expert on a subject matter and desire for competition from peers. Canfield defined the modes of learning preferences as listening, reading, iconics (visual, media presentation), and direct experience. He measured content preferences in terms of numeric, qualitative, inanimate, and people. The anticipated level of performance (success) is defined as superior, above average, average, and below average.

Using an earlier version of the LSI, Canfield and Lafferty in 1974 compared learning style preferences among community college students based on age, gender, and major (physical therapy, criminal justice, preeducation, Girl Scout administration, and nursing). Physical therapy and nursing students preferred direct experience and organization. Preeducation and criminal justice students desired competition and authority. The researchers found that men preferred inanimate and numeric content; whereas, women had a greater preference for people-directed content and organization (as cited in Payton, Hueter, & McDonald, 1979).

Myers-Briggs Type Indicator (MBTI)

The Myers-Briggs Type Indicator (Myers, 1980) was developed to measure the psychological types as defined by Jung. Jung's theory determines the personality types of individuals in terms of three bipolar dimensions: extraversion and introversion; sensing and intuition; thinking and feeling. The fourth dimension, judging and perceiving, was added by Myers and Briggs to expand Jung's theory about psychological type. These four dimensions comprise the four scales of the MBTI and are used to identify individuals' preferences according to 16 types. The following description of the psychological type preferences and teaching style was obtained from the MBTI.

1. Extraversion (E)-Introversion (I)---the EI scale.

Describes where one prefers to focus one's attention. People who prefer extraversion tend to focus on the outer world of people and things. Extroverts usually prefer to communicate by talking rather than by writing. They need to experience the world in order to understand it and tend to like action and variety. Extraverted teachers are likely to give students choices about what to study and are attuned to the changes in student activities. People who prefer introversion focus on the inner world. Introverts prefer to

work quietly without interruption. They like to understand the world before experiencing it and need time to reflect before taking action. Educators who are introverts tend to center the control within themselves.

2. Sensing (S)-Intuition (N)---the SN scale. This describes how one acquires information or finds out about things. Sensing focuses on the realities of a situation. Sensing types are realistic and practical. They prefer to use proven procedures and are careful with detail. Sensing type teachers tend to keep things centralized. Intuition shows the meaning, relationships, and possibilities that go beyond the information from the senses. Intuitive types look at the "big picture" and try to grasp the overall patterns. They value imagination and inspiration. Intuitive type teachers give a wide range of choices to students.

3. Thinking (T)-Feeling (F)---the TF scale. This describes how one makes decisions. Thinking types make decisions objectively by analyzing the evidence. They focus on the logical consequences of any choice or action. Thinking type teachers make objective comments about student performance. Feeling types make decisions based how important the choices are to themselves and others. They like dealing with people

and are sympathetic, appreciative, and tactful. Feeling type teachers praise and criticize verbally and by use of body language.

4. Judging ((J) Perceiving (P)--the JP scale. This describes how one orients toward the outer world. Judging types prefer to live in a orderly fashion. They like to be structured, organized, and want things settled. The judging types educator's classrooms are orderly with adherence to schedules. Perceiving types like flexibility and keeping options open. Perceptive type teachers encourage socializing and open-ended discussions.

Learning Style Inventory

Learning styles are the way individuals perceive and process information or adapt to their environment (Kolb, 1984). Kolb (1985) developed a model for classifying and measuring cognitive dimensions of learning styles. The experiential learning model, upon which the Kolb Learning Style Inventory is based, provides a model of a learning process consistent with what is known about how people think, grow, and develop. While individuals tested on the Kolb's LSI show different patterns of scores, Kolb has

identified four statistically prevalent learning styles as depicted in Figure 2.

The converger's dominant learning abilities are abstract conceptualization and active experimentation. A person with this learning style does best on a conventional intelligence test where there is a single right answer or solution to a question or problem. Persons with this type of learning style prefer to deal with technical tasks rather than people and excel in problem solving, decision making and the practical application of ideas (Kolb, 1985).

The diverger has the opposite learning strengths of the converger. This person uses the learning mode of concrete experience and reflective observation. Divergers perform better in situations that require ideas to be generated and consequently are effective in "brainstorming" sessions. Divergers are interested in people and tend to be imaginative and emotional. They have broad cultural interests and tend to specialize in the arts (Kolb, 1985).

The assimilator's learning abilities are abstract conceptualization and reflective observation. This person excels in inductive reasoning. Like the converger, the assimilator is less interested in people and more concerned

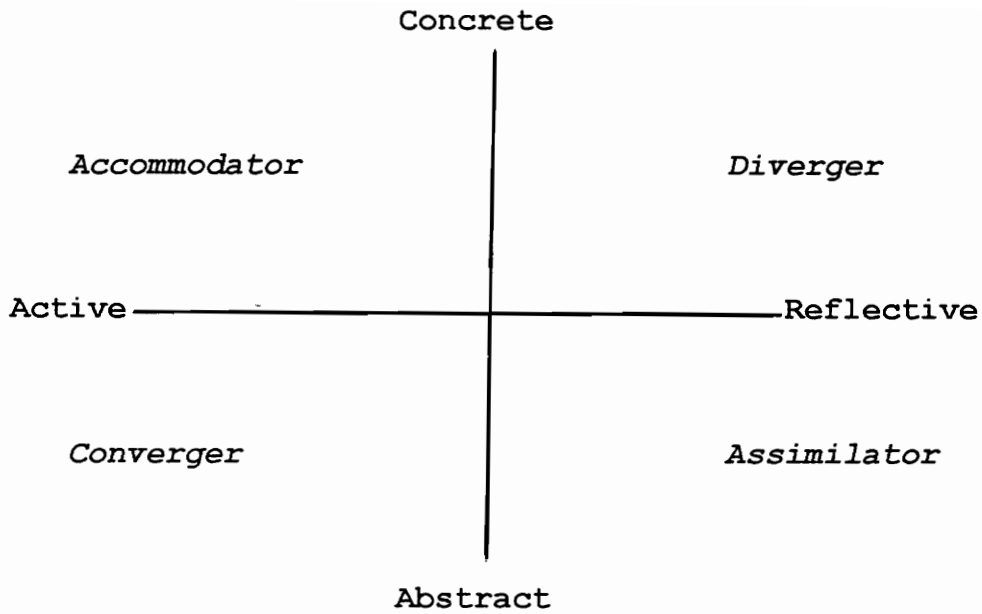


Figure 2. Kolb's learning styles.

From User's Guide for the Learning Style Inventory: A Manual for Teachers and Trainers, by D. M. Smith & D. A. Kolb, 1986. Copyright 1981 by the Experience Based Learning, Inc.

with the practical uses of theories. For the assimilator, it is more important that the theory be logically sound and precise. In a situation where a theory or plan does not fit the "facts", assimilators generally either disregard or re-examine them (Kolb, 1985).

The accommodator has the opposite learning strengths of the assimilator and uses the learning modes of concrete experience and active experimentation. Accommodators are interested in carrying out plans and experiments and being involved in new experiences. The accommodator tends to be more of a risk-taker than people with the other learning styles and excels in situations where one must adapt to specific, immediate circumstances. In situations where a theory or plan does not fit the "facts", the accommodator will most likely discard the theory. Accommodators tend to solve problems in an intuitive, trial-and-error manner, relying on other people for information rather than on their own analytic ability. The accommodator is at ease with people, but is sometimes seen as impatient and "pushy" (Kolb, 1985). Table 3 provides a summary of learning styles and activities according to Kolb's learning theory.

Table 3

Summary of Learning Styles and Activities According to Kolb's Theory

Learning Style	Learning Abilities	Greatest Strength	Application	Organization of Knowledge
Converger	AC & AE	Practical application of ideas	Conventional intelligence tests with single correct answer or solution	Hypothetical deductive reasoning to focus knowledge on specific problems
Diverger	CE & RO	Imaginative ability	Views concrete situations from many perspectives	Generation of ideas such as brainstorming
Assimilator	AC & RO	Ability to create theoretical models	Excels in inductive reasoning	Able to assimilate disparate observations into an integrated explanation
Accommodator	CE & AE	Doing things	Implementing plans and activities	Involvement in new experiences

From Messmer, P. R., Kurtyka, D., & Kelly, C. P. (1992, May/June). A theory-based computer training program. Journal of Nursing Staff Development, p. 137.

Learning Style Research

Kolb (1984) proposed that learning styles are influenced by psychological type, educational specialization, professional career, current job role, and adaptive competencies. Kolb (1984) suggested individuals develop learning styles as a result of one's past life experiences and the demands of the environment. A review of the literature also revealed that other factors such as age and gender influence people's type of learning style. It is also important that instructors in nurse anesthesia programs know how learning styles affect clinical performance and preferences for instruction of students.

The goal of this study was to describe the predominant learning style of SRNAs and CRNA clinical instructors in nurse anesthesia programs and the relationships between learning style and age, gender and other demographic characteristics as described in the research questions. This section describes research involving health care professionals. There is very limited research of learning styles in the field of nurse anesthesia.

Professional Career Choice

Kolb (1984) has suggested that career choice is a factor that shapes learning styles. The workplace, education, and training play a role in the type of predominant learning style people develop. "People choose fields that are consistent with their learning styles and are further shaped to fit the learning norms of their field once they are in it. When there is a mismatch between the field's learning norms and the individual's learning style, people will change or leave the field" (Kolb, 1984, p. 88). According to Kolb (1985), people in service organization fields such as nursing tend to be divergers, those in science careers are assimilators, convergers choose careers in the technology field, and accommodators choose business careers.

Plovnick's (1975) study was to determine if learning style affects career choices among medical students. The study concluded that the choices between family or primary care medical specialties were influenced by different learning style types. It was found that accommodator learning style predominated among family practice/primary care physicians, that is, they prefer learning situations that involve active participation and concrete examples. In

addition, he found those with the assimilative learning style chose academic medicine or pathology as their career, divergers chose psychiatry, and convergers chose medical specialties such as cardiology. To determine if there is an association between learning style and medical career choice for practicing private physicians and medical students, Wunderlich and Gjerde's (1978) study found no correlation between learning style and choice of medical career in either group participating in the study. However, they found, that most of the physicians were convergers. This finding was consistent with Kolb's description that convergers excel in problem solving through use of deductive reasoning and practical application of ideas. In contrast, Salder, Plovnick, and Snope, (1978) found family practice residents were predominately accommodators and that the faculty tended to be more abstract and reflective. The implication of the study is since residents are in a "training" situation, they are more concerned with implementing plans and being involved in new experiences rather than being abstract and reflective like their instructors.

Numerous researchers found the learning styles of nursing students, nursing instructors, and nurse

practitioners demonstrated the four learning styles (Bennet, 1978; DeCoux, 1987/1988; Dougan, 1982; Hodges, 1988; Huch, 1981; King, 1986; Kolb, 1984; Marcinek, 1983; Nagata, 1996). The findings of these studies indicate that the variations in learning styles can be accounted for by a person's career choice.

Current Job Role

Smith and Kolb (1986), and Kolb (1984) suggested that the demands of a person's job tend to shape their adaptive strategies to learning. Kolb states that people with diverger learning styles, such as nurses and social workers, require the establishment of personal relationships and effective communication. Information jobs that require data gathering and analysis, and conceptual modeling have an assimilative learning style component. These people tend to choose careers as researchers and academic physicians. Physicians and applied scientists who require technical and problem-solving skills are convergers. Accommodators, such as administrators, require a strong orientation to task completion and decision making .

Christensen, Lee, and Bugg's (1979) study sought to determine if nurse practitioners (n = 53) who are convergers

have higher perceived job performance than those who are assimilators. They found no differences between convergers and accommodators. Seventy percent of the sample represented one of these two learner types indicating that nurse practitioners were appropriately working in a primary care role. Penn (1991) conducted a study of Army nurses examining the relationship between learning style, clinical specialty, and personality type. The sample group (n = 229) was administered the Kolb's Learning Style Inventory (1985), the Myers-Brigg Type Indicator (MBTI) (n = 107), and a demographic information sheet. The five clinical specialty categories included: Critical care and anesthesia; maternal-child health; medical-surgical; perioperative (operating room); and "all other". The most frequent learning style was assimilator constituting 40% of the total sample. The ISTJ personality type occurred most frequently (19.63%). Using the chi-square statistic, it was found that the relationship between learning style and clinical specialty, and MBTI type and specialty were not statistically significant. Statistical significance (p = .0011) was found between learning style and the I-E dimension of the MBTI; thus implying assimilators tended toward introversion. The findings of the study also did not

support different instructional approaches for each clinical specialty group. Laschinger and Boss (1984) found no relationship between nursing students and their preferred nursing specialty.

Sherbinski's (1994) descriptive study revealed the assimilator (37.2%) and the converger (31.1%) as the learning styles most frequently occurring for graduate nurse anesthesia students. Therefore, those students who are assimilators excel in inductive reasoning, have the ability to create theoretical models, and are able to assimilate disparate observations into an integrated explanation. Those students who are convergers have the ability to solve problems, use deductive reasoning, and make decisions. However, Ramsborg and Holloway (1985) found the learning style of SRNAs in a certificate-granting program not yet exposed to anesthesia training were assimilator and those in their first and second year of training were accommodators. The results of their study may be suggestive of Kolb's (1984) premise that learning styles may change over time. The findings of the study also appear to support Kolb's hypothesis that same career students and instructors share similar learning styles because they also found the learning styles of CRNA instructors were accommodator (29%) and

diverger (38%). Ramsborg and Holloway suggested that as nurse anesthesia students proceed through their education, they emulate their clinical instructors, taking on many of the same characteristics and traits. The study further suggests that a kind of socialization process may be occurring because more experienced students tend to closely resemble their clinical instructors more than do entering students. Katz and Heimann's (1991) study on the learning style of clinical psychology students and practitioners further supported Kolb's philosophy that people in the same career have similar learning styles. Several studies (Baker, Cooke, et al., 1988; Baker & Marks, 1981; Baker, Wallace, Bryans, et al., 1985; Baker, Wallace, & Cooke, 1987; Baker, Wallace, Cooke, Alpert, et al., 1985) analyzing the learning styles of faculty anesthesiologists, clinical anesthesiologists, and anesthesia residents found the predominant learning style type for all groups was accommodator. According to Kolb (1984), accommodator's greatest strength lies in doing things, solving problems by "trial and error", and they tend to excel when he must adapt himself to specific immediate circumstances. This is typical of the job role of anesthesiologists who must respond to the ever changing operating room environment.

Age and Gender

Learning style is not a fixed trait but a current state of mind which changes slightly from situation to situation. Simultaneously, there is some long-term stability in learning style (Kolb, 1984). Researchers (Kolb, 1984; Claxton & Murrell, 1987) suggested, in support of Piaget, there is a general tendency for people to become more analytical and reflective with age. Smith and Kolb (1986) found in a sample of 1446 adults between the ages of 18 and 60 that over 50% of the adults over the age of 45 preferred to use the abstract conceptualization learning ability as a means of learning new information. According to Kolb (1984), males have a preference for using abstract conceptualization and introversion/extraversion is the most stable personality type from childhood to old age.

Merritt (1989) found no relationship between learning style and age or length of nursing employment as measured by the Learning Style Inventory and the Canfield Learning Style Inventory among 343 baccalaureate nursing students.

Sherbinski's (1994) study on the learning style of nurse anesthesia students found no statistically significant relationship between learning style and age or gender. The participants in her study included 109 females and 57 males.

However, Philbin, Meiser, Huffman, and Bouverie (1995) confirmed that learning styles differ between males and females. The convenience study consisted of 45 women and 25 men ranging from 21 to 60 years of age, varied ethnic backgrounds, and mostly college graduates. The results of the KLSI indicated that females learn better in hands-on and practical settings (divergers and convergers) and that males learn best if they are thinking and watching (assimilators). The authors concluded that men found a greater congruence between their preferred learning styles and traditional education which is based on analyzing abstract information and hypotheses testing. A study conducted by Duckwall (1990), to determine if the success of students (n = 100) in a baccalaureate degree program in medicine was related to learning styles, found that the association between learning styles and success was related to differences in gender. The implications of these studies are that instructors might consider the influence of age and gender on learning style when planning effective instructional strategies.

Learning Styles and Achievement

The goal of nurse anesthesia education programs is to produce safe and competent practitioners. Therefore,

instructors must know how learning styles influence clinical performance. Haislett, Hughes, and Atkinson (1993) examined the relationship between learning style and academic performance in four-year baccalaureate nursing programs. The results of the study indicated that the participants (n = 100) preferred the reflective observation mode of learning and the assimilator/converger group earned a significantly higher grade-point ratio, study habit scores, and study attitude scores. In contrast, Zemaitis (1987) and DeCoux (1987/1988) found no relationship between learning style and grade point average or achievement among nursing students. Garcia-Otero and Teddlie (1992) examined how 43 nurse anesthesia students' knowledge of their learning styles influences their anxiety and clinical performance. Using the Productivity Environmental Preference Survey and the Minnesota Multiphasic Personality Inventory, it was found that students who were aware of their learning styles showed less anxiety and improved clinical performance. The purpose of the Welborn and Conti (1986) study was to determine what effect learning styles of health professional students (n = 584) and the teaching styles of their instructors (n = 18) had on the academic achievement of graduate and undergraduate students in allied health programs in a

four-year university. The Canfield Learning Style Inventory collected data about the learning style of the students. Some of the demographic information of the students included: age, gender, highest educational degree obtained, and number of years employed in the health field. The Principles of Adult Learning Scale provided information about the teaching styles of instructors. The demographic characteristics of the instructors included age, gender, years of teaching, primary program assignment, and educational preparation. The relationship of achievement, learning style, and teaching style was analyzed by analysis of covariance. Analysis of covariance was also used to examine the effect of the demographic variables on student achievement. The findings of the study revealed that teaching style (collaborative mode) had a greater effect on student achievement than learning style.

Learning Styles and Learning Preferences for Instruction

Learning styles and preferred learning approaches are believed to have an influence on student learning. Staton-Cross (1988) investigated the relationship of learning style, learning preference, and learning autonomy of associate degree nursing students (n = 202). Results of

the study revealed that a majority of the sample were accommodators and divergers, thus concrete learners. The analysis of a preference mode questionnaire indicated that these students preferred visual aids to explain concepts and the lecture, discussion, and demonstration mode of instruction. The subjects of this study, at the significance level, rejected the self-study and self paced modes of instruction. Goldrick, Gruendemann, and Larson (1993) conducted a descriptive study to survey the learning styles and teaching/learning preferences among nurses in critical care, operating room, and infection control. The results of the study indicated 64% of the participants had an abstract learning style and preferred the self-directed, discovery approach to learning. A study (Carrier, Newell, & Lange, 1982) examining the learning style to preferences for instruction of dental hygiene students and instructors indicated that the divergers preferred problem-solving projects, games, and simulations. Those who were identified as accommodators preferred feedback after performing a task rather than during the task. A study conducted by Whitney and Caplan (1978), investigated the differences in the learning style preferences (LSP) of family practice physicians who attend a continuing education

(CE) program (n = 68) versus those practitioners who do not (n = 43). The study also sought to find if physicians with different LSP prefer different instructional methods and if age is related to instructional preference. The study found that older physicians prefer textbooks as a continuing education method compared to the younger physicians. Those attending CE programs prefer concrete learning environments while those not attending CE programs preferred abstract learning. The results of these studies suggested that learning styles should be considered when designing learning experiences for students.

Chapter Summary

This chapter provided a theoretical framework about learning and the implication for enhancing nurse anesthesia education. A number of theories explain how and why learning takes place. Behaviorism describes the causes of learning, social learning explains human behavior in terms of how the learner interacts with the environment, and cognitive theory explains the change in behavior. The experiential learning theory emphasizes the role experience plays in learning.

Numerous definitions of learning styles exist. According to Kolb (1984), learning styles are defined as the predominant way a learner perceives and processes information, or adapts to the environment. The Learning Style Inventory, one of many learning style instruments, was developed by Kolb (1985) for classifying and measuring cognitive dimensions of learning styles. Kolb (1985) identified these learning styles as converger, diverger, assimilator, and accommodator. Kolb (1984) suggested individuals develop learning styles as a result of one's past life experiences and the demands of the environment. Factors such as age and gender influence people's type of learning style. Recent research indicated that when students know their learning style, then improvement in clinical performance occurs. Thus, nurse anesthesia programs must consider the impact of learning styles when designing curriculum and instructional techniques to enable students to succeed.

Chapter 3

METHODOLOGY

This study sought to identify the learning styles among Student Registered Nurse Anesthetists (SRNAs) and Certified Registered Nurse Anesthetist (CRNA) clinical instructors in nurse anesthesia education programs (NAEPs). This chapter provides a description of the research design, participant selection, and instrumentation, including follow-up procedures used for this study. The method of data collection and data analysis is also described.

Research Design

This was a descriptive study designed to identify the learning styles of SRNAs and CRNA instructors in nurse anesthesia education programs and to describe the relationships between eight demographic characteristics and learning styles of the student and instructor participants. The demographic characteristics studied for the students were: age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of

critical care nursing experience, months of nurse anesthesia training, and number of anesthesia cases completed. The demographic characteristics studied for the instructors were: age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care experience, years of anesthesia experience, and years of nurse anesthesia teaching experience.

Participant Selection

The student and instructor participants in this study were selected from accredited nurse anesthesia education programs in nine eastern states and two western states. A listing of nurse anesthesia education programs was obtained from the American Association of Nurse Anesthetists (AANA) Education and Research Department. The list, dated January 1996, contained 89 nurse anesthesia schools located in 34 states. The nurse anesthesia programs for this study were delineated by geographical location (including states with large numbers of schools), type of program, and type of degree granted (Masters or certificate). A purposive sampling was made of 34 nurse anesthesia programs. These programs were located in the following states: CA, CT, DC,

GA, NC, PA, SC, TN, VA, WA, and WV. They granted a Masters degree to students upon graduation.

A return-reply brochure (see Appendix B) was mailed to each program director. The researcher depended upon each program director to provide the total number of students and clinical CRNA instructors in their respective schools. Programs in three states (SC, TN, & WV) failed to return the reply brochure. Table 4 describes the potential number of nurse anesthesia education programs, students, and instructors agreeing to participate in the study.

Instrumentation

Learning Style Inventory

The Kolb Learning Style Inventory (LSI) was selected to identify the learning styles of both the students and CRNA instructors. The 1985 revised version of the LSI is designed to help individuals assess their ability to learn from experience. This newer version of the LSI includes improvements designed to enhance the scientific measurement specifications and its practical uses in education and counseling.

Table 4

Total Number of Nurse Anesthesia Programs (NAEPs), Students and Instructors Requested to Participate in Study

State	NAEPs	Students	Instructors
CA	1	4	6
CT	3	37	28
DC	1	7	2
GA	1	7	1
NC	4	61	109
PA	14	75	47
SC*	2	---	---
TN*	2	---	---
VA	3	20	20
WA	1	10	3
WV*	2	---	---
<u>Total:</u>	34	221	216

Note: *Failed to return reply brochure

The Kolb's (1985) LSI was chosen for this study because of its usage for measuring learning style variations among several health professional groups: dietitians, dentists, emergency medical technicians, nurse anesthetists, nurses, occupational therapists, and physicians. Designed to be a self-administered test, the LSI provides simple instructions and an example for completing the test. The LSI is a 12-item questionnaire in which respondents are asked to describe their predominant learning style and requires approximately 15 minutes to complete. Each item asks the respondents to rank-order four sentence endings that correspond to the four learning modes: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). The LSI also measures the extent to which the individual emphasizes abstractness over concreteness (AC-CE) and action over reflection (AE-RO).

Reliability

Smith and Kolb (1986) determined the reliability of the Learning Style Inventory. The four learning mode scales (CE, RO, AC, AE) and the two learning dimension scores (AC-CE, AE-RO) show good internal reliability (.88, .81,

respectively) as measured by Cronbach's alpha ($n = 268$).

The learning dimension scores show perfect additivity (1.0) as measured by Tukey's test (see Appendix C). Strong correlation between the revised LSI (1985) and the original LSI (OLSI) (1978) indicate comparable results ($n = 268$), (see Appendix D).

The interrelations among the raw scale scores of the normative profiles follow the predictions of the experiential learning theory (see Appendix E). These normative scores were established for the learning abilities and learning dimensions (see Appendix E). The strongest negative relationships exist between the AC & CE, and AE & RO learning ability scores. There is no relationship (statistical independence) between AC-CE and AE-RO learning dimension scores (see Appendix F).

Validity

Kolb (1984) used a panel of behavioral science specialists to choose socially desirable words which relate to qualities associated with each specific phase of the experiential learning cycle. Merritt and Marshall (1984) compared the psychometric properties of an alternate normative form of Kolb's Learning Style Inventory (LSI) in a

two phase study with baccalaureate nursing students (n = 530). The study concluded that the LSI was congruent with Kolb's model of experiential learning. An another study conducted by Marshall and Merritt (1985), the psychometric properties of a semantic differential format of the LSI were compared. The inventory was administered to 181 university undergraduate nursing students. The results were compared to the normative version of the LSI which was administered to 343 nursing students. The results suggested that valid alternate forms of the LSI can be developed.

Student and Instructor Demographic Information Form

A demographic information form was completed by both the students and instructors participating in this study. The students' demographic information form (see Appendix G) provided information about their age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, months of nurse anesthesia training, and the number of anesthesia cases completed at the time of this study. The instructor demographic form (see Appendix G) provided information on age, gender, highest degree held, years of nurse anesthesia experience, years of nurse anesthesia teaching experience,

years of registered nursing experience, registered nurse specialty, and years of critical care nursing experience. These demographic variables were selected because they have been found statistically significant by some researchers studying the learning styles among health care professionals (DeCoux, 1987/1988; Kolb, 1984; Laschinger & Boss, 1984; Merritt, 1983; Penn, 1991; Ramsborg & Holloway, 1985; Sherbinski, 1994; Welborn & Conti, 1986; Zemaitis, 1987).

Pilot Study

A pilot study, conducted with a small number of subjects, provided the researcher the chance to make any changes to the data collection procedure before conducting the entire study (Babbie, 1990; Burns & Grove, 1993; Cozby, 1989). Such a study was conducted at the Southern Connecticut State University/Bridgeport Hospital/Nurse Anesthesia Program to determine the learning styles of student registered nurse anesthetists (n = 9) and their CRNA clinical instructors (n = 8). A letter of permission was sent to the program director (see Appendix H). Each participant was asked to complete the learning style packet. The learning style packet contained a cover letter (see Appendix I), consent form (see Appendix J), demographic

information form and the Kolb's Learning Style Inventory. The results of the pilot study were used to refine the data collection instrument and to give the researcher experience with the participants, setting, methodology, method of measurement, and data analysis technique. The pilot study found the predominant learning style of the student and instructor participants to be assimilator.

Data Collection Procedure

A purposive sampling was made of 34 nurse anesthesia programs. All program directors were mailed a return-reply brochure describing the purpose of the study, and to provide the researcher with the total number of students and CRNA instructors in their programs. The program directors were asked to return the brochures by the three week deadline. To improve the response rate, a follow-up letter (see Appendix K) was mailed to the program directors. Twenty-eight programs agreed to participate in the study. In an attempt to evaluate the nonrespondents, the researcher phoned the program directors. "Researchers who utilize the mail method have no way of determining nonrespondent characteristics, because they make no personal contact"

(Dillman, 1978; p. 53). Table 4 (p. 63) depicts the total number of students (n = 221) and instructors (n = 216) initially agreeing to participate in the study.

A letter of permission and the learning style packets were sent to the program directors who agreed to participate in the study. The program directors were asked to distribute the learning style packet to all students and clinical CRNA instructors and return completed and non-completed learning packets to the researcher within three weeks. The researcher emphasized that participation in the study was strictly voluntary and all responses would be held in strictest confidence. The letters of permission and learning style packets were mailed incrementally to the nurse anesthesia programs to allow for recycling of non-completed Learning Style Inventories. To improve the response rate, a phone call was made to each director two weeks after the initial learning style packet mailings. At the conclusion of the three week deadline, follow-up letters were sent to all program non-respondents (see Appendix L). Table 5 shows the response rate of programs (n = 12), students (n = 126), and instructors (n = 90) participating

Table 5

Response Rate of Nurse Anesthesia Programs (NAEPs),
Students, and Instructors Participating in Study

State	NAEPs	Students	Instructors
CA	1	4	6
CT	2	34	15
DC	1	7	2
GA	1	7	1
NC	2	20	31
PA	4	37	18
SC	0	0	0
TN	0	0	0
VA	1	7	14
WA	1	10	3
WV	0	0	0
<u>Total:</u>	12	126*	90
<u>Response Rate (%)</u>	42.8	57.0	41.7

Note: *Usable number of responses was 124 students

in the study. Upon review of the completed inventories of the students, two were found to be incomplete. Thus, the usable responses was 124 students.

Data Recording

According to Kolb (1985), each person completing the Learning Style Inventory is asked to complete 12 sentences and rank the endings of each sentence according to how well each one fits how they learn. The responses are ranked from how they learn best (4) to how they least like to learn (1). The 12 numbers entered in each of the four columns of the learning style inventory are totaled. The columns represent the four learning modes as follows:

Column 1=Concrete Experience (CE)

Column 2=Reflective Observation (RO)

Column 3=Abstract Conceptualization (AC)

Column 4=Active Experimentation (AE)

The resulting raw scores will range from 12 to 48 and are to be plotted on the Cycle of Learning Grid (see Appendix M). A dot is placed on each of the lines to correspond with the concrete experience, reflective observation, abstract conceptualization, and active experimentation scores. The

dots are then connected with a line to form a "kite-like" shape. The resulting profile shows which learning mode(s) a person tends to prefer in a learning situation.

Learning style is determined by plotting the point of interception, or data point, of two combination scores for the four learning modes onto the Learning-Style Type Grid (see Appendix N). The AC-CE combination score is calculated by subtracting the CE score from the AC score. The AE-RO combination score is likewise obtained by subtracting the RO score from the AE score. A positive score on the AC-CE scale indicates that the score is more abstract. A negative score on the AC-CE scale indicates a more concrete score. Likewise, a positive or negative score on the AE-RO scale indicates that the scores are either more active or more reflective. These scores range from +36 to -36 (Kolb, 1985).

The quadrant of the Learning-Style Type Grid into which the two combination scores falls shows the preferred learning style. For example, if the AC-CE score was -8 and the AE-RO score was +15, the accommodator would be the dominant learning style. The closer the data point is to the center of the grid, the more balanced is a person's learning style. If the data point falls near any of the far

corners of the grid, that person tends to rely heavily on one particular learning style (Kolb, 1985).

Statistical Analysis of Data

Since the intent of this study was to describe the learning styles and demographic characteristics of student registered nurse anesthetists and certified registered nurse anesthetist instructors in nurse anesthesia education programs, descriptive statistics were used. Descriptive statistics are used to describe and summarize large amounts of data (Burns & Grove, 1993; Polit & Hungler, 1991). The goal of this study was also to describe the relationships between learning styles and the demographic characteristics of students and instructors. Therefore, the Chi-square and Phi correlation statistics were used to determine the statistical significance and degree of magnitude of these relationships (Howell, 1992), respectively. The method of statistical analysis was presented by the research questions.

Research Question #1

What is the predominant learning style of SRNAs in nurse anesthesia education programs?

Descriptive statistics are designed to describe characteristics of large amounts of data (Huck, Cormier, & Bounds, 1974). The methods of descriptive statistics include: frequency distribution, measures of central tendency, measures of variability, and measures of relationship.

Frequency distribution denotes the number of subjects who fall into each of several categories (Cozby, 1989). For this research question, frequency distribution shows the number of students distributed into the four learning styles categories (accommodator, assimilator, converger, or diverger).

The measures of central tendency are a numerical indication of the average score of the distribution (Huck et al., 1974). The most common central tendency statistic is the mean (Cozby, 1989). The measures of variability (standard deviation) demonstrate the degree of dispersion among a set of scores. Simply, a measure of variability indicates how the scores are spread out (Huck et al.).

The mean and standard deviation of the learning dimension scores (AC-CE & AE-RO) were analyzed to describe the overall learning style of the student group.

Research Question #2

What is the predominant learning style of CRNA instructors in nurse anesthesia education programs?

Frequency distribution tables displayed the number of instructors having accommodator, assimilator, converger, or diverger learning styles. The mean and standard deviation were calculated for the learning dimension scores to describe the overall learning style of the instructor sample.

Research Question #3

What is the relationship between the learning style of SRNAs and the demographic variables of age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, months of nurse anesthesia training, and number of anesthesia cases completed?

A frequency distribution was shown for the demographic characteristics: age, gender, highest degree held, years of

registered nurse experience, registered nurse specialty, years of critical care nursing experience, months of anesthesia training, and number of anesthesia cases completed. The mean and standard deviation were computed for the age, years of registered nurse experience, years of critical care nursing experience, months of nurse anesthesia training, and number of anesthesia cases completed for the students.

Correlation describes the nature and degree of relationships between variables (Howell, 1992). The Phi correlation is used to correlate dichotomous variables (Huck et al., 1974). For this research question the learning style and the demographic characteristics were correlated for the students.

The Chi-square statistic was used to measure the statistical significance of the relationship between learning style and demographic variables. The chi-square statistic is used when a researcher is interested in the number of responses, people or objects, that fall in two or more categories (Huck et al., 1974). The chi-square statistic (alpha level of .05) and the Phi correlation were calculated for the following student demographic characteristics: age, gender, highest degree held, years of

registered nurse experience, registered nurse specialty, years of critical care nursing experience, months of nurse anesthesia training, and number of anesthesia cases completed.

Research Question #4

What is the relationship between the learning style of CRNA instructors and the demographic variables of age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, years of nurse anesthesia experience, and years of nurse anesthesia teaching experience?

Frequency distribution was shown for the age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, years of nurse anesthesia experience, and years of nurse anesthesia teaching experience demographic characteristics. The frequencies were displayed in a table format.

The mean and standard deviation were calculated for the demographic characteristics of age, years of registered nurse experience, years of critical care experience, years

of nurse anesthesia experience, and years of nurse anesthesia teaching experience. The Chi-square and Phi correlation statistics were calculated for each demographic characteristic of the instructor group.

Chapter Summary

This descriptive study identified the learning styles and the relationship of demographic characteristics of student registered nurse anesthetists and certified registered nurse instructors in nurse anesthesia education programs. All participants were administered the Kolb's Learning Style Inventory to identify the learning style types of students and instructors. Frequency distribution, mean, standard deviation, Chi-square, and Phi correlation statistic were used to analyze the research questions of this study.

Chapter 4

PRESENTATION AND ANALYSIS OF DATA

This study sought to describe the relationships of learning styles and demographic characteristics of Student Registered Nurse Anesthetists (SRNAs) and Certified Registered Nurse Anesthetist (CRNA) Instructors in nurse anesthesia education programs. Raw scores were used in the data analysis prior to arbitrarily assignment into categories. The relationships of the learning styles and each of the eight demographic characteristics for the students and instructors were measured by the Chi-square statistic. The magnitude of these relationships were determined by the Phi correlation statistic. An alpha level of .05 was used for all statistical tests. To increase the understanding of this study, the data analysis were organized by the research questions.

Research Question #1

What is the predominant student learning style in nurse anesthesia education programs?

The learning dimension scores were analyzed for each student. The student group had a mean AC-CE and AE-RO learning dimension score of 9.15 (SD 12.97) and 4.72 (SD 11.00), respectively. The AC-CE score ranged from -30 to +34 and the AE-RO score ranged from -17 to +29. The most frequently occurring learning style was assimilator (n = 45, 36.3%) followed closely by the converger learning style (n = 41, 33.1%). Table 6 demonstrates the distribution of the learning styles of the student group.

Research Question #2

What is the predominant instructor learning style in nurse anesthesia education programs?

The learning dimension scores were analyzed for each instructor that participated in the study. The mean AC-CE learning dimension score was 7.41 (SD 15.23). The mean AE-RO learning dimension score was 2.43 (SD 11.70). The AC-CE score ranged from -29 to +34 and the AE-RO score ranged from -23 to +28. The overall learning style for the instructor group was assimilator.

Table 6

Frequency and Percentage of Learning Styles of Students

(n = 124)

Style	Frequency	Percentage
Accommodator	19	15.3
Assimilator	45	36.3
Converger	41	33.1
Diverger	19	15.3

The instructor group demonstrated each of the four learning styles as seen in Table 7. Nearly half of this group (n = 41, 45.6%) were assimilators.

Research Question #3

What is the relationship of the predominant learning style of students and the demographic characteristics of age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, months of nurse anesthesia training, and number of anesthesia cases completed?

Age

The student group had a mean age of 34 years (SD 5.51). The largest percentage (33.9, n = 42) of students was in the 31-35 year old age group. The second largest percentage of students (25.8, n = 32) was contained in the 26-30 year old age group. The age of the students ranged from 23-47 years. The distribution of students in all age groups is found in Table 8.

The students in the 31-35 year old age group contained the largest group of assimilators (n = 18, 42.85%).

Table 7

Frequency and Percentage of Learning Styles of Instructors

(n = 90)

Style	Frequency	Percentage
Accommodator	10	11.1
Assimilator	41	45.6
Converger	21	23.3
Diverger	18	20.0

Table 8

Descriptive Statistics of Age of Students (n = 124)

Age	Frequency	Percentage
21-25	6	4.8
26-30	32	25.8
31-35	42	33.9
36-40	28	22.9
41-45	15	12.1
46+	1	0.8

Mean = 34

Standard Deviation = 5.51

Range = 23-47

A nearly equal distribution of convergers and assimilators was found in the 26-30 and 36-40 year old age groups. Table 9 shows the remaining distribution of the age groups and learning style categories. The relationship between age and learning style was not statistically significant as measured by the Chi-square statistic @ the .05 significance level.

Gender

Most of the student group was composed of females (n = 72, 58.1%). Table 10 shows the gender distribution of the remaining students.

The assimilator (n = 22, 30.5%) and converger (n = 27, 37.5%) learning styles were equally represented among the female students as shown in Table 11. The predominant learning style for the male students was assimilator (n = 23, 44.2%).

Highest Degree Held

Among the respondents, 91% (n = 113) indicated that the baccalaureate degree was the highest degree held. The other type of degrees held by the students is found in Table 12.

The students with baccalaureate degrees were equally divided in the assimilator (n = 40, 32.26%) and the

Table 9

The Relationship of Age and Learning Styles of Students

(n = 124)

Age	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
21-25	1	2	2	1
26-30	6	12	10	4
31-35	7	18	12	5
36-40	2	9	11	6
41-45	3	3	6	3
46+	0	1	0	0

Chi-square (15, 124) = 7.474, $p > .05$

Phi coefficient = 0.246

Table 10

Frequency and Percentage of Gender of Students (n = 124)

Gender	Frequency	Percentage
Male	52	41.9
Female	72	58.1

Table 11

The Relationship of Gender and Learning Styles of Students

(n = 124)

Gender	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
Male	6	23	14	9
Female	13	22	27	10

Chi-square (3, 124) = 3.645, $p > .05$

Phi coefficient = 0.171

Table 12

Frequency and Percentage of Highest Degree Held of Students

(n = 124)

Degree	Frequency	Percentage
Bachelors	113	91.1
Masters	9	7.3
None	1	0.8
Other	1	0.8

Note. Other = Doctor of Law

converger (n = 38, 30.65%) learning style categories, Table 13. One student indicated he, or she, did not have a degree. All applicants to nurse anesthesia programs must hold a BS degree; therefore, the researcher concluded that the response was an error. The relationship between highest degree held and learning style was not statistically significant as measured by the Chi-square statistic @ the .05 significance level.

Years of Registered Nurse (RN) Experience

The mean number of years of registered nurse experience was 8.48 (SD 5.03) years among the student group. The years of RN experience reported by the student group ranged from 1 year-20 years. Table 14 provides the total response pattern to this demographic characteristic. The relationship between the years of RN experience and learning style was not statistically significant as measured by the Chi-square statistic @ the .05 significance level. The relationship between the years of registered nurse experience and learning style for the student group is indicated in Table 15.

Table 13

The Relationship of Highest Degree Held and Learning Styles
of Students (n = 124)

Degree	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
Bachelors	18	40	38	17
Masters	1	4	3	1
None	0	0	0	1
Other	0	1	0	0

Note. Other = Doctor of Law

Chi-square (9, 124) = 7.724, $p > .05$

Phi coefficient = 0.250

Table 14

Descriptive Statistics of Years of Registered Nurse (RN)

Experience of Students (n = 124)

Years of RN Experience	Frequency	Percentage
1-5	43	34.68
6-10	40	32.26
11+	41	33.06

Mean = 8.48

Standard Deviation = 5.03

Range = 1-20

Table 15

The Relationship of Years of Registered Nurse (RN)

Experience and Learning Styles of Students (n = 124)

Years of RN Experience	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
1-5	9	16	13	5
6-10	5	15	14	6
11+	5	14	14	8

Chi-square (6, 124) = 2.450, p > .05

Phi coefficient = 0.141

Registered Nurse (RN) Specialty

The most frequently reported registered nurse specialties for the student (n = 123) group were critical care (n = 61, 49.6%), operating room (n = 18, 14.6%), and emergency room (n = 17, 13.8%). Table 16 provides additional frequencies and percentages for the other RN specialties that were reported by the student group.

The predominant learning style for the critical care (n = 22) and operating room (n = 7) specialty groups was converger. The predominant learning style for the emergency care (n = 9) group was assimilator. Table 17 displays the distribution of learning style types among the other RN specialties. The relationship between registered nurse specialty and learning style for the student sample was not statistically significant as measured by the Chi-square statistic @ the .05 significance level.

Years of Critical Care (CC) Nursing Experience

The mean year of critical care nursing experience reported by the student group was 5.5 years (SD 3.9). Table 18 shows the descriptive statistics of the years of critical care nursing experience from all the student participants.

Table 16

Frequency and Percentage of Registered Nurse (RN) Specialty
of Students (n = 123)

RN Specialty	Frequency	Percentage
Critical Care	61	49.6
Emergency Room	17	13.8
Medicine	4	3.3
Operating Room	18	14.6
Pediatrics	4	3.3
Recovery Room	8	6.5
Surgery	11	8.9

Note. Missing data from one participant

Table 17

The Relationship of Registered Nurse (RN) Specialty and Learning Styles of Students (n = 123)

RN Specialty	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
Critical Care	11	16	22	12
Emergency Room	1	9	6	1
Medicine	1	2	1	0
Operating Room	2	6	7	3
Pediatrics	1	1	1	1
Recovery Room	2	5	1	0
Surgery	0	6	3	2

Note. Missing data from one participate

Chi-square (18, 123) = 15.698, $p > .05$

Phi coefficient = 0.357

Table 18

Descriptive Statistics of Years of Critical Care (CC)

Nursing Experience of Students (n = 124)

Years of CC Experience	Frequency	Percentage
0-5	71	57.26
6-10	39	31.45
11+	14	11.29

Mean = 5.5

Standard Deviation = 3.9

Range = 0-18

The range of critical care nursing experience among this group was 0-18 years.

The students in the 0-5 years of critical care nursing experience group contained the greatest number of assimilators (n = 29, 40.84%) as indicated in Table 19. The relationship between years of critical care nursing experience and learning style was not statistically significant as measured by the Chi-square statistic @ the .05 level of significance.

Months of Nurse Anesthesia Training

The mean month of nurse anesthesia training for the student group was 14.0 months (SD 7.02). Those students reporting 9-12 months of training comprised the largest group of all respondents (n = 29, 23.4%). The range for the months of nurse anesthesia training reported by the students was 0-24 months. The frequencies and percentages of the remaining months of training among all respondents are found in Table 20.

The assimilator (n = 10, 34.5%) and converger (n = 9, 31.0%) were the prevalent learning styles among those students who reported 9-12 months of anesthesia training.

Table 19

The Relationship of Years of Critical Care (CC) Experience
and Learning Styles of Students (n = 124)

Years of CC Experience	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
0-5	12	29	21	9
6-10	5	13	15	6
11+	2	3	5	4

Chi-square (6, 124) = 4.199, $p > .05$

Phi coefficient = 0.184

Table 20

Descriptive Statistics of Months of Nurse Anesthesia
Training of Students (n = 124)

Months of Training	Frequency	Percentage
0-3	8	6.5
4-8	23	18.5
9-12	29	23.4
13-16	16	12.9
17-20	21	16.9
21-23	23	18.5
24+	4	3.2

Mean = 14.0

Standard Deviation = 7.02

Range = 0-24

In the 21-24 months of training group, the learning styles were converger (n = 11, 47.8%) and assimilator (n = 9, 39.1%) as depicted in Table 21. The relationship of months of nurse anesthesia training and learning style was not statistically significant as measured by the Chi-square statistic @ the .05 significance level.

Number of Anesthesia Cases Completed

The mean number of anesthesia cases completed by the students was 282 cases (SD 260). The range of anesthesia cases reported by all students was 0-999 cases. The frequency of anesthesia cases was equally divided between the 0-100 (n = 46, 37.10%) and 101-500 (n = 47, 37.90%) groups as shown in Table 22.

Table 23 shows the relationship between learning styles and the number of anesthesia cases completed for all groups. The relationship between number of anesthesia cases completed by the students and learning style was not statistically significant as measured by the Chi-square statistic @ the .05 significance level.

Table 21

The Relationship of Months of Nurse Anesthesia Training
and Learning Styles of Students (n = 124)

Months of Training	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
0-3	0	4	1	3
4-8	5	8	7	3
9-12	4	10	9	6
13-16	3	4	7	2
17-20	5	6	6	4
21-23	2	9	11	1
24+	0	4	0	0

Chi-square (18, 124) = 20.668, $p > .05$

Phi coefficient = 0.408

Table 22

Descriptive Statistics of Number of Anesthesia Cases

Completed of Students (n = 124)

No. of Cases	Frequency	Percentage
0-100	46	37.10
101-500	47	37.90
501+	31	25.00

Mean = 282

Standard Deviation = 260

Range = 0-999

Table 23

The Relationship of Number of Anesthesia Cases Completed
and Learning Styles of Students (n = 124)

Number of Cases	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
0-100	9	13	12	12
101-500	5	20	18	4
501+	5	12	11	3

Chi-square (6, 124) = 9.270, $p > .05$

Phi coefficient = 0.273

Research Question #4

What is the relationship between the learning style of nurse anesthetist instructors and the demographic characteristics of age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, years of nurse anesthesia experience, and years of nurse anesthesia teaching experience.

Age

The mean age for the participating instructors was 40.3 years (SD 6.37). The age range among this group was 26-53 years. The 31-40 year old age group (n = 43, 47.8%) contained the highest number of instructors and is shown in Table 24. Table 25 demonstrates that assimilator was the predominant learning style of the 31-40 and 41-49 age groups for the instructor group.

Gender

Approximately 66% of the instructor group was female (n = 60). Table 26 shows the frequency and percentage of

Table 24

Descriptive Statistics of Age of Instructors (n = 90)

Age	Frequency	Percentage
21-30	5	5.6
31-40	43	47.8
41-49	35	38.9
50+	7	7.8

Mean = 40.3

Standard Deviation = 6.37

Range = 26-53

Table 25

The Relationship of Age and Learning Styles of Instructors

(n = 90)

Age	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
21-30	0	2	1	2
31-40	9	16	8	10
41-49	1	20	10	4
50+	0	3	2	2

Chi-square (9, 90) = 12.645, $p > .05$

Phi coefficient = 0.375

Table 26

Frequency and Percentage of Gender of Instructors (n = 90)

Gender	Frequency	Percentage
Male	30	33.3
Female	60	66.7

the gender demographic characteristics of all instructors participating in this study.

The relationship between gender and learning style of instructors is depicted in Table 27. The assimilator (n = 11, 36.6%) and converger (n = 10, 33.3%) learning styles were somewhat equally dispersed among the male instructors. The predominant learning style for the female instructors was assimilator (n = 30, 50%). The relationship between gender and learning style was not statistically significant as measured by the Chi-square statistic @ the .05 significance level.

Highest Degree Held

Fifty-six percent of the instructors reported that a masters degree was the highest degree held. Table 28 shows the distribution of the degrees held by all the instructors.

Table 29 depicts the relationship of highest degree held by the instructors. The assimilator learning style predominated for those instructors with masters degrees. The relationship of highest degree held and learning style was not statistically significant as measured by the Chi-square statistic @ the .05 significance level.

Table 27

The Relationship of Gender and Learning Styles of
Instructors (n = 90)

Gender	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
Male	3	11	10	6
Female	7	30	11	12

Chi-square (3, 90) = 2.759, $p > .05$

Phi coefficient = 0.175

Table 28

Frequency and Percentage of Highest Degree Held of
Instructors (n = 90)

Degree	Frequency	Percentage
Associate	3	3.3
Bachelors	26	28.9
Masters	51	56.7
None	4	4.4
Other	6	6.7

Note. Other = Doctor of Law

Table 29

The Relationship of Highest Degree Held and Learning Styles
of Instructors (n = 90)

Degree	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
Associate	0	2	0	1
Bachelors	1	14	6	5
Masters	8	22	9	12
None	0	1	3	0
Other	1	2	3	0

Note. Other = Doctor of Law

Chi-square (12, 90) = 14.863, $p > .05$

Phi coefficient = 0.406

Years of Registered Nurse (RN) Experience

The mean year of RN experience reported by the instructor group was 5.1 years (SD 3.8). The years of registered nurse experience reported by the instructor group ranged from 1-18 years. As demonstrated in Table 30, 58.89% (n = 53) of the instructors reported having 1-5 years of RN experience.

The assimilator learning style prevailed among all instructors regardless of the number of years of registered nurse experience (see Table 31). The relationship of years of registered nurse experience and learning style was not statistically significant as measured by the Chi-square statistic @ the .05 significance level.

Registered Nurse (RN) Specialty

The most common RN specialties reported by the instructor group were critical care (n = 53, 58.9%), operating room (n = 16, 17.8%), and surgical nursing (n = 13, 14.4%). Table 32 shows the frequency and percentage distribution of the other RN specialties as reported by the instructors.

As shown in Table 33, the number of instructors was insufficient to show distribution in all learning style

Table 30

Descriptive Statistics of Years of Registered Nurse (RN)

Experience of Instructors (n = 90)

Years of RN Experience	Frequency	Percentage
1-5	53	58.89
6-10	29	32.22
11+	8	8.89

Mean = 5.1

Standard Deviation = 3.8

Range = 1-18

Table 31

The Relationship of Years of Registered Nurse Experience
(RN) and Learning Styles of Instructors (n = 90)

Years of RN Experience	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
1-5	4	26	12	11
6-10	5	10	8	6
11+	1	5	1	1

Chi-square (6, 90) = 3.913, p > .05

Phi coefficient = 0.209

Table 32

Frequency and Percentage of Registered Nurse (RN) Specialty
of Instructors (n = 90)

RN Specialty	Frequency	Percentage
Critical Care	53	58.9
Emergency Room	3	3.3
Medicine	1	1.1
Operating Room	16	17.8
Pediatrics	2	2.2
Recovery Room	2	2.2
Surgery	13	14.4

Table 33

The Relationship of Registered Nurse (RN) Specialty and Learning Styles of Instructors (n = 90)

RN Specialty	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
Critical Care	5	25	13	10
Emergency Room	0	1	0	2
Medicine	1	0	0	0
Operating Room	3	6	5	2
Pediatrics	1	0	1	0
Recovery Room	0	1	0	1
Surgery	0	8	2	3

Chi-square (18, 90) = 23.405, $p > .05$

Phi coefficient = 0.510

categories. The greatest number of assimilators (n = 25) cited critical care nursing as their registered nurse specialty. The relationship of registered nurse specialty and learning style was not statistically significant as measured by the Chi-statistic @ the .05 significance level.

Years of Critical Care (CC) Experience

The mean year of critical care nursing experience for the instructor group was 3.8 years (SD 3.7) and the range of critical care nursing experience was 0-16 years. The descriptive statistics of years of critical care experience are exhibited in Table 34.

Table 35 shows that the assimilator learning style predominated in all years of critical care experience groups. The relationship of years of CC experience and learning style was not statistically significant as measured by the Chi-statistic @ the .05 significance level.

Years of Nurse Anesthesia (NA) Experience

The mean year of nurse anesthesia experience for the instructors was reported to be 10.7 years (SD 8.5) and the range was 1-43 years. Most of the instructors (n = 39,

Table 34

Descriptive Statistics of Years of Critical Care (CC)

Nursing Experience of Instructors (n = 90)

Years of CC Experience	Frequency	Percentage
0-5	62	68.89
6-10	22	24.44
11+	6	6.67

Mean = 3.8

Standard Deviation = 3.7

Range = 0-16

Table 35

The Relationship of Years of Critical Care (CC) Experience
and Learning Styles of Instructors (n = 90)

Years of CC Experience	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
0-5	5	28	15	14
6-10	4	9	5	4
11+	1	4	1	0

Chi-square (6, 90) = 3.948, $p > .05$

Phi coefficient = 0.209

43.33%) participating in the study reported 11+ years of NA experience (see Table 36).

Table 37 shows the distribution of the years of nurse anesthesia experience and learning style categories. The relationship of years of nurse anesthesia experience and learning style was not statistically significant as measured by the Chi-square statistic @ the .05 significance level.

Years of Nurse Anesthesia (NA) Teaching Experience

The mean year of nurse anesthesia teaching experience of instructor group was 7.2 years (SD 6.4). The years of teaching experience among this group ranged from 0-31 years. As shown in Table 38, the 0-5 years of nurse anesthesia teaching experience group contained 47 (52.22%) of the instructors.

Table 39 demonstrates the relationship between years of teaching experience and learning style. This relationship was found to be statistically insignificant as measured by the Chi-square statistic @ the .05 significance level.

Table 36

Frequency and Percentage of Years of Nurse Anesthesia (NA)
Experience of Instructors (n = 90)

Years of NA Experience	Frequency	Percentage
1-5	29	32.22
6-10	22	24.44
11+	39	43.33

Mean = 10.7

Standard Deviation = 8.5

Range = 1-43

Table 37

The Relationship of Years of Nurse Anesthesia (NA)
Experience and Learning Styles of Instructors (n = 90)

Years of NA Experience	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
1-5	7	12	4	6
6-10	1	10	5	6
11+	2	19	12	6

Chi-square (6, 90) = 9.799, $p > .05$

Phi coefficient = 0.330

Table 38

Frequency and Percentage of Years of Nurse Anesthesia (NA)

Teaching Experience of Instructors (n = 90)

Years of NA Teaching	Frequency	Percentage
0-5	47	52.22
6-10	20	22.22
11+	23	25.56

Mean = 7.2

Standard Deviation = 6.4

Range = 0-31

Table 39

The Relationship of Years of Nurse Anesthesia (NA) Teaching Experience and Learning Styles of Instructors (n = 90)

Years of NA Teaching	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
0-5	7	22	10	8
6-10	2	8	3	7
11+	1	11	8	3

Chi-square (6, 90) = 6.740, $p > .05$

Phi coefficient = 0.274

Chapter Summary

This chapter presented the analysis of the data. The results showed that the two most prominent learning styles were assimilator (36.3%) and converger (33.1%) among the students. The most frequently reported learning style for the instructor group was assimilator (45.6%). The mean age for the student group was 34 years (range =23-47) and 40 years (range = 26-53) for the instructor group. Females predominated for both student and instructor groups. All of the students held a baccalaureate degree. In contrast, the majority of the instructors held a masters degree. The mean number of years of registered nurse experience was 8.5 years (range = 1-20) and 5.1 years (range = 1-18), respectively for students and instructors. Both students and instructors indicated critical care and operating room as the most frequently occurring registered nursing specialties. On average, the students had 5.5 years (range = 0-18) of critical care nursing experience and the instructors had 3.8 years (range =0-16). The mean month of nurse anesthesia training for the students was 14 months and the mean number of anesthesia cases was 282 cases (range = 0-999). The instructor group reported the mean year of nurse anesthesia

experience of 10.7 years (range = 1-43) and 7.2 years (range = 0-31) of nurse anesthesia teaching experience. The relationship of the learning styles and the demographic characteristics of age, gender, highest degree held, years of registered nursing experience, registered nursing specialty, years of critical care nursing experience, years of nurse anesthesia experience, years of nurse anesthesia teaching experience, months of nurse anesthesia training, and number of anesthesia cases completed was found not to be statistically significant as measured by the Chi-square statistic @ the .05 significance level among both students and instructors.

Chapter 5

SUMMARY AND DISCUSSION

Introduction

The purpose of this descriptive study was to identify the predominant learning style among students and clinical instructors in nurse anesthesia education programs and to analyze the relationships between the learning styles and the demographic characteristics of age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, months of nurse anesthesia training, and number of anesthesia cases completed for the students. The demographic characteristics analyzed for the instructors were: age, gender, highest degree held, years of registered nurse experience, registered nurse specialty, years of critical care nursing experience, years of nurse anesthesia experience, and years of nurse anesthesia teaching experience.

Since the practice of nurse anesthesia is based on a substantial and credible foundation of academic theory and

clinical performance, several factors led to the research questions for this study: (1) recent scientific and technological advances have made administering anesthesia exceedingly more complex; (2) few nurse anesthesia instructors have formal teacher training experiences; thus, they are not familiar with the basic principles of teaching and learning and its influence on the students' clinical performance; and (3) there is little research on the learning styles of students and nurse anesthesia instructors in nurse anesthesia education programs. This chapter contains a summary and discussion of this study.

Summary

A number of learning style theories (behavioral, social, and cognitive) explains how individuals learn. However, the theoretical framework of this study was based on Kolb's (1984) concept of experiential learning which emphasizes the role experience plays in how individuals learn new information. The cyclical learning process, as depicted in Figure 1 (p. 29), requires the use of four types of learning abilities or modes: concrete experience (CE) enables individuals to become involved in actual

experiences; reflective observation (RO) allows the learner to reflect upon actual experiences from different perspectives; abstract conceptualization (AC) allows the individual to develop a sound theory of what has been experienced; and the final stage, active experimentation (AE), allows the learner to apply the theory developed in the third stage to solve practical problems.

Kolb (1984) defined learning style as the way individuals perceive and process information, or adapt to their environment. The development of learning styles is the result of past experiences in the work, educational, and family environment. The Learning Style Inventory (Kolb, 1985) was developed to classify learners into four learning style categories. The learning styles are converger, diverger, assimilator, and accommodator. Convergents prefer the practical application of ideas, divergers views situations from several perspectives, assimilators have the ability to create theoretical models, and accommodators like being involved in new experiences.

The students and instructors were purposively selected to participate in the study. A total of 124 students and 90 instructors involved in clinical instruction in nurse anesthesia programs were administered the Kolb Learning

Style Inventory and completed a demographic information sheet. The response rate was 57% for the students and 41.7% for the instructors. Descriptive statistics were used to describe the learning styles of both groups. This study revealed the most frequently appearing learning styles were assimilator and converger for the student group and assimilator for the instructor group. The Chi-square (@ the .05 significance level) and Phi correlation statistics determined the statistical significance and the degree of magnitude, respectively, of the relationships between learning styles and the eight demographic characteristics of the students and instructors. These relationships were not statistically significant for the study participants.

Discussion

Nurse anesthesia students are largely responsible for their own learning and applying scientific theory to their clinical practice. To become competent clinicians, students must apply principles of critical thinking, decision making, and problem solving to the clinical setting. Student nurse anesthetists are expected to develop their inductive and

deductive reasoning, and analytical skills to solve patient care problems.

The data indicated that all four learning styles were represented in both the student and instructor groups. However, the student group were largely assimilators (36.3%) and convergers (33.1%) and the instructors predominately had an assimilator (45.6%) learning style. According to Kolb (1984), assimilators display the learning abilities of abstract conceptualization and reflective observation. Those people who are assimilators understand a wide range of information and putting it into concise, logical form. They have a lesser focus on people, excel in inductive reasoning, and are more interested in abstract ideas and concepts. Convergers find practical uses for ideas and theories, excel in deductive reasoning, and would rather deal with technical tasks and problems than with social and interpersonal tasks. The learning abilities of convergers are abstract conceptualization and active experimentation. Experiential learning (Kolb, 1984) in the clinical setting allows the student to develop decision-making, critical thinking, and problem-solving skills. The identification of the assimilator and converger learning styles for the nurse anesthesia students, as well as the assimilator learning

style for the instructors is in contrast to Ramsborg & Holloway's study (1985), who concluded that the predominant learning style for the first- and second-year anesthesia students was the accommodator. They found the instructors had the diverger and accommodator learning styles. The differences in these results of learning styles may be the result of several factors: (1) currently, a baccalaureate degree is required for admission to anesthesia programs, but it was not an admission requirement in the early 1980's; (2) the trend toward higher education for students and practicing nurse anesthetists; and (3) this study included only students in graduate nurse anesthesia education programs (masters). However, this study supports Sherbinski's (1994) finding that the learning styles for nurse anesthesia students were assimilator (37.2%) and converger (31.1%). Several studies identified the predominant learning style for anesthesiologists as accommodator. The normative profile study of the Learning Style Inventory concluded that nursing students predominately had the accommodator learning style (Smith & Kolb, 1986). However, numerous researchers found the learning styles of undergraduate nursing students demonstrated the four learning styles. Nonetheless, no

single predominant learning style could be identified among nursing students, nurse educators or registered nurse practitioners. The learning styles of nursing graduate students were not researched. Based on these results, it seems reasonable to conclude that nurse anesthesia education programs assess the learning styles of individual students early in their anesthesia training. Such knowledge would enhance academic advising, curriculum development, and teaching strategies.

The instruction in nurse anesthesia involve classroom lectures in anatomy, physiology, biochemistry, pathophysiology, chemistry, physics, and pharmacology as they relate to the practice of anesthesia, student presentations, small group discussions, clinical case instruction, and journal clubs. In addition, many nurse anesthesia programs, require study in methods of scientific inquiry and participation in research. According to Kolb (1984), people with the assimilator and converger learning styles prefer lectures, case studies, theoretical readings, and small group discussions. He implied that preferences for instructional activities are associated with a specific learning style (see Table 3, p. 45). The current curriculum design of nurse anesthesia programs appears to support the

instructional preferences of individuals with these types of learning styles. Since some research indicate that teachers tend to teach the way they learn, the researcher recommends further studies using a larger, more representative group in different geographic locations to confirm the instructional preferences of students and the preferred teaching styles of nurse anesthesia instructors and anesthesiologists in nurse anesthesia education programs.

Nurse anesthesia students are given an extensive opportunity to integrate classroom content to direct patient care in the clinical setting. The clinical component of nurse anesthesia education programs mandates that each student administer a minimum of 450 anesthetics. Exposure to the clinical setting and learning the job role of the nurse anesthetist facilitates the socialization of the student into the profession. Students are also socialized to interact and communicate in collaboration with other health care providers. Role modeling, particularly by nurse anesthetists, throughout the educational program is a valuable tool of professional socialization. The identification of students and instructors having the same learning style in this study and Ramsborg & Holloway's (1985) findings support Kolb's (1984) contention that

individuals with certain learning styles tend to gravitate toward certain careers and that they adapt to fit the learning norms of the profession once they are socialized into it. However, a longitudinal study of the learning styles of first- and second-year students in nurse anesthesia education programs and nurse anesthesia practitioners would need to be conducted to validate Kolb's theory.

Some researchers have suggested that age and gender influence learning style. The results of this study revealed the mean age of the student group was 34 years. The age ranged from 23-47 years for the student group and the age of the instructors ranged from 26-53 years with a mean age of 40 years. With few exceptions, the assimilator learning style predominated all age groups for both the students and instructors. In support of Sherbinski's (1994) study, the relationship between learning styles and age was not statistically significant for either the student and instructor participants. The lack of effect of age on learning style was consistent with Kolb's (1984) premise that individual learning style remains fairly stable. Therefore, determining the learning style of the individual

nurse anesthesia student may be more helpful to the educator than knowing the student's age.

The largest group, by gender, for both the students and instructors was female. The assimilator learning style predominated for the male students and the assimilator and converger learning styles were somewhat equally represented among the female students. Interestingly, the predominant learning style for the female instructors was assimilator. The assimilator and converger learning styles were equally represented among the male instructors. According to Kolb (1984), males prefer abstract conceptualization mode when learning new information. This study found the relationship between gender and learning styles was not statistically significant. Sherbinski (1994) also found the relationship between gender and learning styles not to be statistically significant among nurse anesthesia students. This result supports Kolb's (1984) hypothesis that people assimilate the learning norms of the profession to which they are exposed.

Nurse anesthesia students have extensive clinical backgrounds as registered nurses in such settings as critical care (intensive care nursing in the fields of: medicine, surgery, cardiology, pediatrics, or trauma), recovery room, operating room, or emergency room. The

results of this study indicated that the majority of both the students and instructors indicated critical care nursing as their registered nurse specialty prior to nurse anesthesia training. On average, the students had 5.5 years (range = 0-18 years) of critical care nursing experience. The instructors had 3.8 years (range = 0-16 years) of critical care nursing experience. Thus, these students have already demonstrated a high level of competence in the integration of theory into clinical decision making.

The years of registered nurse experience ranged from 1-20 years (mean = 8.5 years) for the student group. The years of registered nurse experience ranged from 1-18 years (mean = 5.1 years) for the instructors. The high cost of graduate nurse anesthesia education or the scarcity of nursing jobs to return to in the event of failure in a nurse anesthesia education program may explain the reason students have more critical care nursing experience and registered nurse experience than their instructors. Simply, students are remaining longer on their jobs before making the commitment to nurse anesthesia education. There was no statistical relationship between learning style and the years of critical care nursing experience or years of registered nurse experience. These results supported Kolb's

(1984) theory that experience in the practice of anesthesia is responsible for the predominant learning styles exhibited by the students and instructors. Kolb (1984) proposed that learning styles are influenced by psychological type, educational specialization, professional career, current job role, and adaptive competencies.

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Appendices

Appendix A

Learning Style Inventory 1985

LSI

LEARNING-STYLE INVENTORY

McBER & COMPANY

Name: _____

Position: _____

Organization: _____

Date: _____

Inventory

McBer & Company
Training Resources Group
116 Huntington Avenue
Boston, Massachusetts 02116
(617) 437-7080

Learning-Style Inventory: Instructions

The Learning-Style Inventory describes the way you learn and how you deal with ideas and day-to-day situations in your life. Below are 12 sentences with a choice of four endings. Rank the endings for each sentence according to how well you think each one fits with how *you* would go about learning something. Try to recall some recent situations where you had to learn something new, perhaps in your job. Then, using the spaces provided, rank a "4" for the sentence ending that describes how you learn *best*, down to a "1" for the sentence ending that seems *least* like the way you would learn. Be sure to rank all the endings for each sentence unit. Please do not make ties.

Example of completed sentence set:

When I learn:	<u>4</u>	I like to deal with my feelings	<u>1</u>	I like to watch and listen	<u>2</u>	I like to think about ideas	<u>3</u>	I like to be doing things
1. When I learn:	___	I like to deal with my feelings	___	I like to watch and listen	___	I like to think about ideas	___	I like to be doing things
2. I learn best when:	___	I trust my hunches and feelings	___	I listen and watch carefully	___	I rely on logical thinking	___	I work hard to get things done
3. When I am learning:	___	I have strong feelings and reactions	___	I am quiet and reserved	___	I tend to reason things out	___	I am responsible about things
4. I learn by:	___	feeling	___	watching	___	thinking	___	doing
5. When I learn:	___	I am open to new experiences	___	I look at all sides of issues	___	I like to analyze things, break them down into their parts	___	I like to try things out
6. When I am learning:	___	I am an intuitive person	___	I am an observing person	___	I am a logical person	___	I am an active person
7. I learn best from:	___	personal relationships	___	observation	___	rational theories	___	a chance to try out and practice
8. When I learn:	___	I feel personally involved in things	___	I take my time before acting	___	I like ideas and theories	___	I like to see results from my work
9. I learn best when:	___	I rely on my feelings	___	I rely on my observations	___	I rely on my ideas	___	I can try things out for myself
10. When I am learning:	___	I am an accepting person	___	I am a reserved person	___	I am a rational person	___	I am a responsible person
11. When I learn:	___	I get involved	___	I like to observe	___	I evaluate things	___	I like to be active
12. I learn best when:	___	I am receptive and open-minded	___	I am careful	___	I analyze ideas	___	I am practical

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Appendix B

Return-Reply Brochure

Learning Styles of Students and Instructors

**ARE THEY IMPORTANT TO
NURSE ANESTHESIA
EDUCATION?**

**Diane Powe, CRNA, MA
P. O. Box 5603
Bridgeport, CT 06610
Phone: 203-368-0869**

**DIANE POWE, CRNA, MA
P. O. BOX 5603
BRIDGEPORT, CT 06610**

Learning styles refer to a person's way of using information in learning and solving problems. Learning styles are important components in making learning and instruction more responsive to the needs of the individual student. I plan to examine the learning styles of nurse anesthesia instructors and their students. This research is part of my Ph.D. requirements.

Your nurse anesthesia education program has been selected to complete a learning style inventory. The inventory will need to be completed by the nurse anesthesia students and nurse anesthesia instructors. You may be assured of complete confidentiality.

If you are willing to participate in this learning style study, please mail the attached return-reply card by (Date). Please provide the total number of students and clinical CRNA instructors in your institution. The complete inventory package will be mailed to you by as soon as possible.

I would be most happy to answer any questions you might have concerning this project. Please write or call. Thank you for your assistance.

Sincerely,

Diane Powe, CRNA, MA

Learning Styles

Name _____

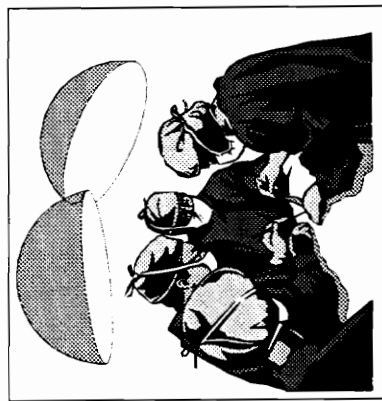
Address _____

City, State, Zip _____

Phone _____

Number of students _____

Number of instructors _____



Appendix C

Reliability of Learning Style Inventory 1985

Reliability of Learning Style Inventory 1985 (n = 268)

	Cronbach's Standardized Scale Alpha	Tukey's Additivity Power
<hr/>		
Learning Ability		
CE	0.82	0.91
RO	0.73	1.09
AC	0.83	1.07
AE	0.73	1.03
Learning Dimension		
AC-CE	0.88	1.00
AE-RO	0.81	0.99

Note. *p < .001. From The Learning Style Inventory User's Guide, by David A. Kolb, 1985. Copyright 1981, revised 1985 by the Experience Based Learning, Inc.

Appendix D

Correlation of Original (OLSI) and Revised Learning Style
(LSI) Inventories

Correlation of OLSI and LSI 1985 (n = 268)

	Split-Half Reliability 6 OLSI + 6 New Items (Spearman-Brown)	Correlation Between OLSI and Total LSI 1985*
<hr/>		
Learning Ability		
CE	0.81	0.89
RO	0.71	0.87
AC	0.84	0.92
AE	0.83	0.92
Learning Dimension		
AC-CE	0.85	0.92
AE-RO	0.82	0.93

Note. *p < .001. From The Learning Style Inventory User's Guide, by David A. Kolb, 1985. Copyright 1981, revised 1985 by the Experience Based Learning, Inc.

Appendix E

Norms for Learning Style Inventory 1985

Norms for the LSI 1985 (n = 1,446)

	Mean	Standard Deviation
<hr/>		
Learning Ability		
CE	26.00	6.8
RO	29.94	6.5
AC	30.28	6.7
AE	35.37	6.9
Learning Dimension		
AC-CE	4.28	11.4
AE-RO	5.92	11.0

Note. $p < .001$. From The Learning Style Inventory User's Guide, by David A. Kolb, 1985. Copyright 1981, revised 1985 by the Experience Based Learning, Inc.

Appendix F

Pearson Correlation Among Learning Ability and Learning
Dimension Scales of Learning Style Inventory 1985

Pearson Correlations Among LSI 1985 Learning Ability and Learning Dimension Scales (n = 1,446)

	CE	RO	AC	AE	AC-CE	AE-RO
CE	1					
RO	-0.32	1				
AC	-0.42	-0.15	1			
AE	-0.22	-0.33	-0.3	1		
AC-CE	-0.85	-0.1	-0.84	-0.05	1	
AE-RO	-0.05	-0.8	-0.1	-0.83	-0.09	1

Note. $p < .001$. From The Learning Style Inventory User's Guide, by David A. Kolb, 1985. Copyright 1981, revised 1985 by the Experience Based Learning, Inc.

Appendix G

Demographic Information Forms

STUDENT DEMOGRAPHIC INFORMATION SHEET

These questions or statements have been designed so that you can easily answer them by CIRCLING the number of the response that is most appropriate. In some cases, you may want to give an answer that is not printed on the list. Therefore, some questions or statements have a space for you to write in your own responses.

1. What is your age?

2. What is your gender?

1. Male
2. Female

3. Indicate highest degree held:

1. Associate degree
2. Baccalaureate degree
3. Masters degree
4. None
5. Other (Describe) _____

4. How many years did you practice as a registered nurse prior to attending nurse anesthesia school?

5. What was your registered nurse specialty prior to entering a nurse anesthesia education program?

6. How many years of critical care nursing experience did you have prior to attending anesthesia school?

7. How many months of nurse anesthesia training have you completed to date?

8. Indicate the number of anesthesia cases completed to date:

INSTRUCTOR DEMOGRAPHIC INFORMATION SHEET

These questions or statements have been designed so that you can easily answer them by **CIRCLING** the number of the response that is most appropriate. In some cases, you may want to give an answer that is not printed on the list. Therefore, some questions or statements have a space for you to write in your own responses.

1. What is your age?

2. What is your gender?

1. Male
2. Female

3. Indicate highest degree held:

1. Associate degree
2. Baccalaureate degree
3. Masters degree
4. None
5. Other (Describe) _____

4. How many years did you practice as a registered nurse prior to becoming a nurse anesthetist?

5. What was your registered nurse specialty prior to becoming a nurse anesthetist?

6. How many years of critical care nursing experience did you have prior to becoming a nurse anesthetist?

7. Indicate the total number of years you have been a practicing certified registered nurse anesthetist:

8. Indicate the total number of years you have been teaching nurse anesthesia students:

Appendix H

Letter of Permission to Program Directors

DIRECTOR OF NURSE ANESTHESIA PROGRAM LETTER

Date

Dear Director:

I would like your school to participate in a study on learning styles of certified registered nurse anesthetist instructors and their students. Learning styles refer to a person's way of using information in learning and solving problems. Learning styles are an important component in making learning and instruction more responsive to the needs of the individual student. This study is a requirement for my Ph.D. degree.

Please ask that each student and CRNA involved in clinical instruction at all clinical sites participate in this study. Participation in this study is strictly voluntary. If they agree to participate, please proceed as follows:

1. Distribute the learning style research packet (cover letter, consent form, demographic information sheet, and learning style inventory) to each participant. If you do not have enough packets or have any questions, please call me immediately at (Phone Number). Ask that the completed packet be returned to you no later than (Date). Suggest that since the research materials take a short amount of time to complete, they may wish to complete them now. Assure that all responses will be held in strictest confidence.

2. Please make sure every learning style packet is returned to you, whether they are completed or not and return them to me by (Date).

For your review and study, each participating nurse anesthesia school will receive a summary report of the general findings of this study upon its completion. Thank you for your interest and cooperation.

Sincerely,

Diane Powe, CRNA, MA
Principal Investigator

Appendix I
Cover Letters

STUDENT REGISTERED NURSE ANESTHETISTS COVER LETTER

Date

Dear SRNA:

You have been selected to participate in this learning styles study. Learning styles refer to a person's way of using information in learning and solving problems. Learning styles are important components in making learning and instruction more responsive to the needs of the individual student. As a requirement for my Ph.D. degree, I plan to examine the learning styles of nurse anesthesia instructors and their students.

The attached learning style inventory has been used primarily for adults in a variety of educational settings. It will take approximately fifteen minutes to complete the consent form, learning style inventory, and demographic information sheet.

You may be assured of complete confidentiality. None of the data collected in this study will at any time be associated with any particular individual.

After you have completed the consent form, learning style inventory, and the demographic information sheet, please return them to the Director of the School of Nurse Anesthesia. For your review and study, each participating nurse anesthesia school will receive a summary report of the general findings of this study upon its completion. If you have any questions or suggestions regarding this study, please call.

Sincerely,

Diane Powe, CRNA, MA
Principal Investigator

CERTIFIED REGISTERED NURSE ANESTHETISTS COVER LETTER

Date

Dear CRNA:

You have been selected to participate in this learning styles study. Learning styles refer to a person's way of using information in learning and solving problems. Learning styles are important components in making learning and instruction more responsive to the needs of the individual student. As a requirement for my Ph.D. degree, I plan to examine the learning styles of nurse anesthesia instructors and their students.

The attached learning style inventory has been used primarily for adults in a variety of educational settings. It will take approximately fifteen minutes to complete the consent form, learning style inventory, and demographic information sheet.

You may be assured of complete confidentiality. None of the data collected in this study will at any time be associated with any particular individual.

After you have completed the consent form, learning style inventory, and the demographic information sheet, please return them to the Director of the School of Nurse Anesthesia. For your review and study, each participating nurse anesthesia school will receive a summary report of the general findings of this study upon its completion. If you have any questions or suggestions regarding this study, please call.

Sincerely,

Diane Powe, CRNA, MA
Principal Investigator

Appendix J
Consent Form

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants of Investigative Projects

Title of Project: Learning Styles of Student Registered Nurse Anesthetists and Certified Registered Nurse Anesthetist Instructors in Nurse Anesthesia Education Programs

Investigator: Diane Powe, CRNA, MA

1. I understand that the purpose of this study is to identify the learning styles of student registered nurse anesthetists and certified registered nurse anesthetist instructors. Learning style refers to a person's way of using information in learning and solving problems. The identification of learning styles is an important component in making learning and instruction more responsive to the needs of the individual students. I understand I will be one of 437 participants in this study.
2. I understand that I will complete the Kolb's Learning Style Inventory and the demographic information sheet. It will take approximately fifteen minutes to complete. There are no right or wrong answers to the questions on the learning style inventory. Once these items are completed I will return them to the Director of the School of Nurse Anesthesia.
3. As a study participant, I understand there are no risks involved and my relationship with my institution will not be affected.
4. I understand that this study is designed to contribute to the knowledge of learning and instruction in nurse anesthesia educational programs and there is no guarantee that I will receive any benefit from the study. Each participating nurse anesthesia program will receive a summary report of the findings of this study.
5. I understand that the records of my participation in this study will be kept confidential. I understand I will not be identified in the results of the study and at no time will the researcher release the results of the study to anyone without my written consent.
6. I understand I can withdraw from the study or answer any questions at any time without penalty. I also understand that the researcher may terminate my participation in this study at any time if she believes this to be in my best interest.
7. I understand this research project has been approved, as required, by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University.

8. I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project. If I participate, I may withdraw at any time without penalty. I agree to abide by the rules of this project.

Signature

Date

Should I have any questions about this research or its conduct, I may contact:

Diane Powe _____ 203-368-0869
Investigator Phone Number

Kurt Eschenmann _____ 540-231-5175
Faculty Advisor Phone Number

E.R. Stout _____ 540-231-9359
IRB Phone Number

Appendix K
First Follow-Up Letter

First Follow-up Letter to Nurse Anesthesia Program Directors

Date

Director Nurse Anesthesia Program
Address
City, State, Zip Code

Dear Sir:

Two weeks ago a brochure seeking your assistance to examine the learning styles of nurse anesthesia instructors and students was mailed to you. If you have already returned the reply card, please accept my sincere thanks. If not, please do so today.

Sincerely,

Diane Powe, CRNA, MA
Principal Investigator

Appendix L
Second Follow-Up Letter

Second Follow-up Letter to Nurse Anesthesia Program Directors

Date

Director Nurse Anesthesia Program
Address
City, State, Zip Code

Dear Sir:

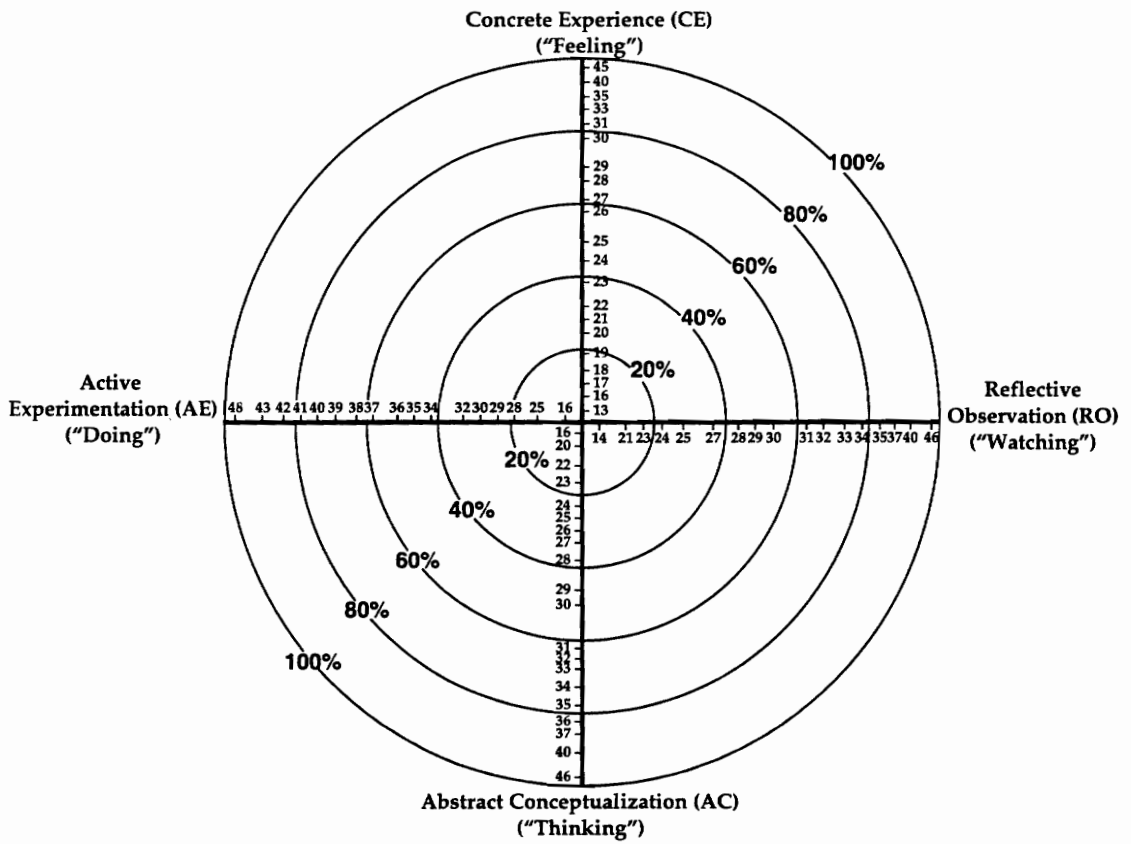
Three weeks ago learning style packets to be completed by nurse anesthesia instructors and students at your institution were mailed to you. If you have already returned the learning style packets, please accept my sincere thanks. If not, please do so today.

Sincerely,

Diane Powe, CRNA, MA
Principal Investigator

Appendix M
Cycle Of Learning Grid

The Cycle of Learning

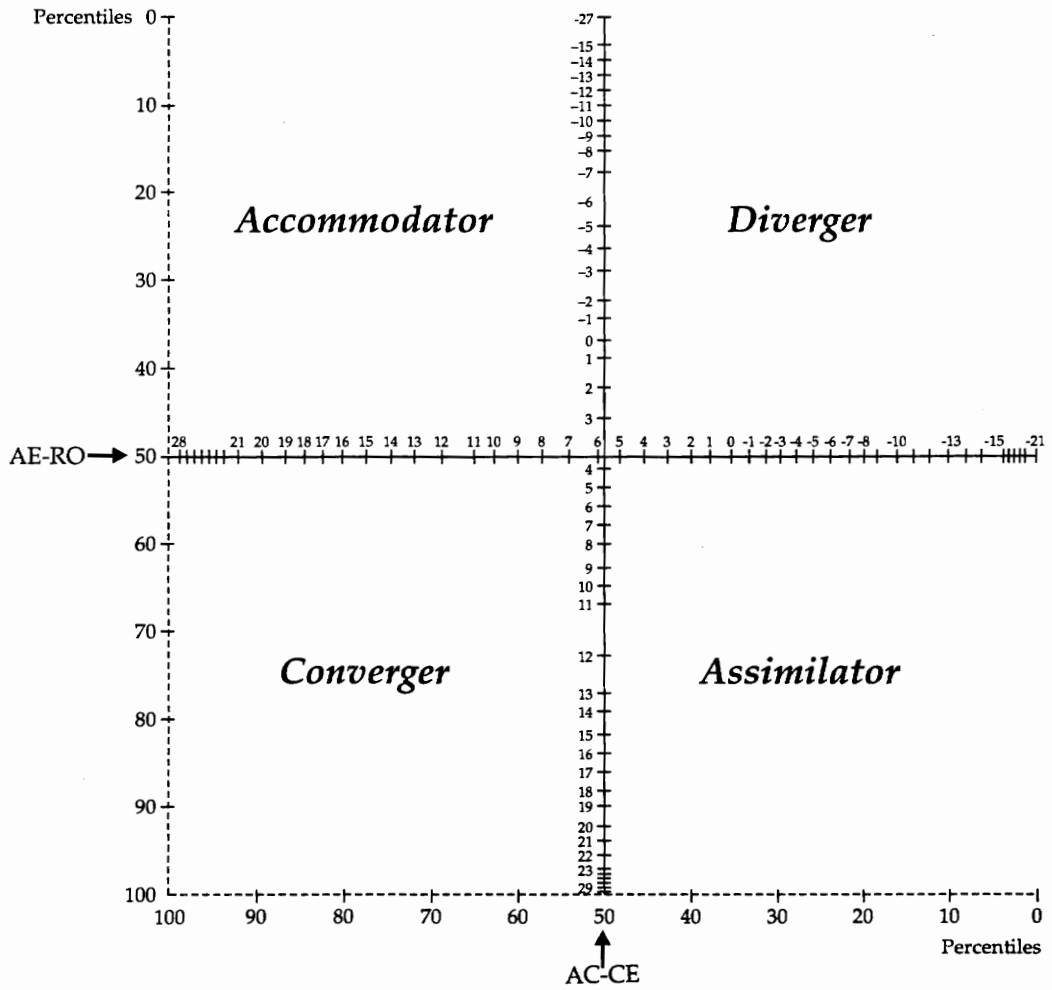


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Appendix N

Learning Style Type Grid

Learning-Style Type Grid



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Appendix O

Letter of Permission From Mcber & Company

Hay McBer
116 Huntington Avenue
Boston, MA 02116-5712
Tel: (617) 437-7933
Fax: (617) 425-0073

February 14, 1995

Hay McBer

Diane Powe, CRNA, Ph.D (ABD)
7009 Sugar Maple Court, NW
Roanoke, VA 24019-2152

Dear Ms. Powe:

You may have permission to reproduce the Learning Style Inventory, Profile Sheet and Learning Type Grid for the appendices of your dissertation. Please include our copyright notation, © Experience Based Learning, Inc., 1981, revised 1985. Developed by David A. Kolb. Reprinted with permission from McBer & Company, Inc., 116 Huntington Avenue, Boston, MA 02116. 617-425-4500.

Congratulations on the near completion of your dissertation. I would be interested to receive a summary of your paper and your findings. You may send it to my attention. Thank you.

Sincerely,



Tamara Friedman
Permissions Editor

Vita

Ms. Powe, who was born July 30, 1951, holds an A.A.S. degree in Nursing from Queensborough Community College, NY; a BSN degree from Hunter College, NY; a MA degree in Nursing Education from Teachers' College, Columbia University, NY; and a certificate in anesthesia from the Kings County Hospital School of Nurse Anesthesia, NY. All requirements for the Doctor of Philosophy Degree in Vocational & Technical Education were completed in 1996 from Virginia Polytechnic Institute and State University (VPI&SU). She attended the Navy Instructor Training School and has completed several courses in computer science, management, and combat casualty care. Ms. Powe most recently completed the Nurse Anesthesia Education Fellowship Program at the Southern Connecticut State University/Bridgeport Hospital Nurse Anesthesia Program (SCSU/BH/NAP).

Ms. Powe, who was a Commander in the Naval Reserves, has worked as a staff nurse anesthetist in several military and civilian hospitals. Ms. Powe has been an instructor at the Navy Hospital Corps School, the Kings County Hospital School of Nurse Anesthesia, and Co-assistant director at the

SCSU/BH/NAP. Ms Powe was also a research assistant at VPI&SU.

Ms. Powe is the recipient of numerous honors and awards, including the National Defense Service Medal, the Meritorious Unit Commendation Ribbon, Who's Who of American Women, and the American Association of Nurse Anesthetists (AANA) Journal Fellowship in Scientific Writing. She was a participant of the AANA Leadership Conference and the AANA Clinical Research Scholar's Program.

Ms. Powe is a member of the American Association of Nurse Anesthetists, the Naval Reserve Association, the Association of Military Surgeons of the United States, the Navy Anesthesia Association, and the National Employment and Training Association. She is also member of Phi Theta Kappa, Delta Tau Kappa, and Omicron Tau Theta Honor Societies. Ms. Powe has published several professional articles, served on various professional association committees, and participated in anesthesia related research.

