ABSTRACT

DURHAM, CAROL FOWLER. Preference for Instructional Methods and MBTI Personality Types in Nurses. (Under the direction of Duane Akroyd.)

The purpose of this study was to examine the relationship between personality type and preference for instructional methodologies (lecture, online and simulation). The sample consisted of 94 practicing gerontology nurses (RNs and LPNs) who attended a continuing education workshop on the care of the acutely ill elder at a public university in the Southeast. The dependent variable, preference for instructional delivery methods (lecture, online, simulation) was measured using *Learner's Evaluation of Instructional Methods* modified from the *Student Evaluation of Education Quality* (SEEQ) instrument. Independent variables were: personality type measured by the Myers-Briggs Type Indicator (MBTI): Extraversion/Introversion, Sensing/Intuition, Thinking/Feeling, and Judging/Perceiving and demographics of education, ethnicity, and age. The multivariate analysis of variance (MANOVA) revealed no overall statistical significant difference in the nurses' preference for lecture, online and simulation according to MBTI, education, ethnicity, or age. Analysis of variance revealed some significant relationships, so the data was further analyzed using independent-samples *t* tests. The *t* test analysis showed a significant difference between Sensing and Intuition for the instructional modality of simulation (t (82) = -2.26; p<.05). Sensing nurses were significantly higher than Intuitive nurses on their preference for the instructional modality of simulation. The independent-samples *t* test also revealed a significant difference between Judging nurses and Perceiving nurses for lecture as the preferred instructional modality (t (83) = 2.29; p<.05), and between Judging nurses and

Perceiving nurses for online as the preferred instructional modality (t (82) = 2.26; p<.05). Judging nurses preferred lecture more than Perceiving nurses. Judging nurses were higher on their preference for online learning than Perceiving nurses. This study supports that educators do not have to tailor learning experiences for a particular personality type but rather, they can develop learning experience incorporating many instructional modalities including lecture, online and simulation. Additionally, working within the time limited nature of continuing education and with groups of experienced, practicing nurses, simulation is a preferred instructional modality and should be included when developing educational opportunities.

Preference for Instructional Methods and MBTI Personality Types in Nurses

by
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DEDICATION

This dissertation is dedicated to my husband Stephen, our son Brandon and our daughter Rebecca for their support, encouragement, and patience without which the completion of this work would not have been possible. To Stephen, I am eternally grateful for his steadfast presence, sustaining love, uplifting encouragement, and unrelenting support. You are “still the one” after all these years, my soul mate, whom I love dearly.

BIOGRAPHY

Carol Fowler Durham, MSN, RN, is an experienced clinician and educator. In 1976, she received her baccalaureate of science in nursing from Western Carolina University. She obtained her master's of science in nursing with a minor in education from The University of North Carolina at Chapel Hill in 1982. Her doctoral work has focused on personality type and instructional methods. Jung's theory of personality type and the Myers-Briggs Type Indicator were used in her doctoral research.

She has taught in the School of Nursing at The University of North Carolina at Chapel Hill since 1982 with a focus on undergraduate education. Since 1988, she has been the Director of the Clinical Education & Resource Center where she established and maintained state-of-the-art skills and simulation laboratories, developed and designed curriculum to teach fundamental to advanced skills, and innovative simulations using human patient simulators. She developed the curriculum and produced teaching materials (DVD and a teaching toolbox) for a statewide project to train unlicensed personnel to administer medications. In 2005, the North Carolina Nurse's Association honored her with the *Educator of the Year* award. In 2006 she and colleagues were awarded the Safe Patient Handling and Movement Award. In 2007 she was selected as a one of nine simulation experts across the nation for the National League for Nursing and Laerdal team to develop online courses for faculty development around simulation as part of the *Simulation Innovation Resource Center*. In Spring 2008 she was honored by the Western Carolina School of Nursing as the Alumnae of the Year. In Fall 2008 she was honored by the University of North Carolina School of

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She lives in Hillsborough, North Carolina with her husband of 33 years. She is the mother of two young adults, a son who is a graduate of North Carolina State University with two undergraduate degrees Psychology and Sociology and a daughter who is a pre-vet senior at North Carolina State University in Animal Science.

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DEFINITION OF TERMS

Myers-Briggs Type Indicator (MBTI) Online Form M - self-report questionnaire to determine personality type according to Jung's theory expanded by Briggs and Myers (Myers, Kirby, Myers, 1998).

- Extraversion (E) – People who like to focus on the outer world of people and activity (Myers, Kirby, et al., 1998).
- Introversion (I) – People who like to reflect internally on experiences and to generate ideas (Myers, Kirby, et al., 1998).
- Sensing (S) – People who are attuned to practical realities and prefer taking in information that is real and tangible (Myers, Kirby, et al., 1998).
- Intuition (N) – People who focus on the big picture to understand the relationship and/or patterns of facts (Myers, Kirby, et al., 1998).
- Thinking (T) – People who critically analysis problems examining the logical consequences of a choice or action (Myers, Kirby, et al., 1998).
- Feeling (F) – People who consider what is important to all involved and make decisions to honor people (Myers, Kirby, et al., 1998).
- Judging (J) – People who prefer to be structured and organized in order to regulate and manage their lives (Myers, Kirby, et al., 1998).

- Perceiving (P) – People who prefer to be flexible and spontaneous, seeking to experience and understand life rather than control it (Myers, Kirby, et al., 1998).
- **Type** is defined by Jung (1971/1976) as the habitual preference for one of the four basic psychological functions of thinking, feeling, sensation, and intuition. Further he feels that extravert and introvert are overarching over the basic psychological functions and contribute to type as the person prefers one way of interacting with the environment over another.

LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CAPT	Center for Application of Psychological Type, Inc.
CD-ROM	Compact Disc Read-Only Memory
CE	Continuing Education
CPP	Consulting Psychologists Press, Inc.
DV	Dependent Variable
E	Extraversion
EFA	Exploratory Factor Analysis
F	Feeling
I	Introversion
I	Selection Ratio
IRT	Item Response Theory
IV	Independent Variable
J	Judging
LPN	Licensed Practical Nurse
MANOVA	Multivariate Analysis of Variance
MBTI	Myers-Briggs Type Indicator®
N	iNtuition
P	Perceiving

pci	Preference clarity index
RN	Registered Nurse
S	Sensing
SEEQ	Student Evaluation of Educational Quality
SRTT	Selection Ration Type Table
T	Thinking

Chapter One
Introduction

The goal of education is to create meaningful learning. In order to do this, the educator must organize a large body of knowledge and structure the learning experience to allow the learner to be successful in not only understanding but transferring that knowledge to their practice setting. However, learning cannot be assured regardless of how expert the educator or how elaborate and diligent the lesson plan (Jarvis, 2002). To be an effective teacher, the educator must understand how students learn.

While there are many common characteristics in learners, there are many differences (Patrina, 2007). Learners are ever changing. More and more are coming from the technology generation where they not only have had color television in their homes since birth, but also have access to computers and handheld devices that allow them to communicate, listen to music, watch a video, or play a computer game with the touch of a button. These technologically savvy learners are entering the doors of academia. Educators must revise the way they teach in order to capitalize on student's different learning styles and to address their decreased tolerances to traditional learning dogma. The educator can no longer can get by with being the "sage on the stage," delivering information through didactic presentation in a one-size-fits-all model. It is not enough for a good educator to be creative or enthusiastic; educators have to also be aware of personality type to allow us to better engage a variety of learners.

Coffield, Moseley, Hall, & Ecclestone (2004) suggest students are more motivated to learn if they know more about how they best learn. Students who are aware of their

personality type are more likely to develop desirable intellectual skills to address the differences they will inevitably face as they encounter various formal and informal educational settings. The understanding of type will enhance functional problem-solving skills in a plethora of environments throughout life. Once equipped with this knowledge, learners can independently develop more effective learning strategies regardless of the classroom environment or the instructional strategy design. Awareness of their personality type can allow learners to request or structure their learning environment to optimize their learning performance (Sadler-Smith & Riding, 1999). This knowledge also can empower the learner to learn in the midst of less than desirable instruction.

It is evident from the research literature and from observation that individuals vary in the way they learn; therefore, assessment of personality type is vital to teaching and learning (Jonassen & Grabowski, 1993; Larkin-Hein & Budny, 2000). While educators need to grasp the importance of understanding how people learn, they must also become informed about personality type in order to plan the best possible teaching/learning experiences (Cassidy, 2004). When educators consider type in addition to abilities, they improve assessment and instruction (Grigorenko & Sternberg, 1997; Sternberg & Grigorenko, 1995, 1997; Zhang & Sternberg, 2001). Understanding the personality type of the learner is an important factor in making teaching more effective (Entwistle, 1988; Rezaei & Katz, 2004; Riding & Rayner, 1998; Schmeck, 1988).

Understanding how people learn is intriguing, elusive, and, most of all, crucial for educators. While this research project is focused on personality type and its relationship to instructional modalities, a discussion of learning styles literature provides the background.

Discussion regarding “learning style” is prevalent in both the academic and popular press. Coffield, et al., (2004) suggest there is a “strong intuitive appeal” that we have individual styles of learning as well as individual preferences (p. 1).

Jung (1971/1976) found that there are noted differences in how people prefer to gather and process information that do not occur by chance but rather are observable preference. Jung (1971/1976) believed if the person used their preferred method of gathering information often, then it became their personality type. He further postulated that people sometime used the opposite function but usually needed a compelling reason to use the opposite function (Jung, 1971/1976; Myers, McCaulley, Quenk, & Hammer, 2003). Sternberg and Grigorenko (2001) indicate that the interest in style persists because of “the sense people have that styles exists, that they account for variation in performance not accounted for by abilities, and that they may be important in various real-world settings, such as the school, the workplace, and even the home” (Sternberg & Grigorenko, 2001, p. 18).

Allport (1937) moved the concept of style from the esthetic creation, such as the style of a famous artist or composer, into psychological applications. He defined style as a high level of integration with the traits of personality involving the whole of activity, a “personal idiom” in behavior (Allport, 1937, p. 490). Sternberg and Grigorenko (2001) point out that styles are preferences and not abilities. Their definition of style continues to align with Allport’s. Style is defined as “reference to habitual patterns or preferred ways of doing something (e.g. thinking, learning, or teaching) that are consistent over long periods of time and across many areas of activity” (Sternberg & Grigorenko, 2001, p. 2). Style can then be defined more explicitly based upon its preceding adjective. Messick (1970) defines cognitive

styles as information processing habits “which represent a person’s typical mode of perceiving, remembering, thinking, and problem solving” (p.189).

As distinguished from style, Jung’s (1971/1976) definition of type is a habitual preference for one of the four basic psychological functions of Thinking, Feeling, Sensation, and iNtuition. Further he posits that Extravert and Introvert are the basic psychological functions which determine personal preference for interacting with the environment (Jung, 1971/1976). Jung presents a more comprehensive and global definition of type, and as such presents an applicable definition for research purposes. He describes type development as a lifelong process in which type is stable, but as people gain life experience, they may have greater command over their preferred and less preferred type dichotomies (Jung, 1971/1976; Myers et al., 2003). While persons may have a preferred type, they may respond differently because the situation is best handled from a different perspective based in their experience (Jung, 1971/1976).

Research on type, evolved from psychological research and studies on type, can be found in psychology, education, and sociology (Curry, 1983). Personality types and methods of teaching also seemed to impact performance. More recently, researchers have investigated the role of personality type, cognitive styles, learning styles, and thinking styles and how they interface with ability (Cassidy, 2004; Coffield et al., 2004; Sternberg & Grigorenko, 2001). The research has found that differences in people’s performance can be accounted for much better by considering types in addition to abilities (Sternberg & Grigorenko, 2001).

Researchers use varying degrees of theoretical frameworks to discuss personality types. Kerlinger and Lee (2000) define theory as “a set of interrelated constructs (concepts),

definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting the phenomena" (p.11). Several theoretical perspectives were identified in this literature review which highlights the issues and complexities of doing research on personality type. For this research, several theoretical frameworks have been examined, each with appealing components. In some studies, the theoretical framework was not evident (Beets & Lobingier, 2001; Effken & Doyle, 2001; Fleming, Mauriello, McKaig, & Ludlow, 2003; Furuhata, 2002; Gould, 2003; James-Gordon & Bal, 2001; Keri, 2002; Knisbacher, 1999). While other studies did not clearly delineate their theoretical perspective, they provided partial information that allowed deduction about their theory base. Dunn and Dunn *Learning Styles Theory* is one example that was used by Honigsfeld and Schiering (2004), Rayneri and Gerber (2004), and Rochford (2003). Another example is Gregorc's *Cognitive Styles Model* used by Ross, Drysdale, and Schulz (2001) and Seidel and England (1999).

Some theories, cited as frameworks, only appeared once in individual studies. They include Ajzen's *Theory of Planned Behavior* used by Ballone and Czerniak (2001); *Social Interaction Theory* used by Sonnenwald and Li (2003), and Moore's *Learning Interaction Theory* coupled with Soloman's *Sequential-Global Theory* as the theoretical base for Sabry and Baldwin's (2003) research. Most studies focused on one to two theories to support their research directive, but Caulfield (2001) used a potpourri of theories for her study, including Keegan's *Theory of Reintegrating the Teaching Acts*, Moore's *Transactional Theory*, Holmberg's *Theory of Distance Education*, Peter's *Industrial/Postindustrial Theory*, Bates's

Theory and Practice in the Use of Technology in Distance Education, and Tuning's *Theory as Related to Web-Based Learning*.

Witkin's *Field Dependence/Independence* was the framework for the research of Chen and Macredie (2004), Ghinea and Chen (2003), and Thomas (2001). Ford and Chen (2001) combined Pask's *Holists/Serialists* with Witkin's *Field Dependence/Independence*. Riding's *Wholist-Analytic and Verbalizer-Imager* was the theory used by Graff (2003), McKay (1999), Rezaei and Katz (2004), and Sadler-Smith and Riding (1999). Curry's *Theoretical Model of Learning Style Components and Effects* was the theoretical rationale for Aragon, Johnson, and Shaik (2002), Sadler-Smith and Riding (1999), and Smith (2001). While Sternberg's *Theory of Mental Self-Government* was the evident theory in four research articles, three of the articles were by the same author (Zhang, 2001; Zhang, 2004a; Zhang, 2004b; Workman, 2004). Jung's *Theory of Psychological Type* was the theoretical framework for both qualitative and quantitative studies (Ahn, 1999; Bezner & Boucher, 2001).

Conceptual Framework

Much research has been done examining the relationships between personality type and its use in education, counseling and psychotherapy, organizational teamwork and communication, career counseling, and multicultural settings. Upon examination of Jung's *Theory of Psychological Type*, the strength of the theory as a framework for research on personality type became evident. Its strength is that it is a theory about personality type and not about behaviors or beliefs. It allows educators to "…penetrate through the veil of

behavior to underlying cognitive functions…" (Jensen, 2003, p.124) which allows the educator to go beyond current behavior to suggest ways to learn.

Jung's theory approaches this complex task from a global and more theoretical point of view compared to other theorists who appear to get bogged down in the minutia of influences (e.g. room temperature). Jung's *Theory of Psychological Type* is best used in research about personality type and instructional methods because it has a broad view of human behavior in relation to the world. It is not limited in its conceptualization of minute details, but rather describes ways of using mental processes as one interacts with the environment. An overview of Jung's theory follows.

Jung's (1971/1976) *Theory of Psychological Type* was developed to explain human personality. In Jung's observations about people, he felt that their differences were not random, but rather logical and consistent differences in mental functioning. He believed these personality characteristics were innate and affected what and how people perceived information, interacted with the world, and found the source of their energy. Jung believed *type* was a stable characteristic of one's personality.

Jung (1971/1976) identified ways that he felt people focused their energy and engaged the environment, either externally by involving people, experiences, and activities (Extraversion) or more internally reflecting on thoughts, ideas, memories and emotions (Introversion). Jung (1971/1976) used Extraversion and Introversion as an overarching way to describe type and how people interact with the world and the orientation from which people receive their energy.

Through continual observation and reflection, Jung felt extraversion and introversion did not adequately describe the person. To expand and further elucidate his model, he distinguished four basic psychological functions: Thinking, Feeling, Sensation, and iNtuition. He described them saying "The essential function of *Sensation* is to establish that something exists. *Thinking* tells us what it means, *Feeling* what its value is, and *iNtuition* surmises whence it comes and whither it goes" (Jung, 1971/1976, p.553 italics mine).

Jung classified his observable behaviors into two mental activities, *Perceiving* (Sensing/iNtuition) which is how one takes in information and *Judging* (Thinking/Feeling) which is the way a person organizes and uses information. However, people differ in their preferred function, for example, choosing Sensing over iNtuition. To better illustrate type preference, it has been related to handedness (right or left). People can use both hands but choose to use one hand more than another (Myers et al., 2003). Jung (1971/1976) stated, "one mechanism will naturally predominate, and if this condition becomes in any way chronic a *type* will be produced…" (p.6).

Jung believed that people, who had a preference for perceiving, perceived through Sensing or iNtuition followed by a preference for responding to that perception through the mental processes of Thinking or Feeling. He viewed Perceiving and Judging as basic mental processes. Whenever people's minds were engaged, they were involved in taking in information either by perceiving it, or by organizing it and coming to conclusions about the information, which he called Judging (Myers, Kirby & Myers, 1998). Jung defined eight mental functions by combining the two orientations of energy with the four mental processes (Jung 1971/1976; Myers et al., 1998). There was the overall archetype of Perceiving

followed by Sensing/iNtuition, or Judging followed by Thinking/Feeling and finally is either Introverted or Extraverted.

Jung (1971/1976) acknowledged that his psychological type theory did not define nor account for all that comprises the "conscious psyche" and recognized that *memory* and *will* have not been included (p. 554). Jung (1971/1976) was the first to say that psychological typology should not be used to categorize people; he felt that people used each of the type functions but certain ones were just preferred over others. For the purposes of the researcher, he believed that psychological "type" theory could help to bring some organization to the cadre of individual experiences. He also thought the typology could help to understand individuals and current theories. Lastly, he believed typology could help the psychologist to better understand himself so that he could be a better practitioner. Extending this logic one might propose that the educator who better understands his/her typology can be a more effective teacher.

Myers and Briggs studied Jungian theory and made their own observations about people (Myers et al., 2003). In an effort to make Jung's theory of personality type more readily useful and practical for people in general, they begin to elaborate on Jung's ways to describe patterns of human behavior (Myers et al., 2003). Myers and Briggs further expanded Jung's overarching view of Extraversion and Introversion and developed a fourth dichotomous scale to describe the way people take in information: Judging or Perceiving (Myers et al., 2003). They felt that the Judging/Perceiving scale was implicit in Jung's description. Since the model is considered to be dynamic, Myers et al. (2003) refined the dichotomies to complement the type typology. They moved Jung's personality framework

from two binary types to four binary types: Extraversion (E) - Introversion (I), Sensing (S) - iNtuition (N), Thinking (T) - Feeling (F), Judging (J) - Perceiving (P). Myers, Briggs, and Jung define the type in the same way.

The Extraversion/Introversion dichotomy describes where one derives one's energy and engages the environment. Extraverts prefer to draw energy from people and activities outside of themselves; they are action oriented (Myers, et al., 1998). Introverts prefer to draw energy from inside themselves; they develop connections and integrate knowledge to see the big picture.

The second dichotomy, Sensing/iNtuition, describes how people gather and organize information. Sensors seek out facts that are real and tangible, details about what is actually happening; they are practical (Jung, 1971/1976; Myers et al., 2003; Wicklein & Rojewski, 1995). They like to take in information through their senses and try to understand the relationships between the facts by looking for the patterns (Felder, 1993; Jung, 1971/1976; Myers et al., 2003; Wicklein & Rojewski, 1995). iNtuitive people prefer to focus on relationships. They enjoy using the discovery method and need to have the "big picture" trying to see the connections between facts and looking for patterns (Myers et al., 2003; Wicklein & Rojewski, 1995). They favor information that comes from their imagination, reflection, and memorization (Felder, 1993).

The Thinking/Feeling dichotomy describes how people make decisions. Thinking people make decisions by looking at logical consequences of choice or action and gain energy from objectively critiquing and analyzing to problem solve. Thinking people value fairness. Feeling people focus on human values and harmony, are good facilitators and are

persuasive. They consider what is important to the people involved and make decisions based on their values of honoring people. Feeling types gain energy from encouraging and supporting others.

The final dichotomy, Judging/Perceiving, describes how people prefer to deal with the outer world. Judging people are task-oriented, decisive planners, adhere to deadlines, and jump in and take action. Judging people prefer organization, planning and are energized by getting things done. Perceptive people are flexible, spontaneous, and curious. They are energized by their resourcefulness (Myers et al., 2003; Wicklein & Rojewski, 1995).

Building on Jung's work, Briggs and Myers incorporated auxiliary function to the dominate function. The various combinations of these four dichotomies resulted in sixteen personality "type" with generalized characteristics and values. These types are presented as a person's MBTI type and are listed as a four letter combinations. The first letter is either Extraversion or Introversion (E/I) followed by Sensing or iNtuition (S/N), the letter for Thinking or Feeling (T/F), and lastly the letter for Judging or Perceiving (J/P). So, for example, a person described as an ENFP, interpreted as a dominate function of Extraverted iNtuition with an auxiliary function of Introverted Feeling (Myers et al., 1998). The type described preferences for taking in information, learning, and making decisions. Type helped to explain how people work, where they put their attention, as well as how they interact with other people (Clutterbuck, 2003).

Jung (1971/1976) described the eight patterns of mental activity (E/I, S/N, T/F, J/P) and further identified that people used the functions in a hierarchical preference. Differences in patterns of behaviors between people occurred based upon their developed dominant

function which was their preferred way of thinking (Myers, et al., 1998). The preferred function is referred to as the dominate function, the next preferred is referred to as an auxiliary function, the third preferred is the tertiary function, and the fourth preferred or the least preferred is the inferior function. The dynamic interaction between the dominant function and other mental functions forms personality type (Jung, 1971/1976; Myers et al., 2003).

Personality type, just like handedness, appears so early in development that it is considered to be innate (Jung, 1971/1976). The dominant type becomes the basis of decision-making as the individual moves through life (Myers et al., 2003). The non-dominant mechanism, for example *feeling* if *thinking* is dominant, becomes auxiliary and is important to becoming a balanced person (Myers et al., 2003). The auxiliary type is thought to develop during adolescence (Myers et al., 2003). Both Jung (1971/1976) and Myers et al. (2003) believe that the whole person as described by the 16 type has to be considered and it is important not just to focus on one mental processing domain. The richness of understanding a person comes from understanding all four mental functions (Jung, 1971/1976; Myers et al., 2003).

In summary Jung's *Theory of Psychological Type* provides a sound theoretical framework for this research because it focuses "on the development of personality throughout the life span" (Myers et al., 2003, p.27). Since learning is a lifelong process and how we learn is interwoven with our personality type and preferences, Jungian theory gives a sound basis to develop and discuss correlations between learning preferences and how people develop their innate type across a lifespan developing various aspects of the type to function

optimally in the world. Jungian theory supports that type does not change across time or as a person matures but rather the expression of type develops and may vary depending on the life circumstances and stage of life (Jung, 1971/1976; Myers et al., 2003).

Learning Preference

Educators try to make the broadest impact while being effective and efficient in the dissemination of knowledge. The knowledge and skills that the learner needs to acquire have to be paramount in the instructional design. Merrill (2002) asserts that in order to optimize student learning and instructional goals, style must be a secondary focus. Gagné (1985) states that different types of learning require different conditions. Merrill (2002) reinforces this concept, stating that learning will not be effective or efficient if the learning environment does not provide the appropriate instructional strategy. Educators strive to maximize the learning experience for their learners. However, pedagogy is much more complex and broader than focusing on the technical aspects of teaching and personality type. The literature on personality type pointed to the interest in the inherent belief that type makes a difference.

In addition to acknowledgement of type, selection of delivery methods for information must be decided. Since the early 20th century, there has been much research on instructional methods (Clark, 1983). In recent years, the delivery methods available have increased exponentially from lecture, print-based, audio/video tapes, discussion, and low-tech simulation to synchronous and asynchronous computer-based technologies, video teleconferencing, CD-ROM, Computer Assisted Instruction (CAI), and high fidelity simulators such as human patient simulators. The role of educators is to design the best possible learning experience for their learners. Given the expanded options of instructional

methods, the educator is privileged *or burdened* to make decisions about what instructional methods to use, taking into consideration content, educational level, and learner personality type.

Coker (2000) suggests learning modes and styles shift according to settings. Jones and Reichard (2003) discuss style flexing, meaning a person can adapt their style to learn no matter how the information is presented. For example, students in a professional program know they need a body of knowledge to prepare them for practice, so they will adapt to get the information they need. If learners are style flexing, then how reliable can the measurement of style be at any point in time? Kolb (1984) suggests that learning style is considered a state and not a trait and as such is not stable over time. One of the "central tenet(s) of type theory is that all the types have potential for competence but that their preferred processes may put them at a temporary disadvantage until they can find a means (or a mentor) to assist in the transition to the unfamiliar territory of new learning" (Myers et al., 2003, p. 275). Jung believed type was stable and as such, people do not change type, but rather alter their use of their innate type (Jung, 1971/1976; Myers et al., 2003).

In contrast to this proposed study of personality type and instructional methods, much research has been done examining the relationship of learning styles and preference for instructional methods (Aragon et al., 2002; Beets & Lobingier, 2001; Buch & Bartley, 2002; Caulfield, 2001; Fleming, et al., 2003; Freeman & Tijerina, 2000; Jackson, 2001; James-Gordon & Bal, 2001; Knisbacher, 1999; Sadler-Smith & Riding, 1999; Seidel & England, 1999; Smith, 2001; Thomas, 2001). Predictions of preferred teaching approaches based on thinking styles or learning styles were explored (Loo, 2004; Zhang, 2004a). Learning

environment was explored to see if it supported learning style preferences of the learners (Daniel, 1999; DiBartola, Miller & Turley, 2001; Rayneri & Gerber, 2004; Workman, 2004). Utilization of web-instruction as an effective learning environment was examined alone or in comparison to an alternate instructional method (Aragon et al., 2002; Chen & Macredie, 2004; Effken & Doyle, 2001; Federico, 2000; Ford & Chen, 2001; Sabry & Baldwin, 2003). Structuring the web instruction in relation to cognitive style was another approach for some research (Gary, Ellis, & Rasmussen, 2004; Ghinea & Chen, 2003; Graff, 2003). Several studies examined learning styles in relation to learning specific information such as Japanese or HTML web design (Chen & Macredie, 2004; Furuhata, 2002). A less frequently examined but significant study examined the consistency of learning style across instructional sites including both classroom and clinical settings (Coker, 2000).

It is clear that people differ, and educators desire to use their knowledge of these differences to enhance learning where possible. Each of the theoretical frameworks examined tried to explain some component of preference for processing environment, gathering energy, or type of mental processing.

Statement of the Problem

Learners in any setting encompass a broad range of personality types. Educators should include a variety of instructional methods in course design to provide something for each type of learner. There are noted differences in how people prefer to gather and process information that does not occur by chance but rather are observable preferences according to Jung (1971/1976). Myers and Briggs suggested that different people have distinct type structures (Myers et al., 2003). While it is thought that our innate preferences are what we

will most often use, it is also recognized that all types can be appropriately used to process information at different times (Ring, 1998). Several studies have suggested that students benefit from different instructional methods, but there has been limited research to examine the role of individual difference in learner preference for instructional modalities in correlation to learner personality type as measured by the MBTI (Andrusyszn, Cragg, & Humbert, 2001; Aragon et al., 2002; Buch & Bartley, 2002; Caufield, 2001; Chen & Macredie, 2004; Coker, 2000; DiBartola et al., 2001; James-Gordon & Bal, 2001; Sternberg, 2001; Workman, 2004; Zhang, 2004a).

Nursing education is challenged every day with having to teach more in less time (Rothwell & Kolb, 1999). The nursing shortage is predicted to peak by 2020, and the need for efficient, quality nursing education is urgent (North Carolina Institute of Medicine [NCIOM], 2004). New graduates no longer have the luxury of long orientation periods with a gradual adaptation of their new roles; they must quickly begin to make critical decisions that can result in life or death (Friedrich, 2002; McCausland, Curran, & Cataldi, 2004;Treadwell & Grobler, 2001; Wilson, Shepherd, Kelly, & Pitzner, 2005). Understanding personality type and instructional strategy preferences can assist educators to structure educational experiences that optimize learning and thus, have nurses better prepared for their role as a competent and confident nurses.

Purpose of the Study

The purpose statement is a clear, concise description of the focus of the research problem and direction (Creswell, 2003). The purpose of this study is to examine the correlation between personality type and preference of instructional methodologies in a

sample of practicing gerontology nurses in North Carolina. Knowledge of the relationship between personality type and preference for instructional method may guide educators in the development and selection of instructional methods for learners with varied personality types. The results of this study can be used by educators to understand how preferences by personality type can inform instructional design. Type theory helps to conceptualize the many methods that learners and educators use to learn and teach (Myers et al., 2003). Jung's personality type "theory provides a useful model to [understand] the various activities, stages, and processes that learners go through while acquiring confidence and competence as readers, writers, or speakers of either their native or a foreign language" (Myers et al., 2003, p. 276) and perhaps by extension, to how nurses learn. More importantly, use of the personality type theory can assist learners to understand themselves better and to identify which ways they prefer to learn, which can in turn enhance their self-confidence (Myers et al., 2003).

Research Question

Research Question: Do nurse's preferences for different instructional delivery methods (lecture, online, simulation) differ by MBTI personality type, education, ethnicity, or age?

Conceptual Model

The conceptual model (see Figure 1.1) is designed with the predictor variable that will be used to measure personality type according to the four domains as measured by the Myers-Briggs Type Indicator: Extraversion or Introversion, Sensing or iNtuition, Thinking or Feeling, and Judging or Perceiving. The sample nurses worked in the field of gerontology. In addition to personality types of these nurses, it was of interest whether demographics also

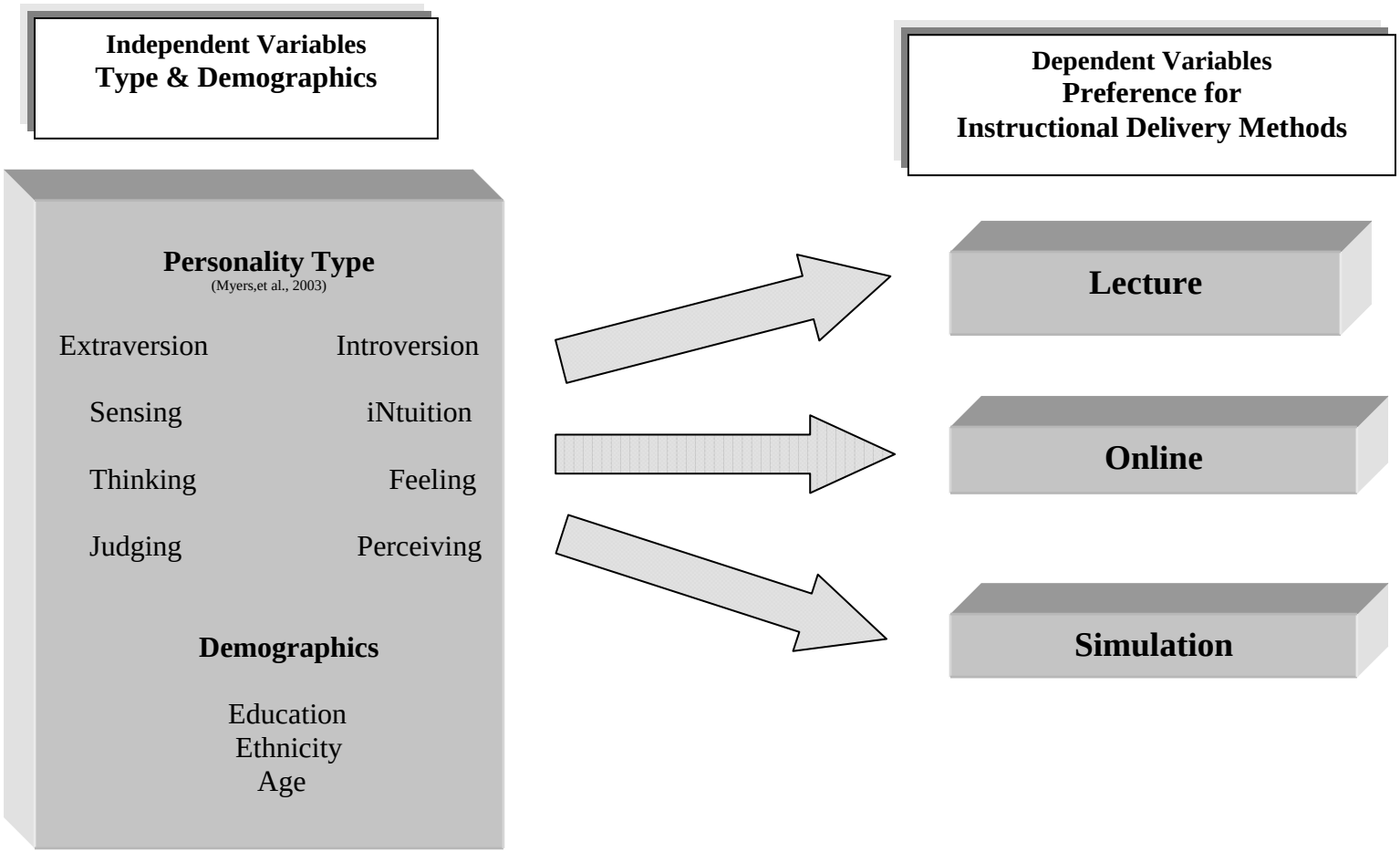

Figure 1.1. Conceptual Model.

influenced preference for instructional methods. This research was designed to determine if there were differences in preference for instructional methods (lecture, online, and simulation), personality type, and demographics (education, ethnicity, or age).

Significance of the Study

There is a significant amount of literature related to personality type and education (Ahn, 1999; Bezner & Boucher, 2001; DiTiberio, 1996; Lawrence, 1993). Several studies have been done to examine the effect of matching personality type on academic aptitude and achievement, and on matching teacher and student personality type (Ford & Chen, 2001; Keri, 2002; Weng, 2001). This research is focused on examining if there is a correlation with personality type, education, ethnicity and/or age to the instructional method a learner prefers.

A clear understanding of practicing nurses' personality types and preference for specific methods of instruction can be used to develop prescriptive theory for the optimal design of the learning environment. Additionally, this information will assist educators to focus their limited resources of time and money on the instructional methodologies that provide the best learning experiences.

Myers et al. (2003) suggest that different people have distinct type structures. The identification of the personality types of nurses, preference for learning, along with any relevant demographic variables, may inform future educational endeavors targeted to nurses during times of severe staffing shortages and when educational resource limitations are being experienced.

Computer-assisted instruction and online learning have been studied. No studies

could be found that have examined the relationship between the use of simulation as a teaching strategy and personality types. Designing any course or program offering requires an understanding of the target audience. Understanding learners' personality types might guide educators in preparing instructional methods that will be most appropriate for learners with different personality types. Additionally, in developing effective programs, educators must take into account learners' characteristics that may influence the learning environment, including education, ethnicity, and age. Information gained from this research might be used to better inform nurse educators about differences in learners of different educational levels, ranging from technical schools to master's level and from various work settings, from different ethnic groups and across a wide age range.

Knowledge about personality types and instructional methods preferences can impact the success of education offerings. To be an effective educator, one must accommodate the diverse personality types such as Extravert, Introvert, Perceiving, Judging, Sensing, iNtuition, Thinking, and Feeling in each teaching environment. The combinations are as varied as the number of individuals present.

The structure of a time-limited continuing education program offering can be enhanced by the information gained from this study. For example, instead of spending an entire daylong workshop in lecture, if that is found to be a less preferred strategy, the educators designing the program offerings can provide mixed educational methods that include online and simulation as well. Through diverse learning methods, the learners could gain more information directly beneficial to their jobs and return to their workplace with

increased knowledge and improved nursing care skills for their clients.

The information gained from this research can inform curriculum that teaches instructional methods to future educators. While alternative teaching methods can be more time consuming and challenging for the educator than the more familiar strategies such as lecture, data can help support the need to develop a variety of instructional methods (Andrusyszyn et al., 2001; Coates, et al., 2003; Effken & Doyle, 2001; Federico, 2000). Correlational analysis, which examines possible relationships between personality types and preferred instructional methods, can be used to inform theory and practice in nursing education (Gravetter & Forzano, 2003).

In summary, the understanding of preference for instructional modality and its relationship to type must inform nursing instruction to maximize learning. This study will explore the relationship between instructional delivery methods and personality type.

Chapter Two
Literature Review

The current psychological type and instructional method literature was searched using a variety of search terms. Education, medical, and psychology databases, including the *Center for Applications of Psychological Type* (CAPT) database, were searched. The references included in those articles were explored to identify additional resources that might have been missed by the database search. Once repetitive sources were repeatedly identified, it appeared that a good representation of the current research on cognitive styles and instructional methods had been gathered. The literature was reviewed to identify predominate theories used, to examine the type of research purposes conceptualized, to review methodological issues, and to report current research.

Due to the variance in conceptual frameworks and development approaches, there was a proliferation of terms and concepts for styles that were often used interchangeably (Coffield et al., 2004). The difficulty in defining style was confounded by the vast quantity and type of research in the area, where often there was a "variety of definitions, theoretical positions, models, interpretations and measures of the construct" (Cassidy, 2004, p. 420). An exemplar list of terms included: learning styles, learning strategy, "cognitive styles, conative styles, cognitive structures, thinking styles, teaching styles, motivational styles, learning orientations, and learning conditions" (Coffield et al., 2004, p. 3). Sternberg (2001) defined a few of these terms simplistically: learning styles – preference of learning; thinking styles – preference for thinking; cognitive styles – how one processes information. He also stated that cognitive styles were the closest to personality type (p. vii). Riding and Rayner (1998)

defined cognitive style “as an individual’s preferred and habitual approach to organizing and representing information” (p. 8). Learning styles were defined by Felder (1993) as the preference for type of information, ways of perceiving, and understanding information. Dunn and Dunn (1993) defined learning styles as ways students acquire, process, and recall new information.

Coffield, et al. (2004) clearly identified some research issues for examining cognitive styles and instructional methods. The field of learning styles consists of a wide variety of approaches that stem from different perspectives, which have some underlying similarities and some conceptual overlap. There are numerous groups working in isolation from each other and, with few exceptions, from mainstream research in psychology. Research into learning styles can, in the main, be characterized as small-scale, non-cumulative, uncritical and inward looking. It has been carried out largely by cognitive and educational psychologists and by researchers in business schools and has not benefited from much interdisciplinary research (p.53).

There continues to be “disunity, dissention, and conceptual confusion” in the style literature (Coffield et al., 2004, p1). Cassidy (2004) stated the topic of styles and types were fragmented and disparate because of the diverse fields and purposes of the research as well as the quantity of research. In this review of articles, that opinion is upheld. Oftentimes, the title and abstract led the reader to believe the research was very applicable, if not pivotal, to the issue of cognitive style and instructional methods only to be disappointed in impertinent content and applicability.

Over the last fifty years, there have been many constructs, instruments, inventories, and models that have been labeled “styles” (Coffield et al., 2004; Curry, 1983; De Bello, 1990). These have generated a lot of interest, research, and controversy, especially over the last two decades (Coffield et al., 2004; Curry, 1983; Sternberg & Grigorenko, 2001). This review of the literature represented the various approaches and different terminology and while not focused solely on personality type, was informative to this research project. This literature review was organized by the different instructional methods: lecture, online, and simulation.

Lecture

The traditional pedagogical approach to teaching from which most adults have come has placed the responsibility for student learning on the instructor as the all-knowing “sage-on-the-stage.” Learners have encountered little variety in instructional methods beyond lecture and, as a result, have become passive learners, where the educator provides them with all they need to know. Innate curiosity, inquiry and the desire to be involved are stifled, and the learner becomes the receptacle of knowledge instead of the seeker of knowledge (Brookfield, 1986).

Often educators find it hard to teach differently from the way they were taught and thus perpetuate passive learning by primarily using lecture as the predominate instructional strategy. Barr and Tagg (1995) suggest a shift from thinking of education as a means to an end, to recognizing that providing instruction is not enough: teaching people *how to learn* is the broader goal. This paradigm shift will liberate the educator from being the sole source of

knowledge and allow them to become the facilitator of learning.

Beishline and Homes (1997) examined 248 students from two different universities from all grade levels and in different classes. They found that the students disliked lecture-only classes, as well as classes that forced participation. They did not like having student presentations of material but rather felt they were there to learn from the "expert:" the faculty member. They indicated that lecture was an effective way to hear from the expert but preferred lecture format mixed with student discussions and demonstrations.

Beets and Lobinger (2001) studied 78 students in a financial accounting course at the university level. Three classes, all taught by the same instructor and in the same physical classroom over three semesters, were studied. They examined the student's preference for three instructional techniques: chalkboard, transparencies used on an overhead projector, and presentation software used to facilitate discussion across the semester. They found no significant difference in attendance. Fifty-four percent (54%) preferred discussions that were facilitated by projected software, followed by 33% who preferred chalkboard discussions, and the remaining 13% preferred overhead projection. Comparing instructional method preference to performance revealed that students performed better on exams when they were exposed to their preferred method.

Thompson and Sheckly (1997) studied 206 baccalaureate nursing students. Students rated their learning experiences in terms of the "amount of information learned, the relevance of the materials presented, their degree of interest in the content area, and their degree of satisfaction with the class/course" (Thompson & Sheckly, 1997, p. 165). In this study,

students rated an organized and knowledgeable faculty who clarified time on task and encouraged cooperative, active learning more positively. If these factors were not present, and interaction and diverse instructional methods were not considered, the students rated the experience as poor. It is interesting to note that students with prior work experience, such as RNs, valued active and cooperative learning more than their younger, non-nurse classmates.

Coker (2000) studied the consistency of learning styles across the traditional classroom and the clinical settings for 26 undergraduate athletic training students. Kolb's *Learning Style Inventory (LSI)* was used to determine learning styles. She found that learning style stability depended on the learning environment. In her sample, 58% of the respondents switched learning style, depending on whether they were in the classroom or clinical. There was a significant difference in learning style preference across settings for two of Kolb's learning styles. Reflective Observation was the preferred style for classroom and Active Experimentation was preferred in the clinical setting. Coker (2000) did not find significant differences among the Concrete Experience and Abstract Conceptualization learning styles. Coker highlights that the LSI administrative instruction leads the user to select the most recent learning experiences and this variance in focus contributes to the test-retest reliability issues for the LSI.

Jeffries (2001) compared the effectiveness of both an interactive, multimedia CD-ROM and lecture for teaching oral medications to 42 randomly assigned, junior baccalaureate nursing students. She found 15% reported poor computer skills. She found a significant difference with the computer group demonstrating higher satisfaction and more cognitive gains than the lecture group.

Jones and Reichard (2003) studied four disciplines: English, math, science, and social studies, to determine if the student's learning style preferences varied as a function of discipline. A total of 105 Community College students (47 males and 58 females) were administered the Kolb *Learning Style Inventory IIa*. An interesting finding was that students were able to "style-flex" from one learning style to another, indicating that students adapted to the various learning strategies needed to be successful in the different disciplines. They found that most of the participant's learning style preference varied significantly across the four disciplines. They found no significant differences in preferred learning style by gender.

Truluck and Courtenay (1999) studied older adults to determine their learning style preferences and to examine if there were any associations of gender, age, and education level to the preference. A sample of 172 older adults ranging in age from 55 to 75 with 122 females and 50 males were recruited from local senior citizen groups, churches and retirement programs. Kolb's *Learning Style Inventory* was used to determine their preferred learning styles. The study found that the participants were evenly distributed across the styles of Accommodator, Assimilator, and Diverger with fewer preferring Converger. The results suggest that as learners age they are not as much hands-on but rather are more reflective and observational. There were no significant differences found between learning style preference and age, educational level, or gender.

Ballone and Czerniak (2001) examined teachers' beliefs about implementing a variety of instructional methods to meet the diverse learning styles represented in a science classroom. They used Ajzen's *Theory of Planned Behavior* to examine attitudes, control, and

intent to engage in implementing varied instructional methods. A survey was administered to 109 randomly selected teachers. The researchers found that the teachers believed using a variety of instructional methods would motivate students and help meet their needs to make science a good learning experience. Although positive, teachers were concerned about not having enough time, materials, or money and felt that resources would not be available to assist in the implementation of a variety of instructional activities. The study found that attitude was the most significant influence on the teacher's intent to implement a variety of instructional methods to meet different learning styles. Caucasian and African American respondents had the most positive attitude and were most likely to implement a variety of instructional methods.

Rochford (2003) examined how achievement rates among underachieving community college students can be improved with learning-style responsive teaching methods. The researcher used Dunn, Dunn, and Price's *Productivity Environmental Preference Survey* to determine the student's learning style preference. Two experiments were conducted. Experiment 1 had a control group of 53 English as a Second Language (ESL) and an experimental group of 56 ESL students who were prepared for the ACT Writing Skills Test with learning style responsive materials. The experimental group performed better with 59% obtaining a score of 7 or more compared with only 39.6% of the control group. In experiment 2, 14 remedial writing students were taught using learning style responsive materials and had much improved test scores. Overall, Rochford (2003) suggests that instructors need to understand the learning styles of their students and to design lessons targeted toward those

learning style preferences.

Loo (2004) examined the relationships between learning styles and student's preference for learning situations. His sample included 201 voluntary undergraduate students in management classes. Learning styles were determined by Kolb's *Learning Style Inventory*. He found that learning style was not a determinate of learning preferences; none of the learning styles liked writing major papers, doing class presentations, or performing library searches. However, the learners did like problem solving, group activities, and practical exercise.

Zhang (2004a) studied students' thinking styles and preferred teaching approaches. Additionally, Zhang wanted to ascertain validity and reliability of the researchers *Preferred Teaching Approach Inventory*. Thinking styles were determined using the Sternberg, Wagner and Zhang's *Thinking Styles Inventory – revised*. There were 348 university students in the study. Students preferred the conceptual change teaching approach to the information transmission approach. Predictive relationships were found. The liberal, internal, and external thinking styles positively predicted the preferred teaching approach of conceptual change strategy while conservative style negatively predicted a conceptual change strategy. Conservative, global, local, and external styles helped to predict the learner would prefer an information transmission teaching strategy.

Zhang (2004b) examined the role of students' thinking styles and their preferred teaching style and also explored the role of the students' thinking style on their perception of the teacher's effectiveness. The sample consisted of 255 university students. Zhang found

that thinking styles predicted preferences in teaching style. All thinking styles preferred teaching that encouraged creativity and critical thinking. Zhang found that students preferred teaching styles that were complementary to their learning styles. For example, the global teaching styles were predicted by the legislative thinking style, and the oligarchic thinking style preferred the monarchic teaching style.

Kulinna and Cothran (2003) explored the perceptions and use of teaching styles among 212 physical education teachers in elementary and secondary school settings. They modified Mosston's *Spectrum of Teaching Styles* by changing the wording to reflect teachers' versus students' use and perceptions to gather experience and perception of teaching styles. The new instrument was called *Physical Education Teachers' Perceptions of Teaching Styles*. They found that teachers reported using a variety of styles with the most used styles were practice, reciprocal, and command. The overall perceptions of styles were similar to the ones they rated as fun and motivation. The exception was the command style that was rated low for fun and motivation but was perceived as a highly effective style. The study did not find significant difference among teachers' age, years of experience, length of class, number of students, or urban versus rural setting.

Zhang (2000) explored the relationship between Sternberg's thinking styles and Holland's theory of personality type. It is interesting to note that four forms of the thinking styles (hierarchical, oligarchic, anarchic and monarchic) were not assessed because the researcher felt there was not a relationship to the six personality types. Six hundred entering university students volunteered to participate in the study. The *Thinking Styles Inventory* and

the *Short–version Self-directed Search,* an instrument developed for the study, were administered. The *Short–version Self-directed Search* instrument was developed in an attempt to simplify Holland's personality type assessment. The social, enterprising personality styles are positively related to the external and judicial thinking styles and negatively related to the internal style. The authors purported that these people did not like to work alone but preferred to interact with people and explore different ideas.

Zhang (2001) examined the relationship between thinking styles and teaching approaches. Data were collected from 76 teachers in training from a university in Hong Kong. Trigwell and Prosser's *Approaches to Teaching Inventory* and Grigorenko and Sternberg's *Thinking Styles in Teaching Inventory* were administered to determine teaching methods and thinking styles respectively. The researcher found that thinking styles and approaches to teaching seem to have an overlapping conceptual role. Many examples are given, such as a teacher trying to help students with a conceptual change should teach in a nontraditional way and be more creative in their student-focused teaching approach. Zhang (2001) found thinking styles and teaching approaches conceptually overlapped.

Rezaei and Katz (2004) conducted three experiments to investigate the reliability of Riding's *Cognitive Styles Analysis (CSA)*, which is used to measure cognitive styles. The first experiment was done using a randomly selected group of 73 high school students who completed the CSA with a one-week interval between pre- and post-tests. A second experiment was completed using a group of 36 volunteer university students with a month between pre- and post-tests. The third experiment was done using 45 volunteer university

faculty and students with a pre- and post-test interval of one month. Reliability of the CSA could not be substantiated.

Sadler-Smith and Riding (1999) examined the relationship between learner's cognitive styles and their instructional preferences. The sample was 240 university students studying business. Riding's *Cognitive Styles Analysis* was used to assess cognitive styles and the *Instructional Preference Inventory* was used to determine the learners' instructional preferences. They found traditional didactic dependent methods such as lectures and tutorials using print-based media were the overall preferred instructional method. The wholist-analytical cognitive style was found to have a significant effect on the collaborative method such as role-play and group discussions and a preference for non-print media such as slide, videos and overhead transparencies. They agreed that students could develop "stylistic versatility" but felt that this is a strategy versus a cognitive style.

Wessel, et al. (1999) examined the learning styles and problem solving ability of 158 upper level undergraduate students in a physiotherapy program. Learning styles were determined using Kolb's *Learning Style Inventory* and problem-solving ability was addressed using the *Heppner Problem Solving Inventory*. The majority of the students were either Convergers or Assimilators. The researchers concluded that learners like to combine abstract conceptualization with reflective observation or active experimentation. They found no relationship between problem solving and learning style.

Titiloye and Scott (2001) examined the learning styles of 201 university occupational therapy students over nine years. Kolb's *Learning Style Inventory* was used to determine

learning style. The majority of the students were Convergers with a mean of 36%; the next highest were Assimilators with a mean of 25%. The Diverger learning style was least represented, with a mean of 18%. The profession requires the therapist to analyze and synthesize information in order to make objective, sound decisions and judgments. Students are taught to be analytical and to synthesize clinical and classroom material to justify their treatment approaches to the care of clients. These characteristics are strengths of the Convergers and Assimilators, which were the learning styles of most of the students in the occupational therapy cohorts.

Type has been studied in relationship to professional orientation and education. Gambles, Wilkinson and Dissanayake (2003) studied 178 nurses studying for a degree in cancer and palliative care. The majority of the sample was female (95.5%) and worked in hospitals or community environments (72.5%). They used 16 *primary factors* of the Myers-Briggs Inventory to evaluate personality and found the sample had high scores for extraversion with an emotional sensitivity. The sample was found to be "Extraverted, empathic, trusting, open, expressive, insightful, and group oriented" (Gambles et al., 2003, 103).

McNeal and Dwyer (1999) studied 150 nursing students from three programs: associate, diploma and baccalaureate degrees. The instructional methods included three teaching modalities that included various aspects of oral/print presentation with the fourth treatment modality called original, which included visuals, questions, shaded drawings and content questions. These treatment modalities were matched with the learning styles

described by Kolb. No significant difference in the achievement between nursing students who were matched according to learning style and method of instruction were found.

Bezner and Boucher (2001) examined the influence of interview team's personality type on admission decisions into a physical therapy program. Their subjects came from 20% of all departments at the university and were respiratory care, English, computer informatics, health informatics and geography. The sample of convenience included 298 student applicants, 19 faculty and 47 clinicians from two programs for a masters of science in physical therapy. They identified the personality type using the Myers-Briggs Type Indicator Form G and Personality Styles assessment instrument. Based upon the results, interview teams of faculty and clinicians were formed controlling for homogeneity and heterogeneity in personality type. Then the applicants were randomly assigned to interview teams. The faculty and clinicians individually rated each applicant using a standardized form. Bezner and Boucher (2001) found that the interviewers did not rate applicants differently whether they had similar or different personality types, refuting the presence of interviewer bias. However, they did find that there were different scores among personality types of the applicants, which they felt demonstrated stereotyping according to type based on the rating criteria.

Horstein (1995) studied 128 associate degree nursing students and 13 faculty using a non-experimental design. The nursing students and faculty were equally divided between Extrovert and Introvert. Students were equally divided between the Thinking and Feeling while the faculty were predominately Thinking. The students had more Sensing types (71%) while the faculty had more Intuitive (69%). The study sample were predominately Judging

with both students and faculty at 71% Judging versus Perceiving.

Bean and Hocombe (1993) studied 40 oncology nurses to determine the personality type of these nurses in clinical practice. and found that the majority (n=6) were Introversion-Sensing-Feeling-Judging (ISFJ) with Extraversion-Sensing-Feeling-Juding (ESFJ) and Extraversion-iNutiion-Feeling-Perceiving (ENFP) were next most frequent with three nurses each.

Wicklein and Rojewski (1995) investigated the psychological type preference using the Keirsey-Bates Temperament Sorter (based on MBTI and Jungian type theory). Their sample was 254 secondary industrial arts (n=110) and technology educators (n=136) using a stratified random sampling procedure. They found a relationship between psychological type preference and professional orientation. Technology educators were more likely to be Extraverted, iNtuitive and Feeling types while industrial arts educators were likely to be Introverted, Sensing and Judging types.

Smith (2001) studied 338 technology students and determined their learning styles using Canfield's *Learning Styles Inventory*. He found that students preferred learning in an environment where the learning program is well organized and the requirements of the program are known in advance. The students preferred direct learning with processes and equipment in a social environment where they could establish a relationship with faculty and fellow students. They had a low preference for independent learning and liked being able to contribute to their learning objectives and modifying them with feedback. Smith related his results to the Witkin's field dependent research. They had a strong preference for non print-

based media with less reading and more hands-on experience. Smith's results further indicated that older students preferred authoritative and organized instruction and were more comfortable in an instructor-led learning environment. Younger participants preferred discussion and observation and needed social interaction as they learned. Self-directed learning was not related to age or gender.

Buch and Bartley (2002) investigated relationships between preference for training delivery mode and learning styles using an exploratory study design. The sample was 165 employees of a financial services institution and Kolb's *Learning Style Inventory* was used to determine learning styles. Each learning style was relatively equally represented in the population. Classroom instructional method was the most preferred with two-thirds of the participations selecting that mode. They found significant difference in preference for delivery methods and learning styles. Divergers preferred classroom, accommodators preferred computer-based, and audio-based learning preferred classroom to all other formats. Convergers preferred classroom with computer-based their second choice. Assimilators preferred classroom with print-based learning their second choice.

Worthington and Clay (1995) found that some health professionals attending continuing education programs learned well in the large audience environment while others would have benefited from a different continuing education format. They suggest that understanding of one's MBTI can assist in selecting continuing education offerings that will be more efficient and effective for the learner.

Charles and Mamary (2002) surveyed 103 advanced nursing practitioners, examining

their participation in continuing education offerings. They found their top three preferences were the in-person conference, followed by self-instructional print-based materials, with interactive videoconference the least preferred.

Petracchi and Patchner (2000) studied 65 social work students in a research methods course to examine their experiences in distance education. They compared three groups: two groups were in classrooms with interactive television broadcasts (one onsite and one remote), and the third group was a traditional classroom. They found no statistical differences were found between the course delivery formats. Students reported similar learning experiences with satisfaction with the access to the instructor and other university resources. The majority in all three groups reported they would take another course in the format they had experienced indicating they liked the strategy they had experienced.

Online

Online presentation of content allows for learners to access information in a synchronous or asynchronous manner depending on the course design. This instructional method allows learners to access the material at any time and to tailor their learning to the areas of interest for their practice site or areas of interest. The rapid proliferation of the use of online instructions not only in traditional higher education programs but also in continuing education requires some study. Most studies examine online instruction that has instructor and student interaction (Thiele, 2003; White, & Weight, 2000).

Computer-based instruction allows for instructional diversity, offering information in multimedia formats and content structure so that the personality type of the individual can be

accommodated (Rezaei & Katz, 2004; Berger, Belzer, & Voss, 1994). Clark (1985) states computer instruction allows for individualized pacing, and practice lessons with feedback, whereas, the learners' control of their individualized instruction is not possible in a classroom lead by a teacher (Friend & Cole, 1990).

Cobb (2004) examined seventeen articles that focused on the use of web instruction for continuing education for health care professionals. She found that in-person continuing education offerings were the more frequently preferred format. Web-based continuing education is gaining popularity but lack of computer skills along with technical difficulties are encountered barriers (Cobb, 2004).

Aragon, et al. (2002) collected data on two graduate-level courses. One was a face-to-face format and the other was online. Both were taught by the same instructor and had the same requirements. Each group contained 19 subjects. There were significant differences between the learning style preferences of the students but the differences were not significant when success factors were controlled. Cognitive processing habits were found to be significant between the two groups. The online students were found to be more reflective and preferred abstract conceptualization compared with the face-to-face students. The face-to-face students preferred more active experimentation, meaning learning by doing, than the online students reported. An interesting conclusion of this study was that students can learn equally well in either instructional method regardless of learning style provided that the course is developed using sound educational principles.

Effken and Doyle (2001) examined how cognitive style affect student learning by

using a computer simulation of 3 hemodynamic problems presented in 3 display formats or interface designs. The sample of 18 undergraduate nursing students completed Kirby, Moore, and Schofield's modification of Richardson's *Verbaliser-Visualiser Questionnaire*. They found the visual group outperformed the verbal group. Initially, cognitive style affected performance based on the design interface but the effect diminished over time with practice.

Graff (2003) examined if consideration of cognitive style was helpful in the design of web-based instructional systems. He studied 50 first year college students who were studying psychological ethics and assigned them to one of two web-based instructional systems. Cognitive styles were determined using Riding's *Cognitive Styles Analysis*. The two methods involved differences in page length and thus segmentation of information and one offered an overview. Graff (2003) supported research that Wholist learned best from short, segmental information blocks and the Analytic did not learn as well from the segmented format. Imagers performed better than Verbalisers on the short-page condition, which was consistent with the literature that Imagers kept track of material better in terms of spatial location on the web. He concluded that students learned better when cognitive style was considered for organization of material into long or shorter segments. The overview map was not found to affect learning performance of subjects with different learning styles.

Berry (2002) examined the preferred learning styles and attitudes toward computer technology of 102 counselors-in-training. She used Kolb Learning Style Inventory and found no significant findings between learning styles and attitudes toward computer use. They did report that they preferred discussion, lecture, and small group work respectively as

instructional strategies. It is interesting to note that none of the respondents indicated online instruction was their preferred instructional delivery method.

Ghinea and Chen (2003) studied the impact of cognitive styles on the quality of multimedia in a web-based instructional program. There were 132 university student volunteers in the information systems and computing program. Cognitive styles were measured by Riding's *Cognitive Styles Analysis*. The perceived multimedia quality was measured using the *Quality of Perception* which examined the users' levels of enjoyment of the content as well as understanding of the content. The subject content significantly impacted the level of participant's understanding. Field dependent participants performed better when viewing documentary clips compared with the intermediate and field independent who performed better with clips that included text. All cognitive types performed worst in the highly dynamic sports action clips. The documentary and rugby video clips were most enjoyed. It was interesting to note that the field dependent rated the most enjoyed with where they also learned the most. The researchers concluded that educators should focus on "relatively static multimedia video and take into consideration the appropriateness of the subject matter for the purposes of the specific education objectives being sought" (Ghinea & Chen, 2003, p. 404) when selecting an edutainment experience for their learners.

Kelly and Schorger (2002) studied 64 students' personality traits and learning preferences to determine their perception of online learning. The students were assigned to two different sections. One section (n=36) received traditional instruction across the semester

while the second section (n=28) received traditional instruction for one-half of the semester and online computer mediated communication for the last half of the semester. The Myers-Briggs Modified Kerisey Temperament Sorter, which is an adaptation of the MBTI, was one instrument. Additionally, the Student Perceptions of Online Learning (SPOOL) was used to assess their experiences with online learning. They found that students perceived that they did not learn as much online, however, their grade performance did not reflect that perception. They also found that the Extravert, iNtuition, Thinking, and Judging (ENTJ) personality types did best with online instruction.

Mupinga, Nora, and Yaw (2006) studied 131 undergraduate students enrolled in an online course in the Department of Industrial Technology Education to determine the learning styles, expectations and needs of the learners. The Myers-Briggs Cognitive Style Inventory an adaptation of the MBTI was used for personality type. They did not find a particular learning style to be predominant for the online learners. It was interesting to note that close to one-half of the learners were Introverts, Sensors and Judgers. They supported the concept that students take online courses because of convenience versus the preference for the instructional delivery method. They suggested that online courses be designed to accommodate various learning styles and personality types using a variety of instructional strategies.

Gary, et al. (2004) examined how effective hypermedia could be used as a tool for learning. Using a pre- and post-test design, they measured knowledge of case law for 183 undergraduate students. They had a control group and an experimental group, which received

the material via a hypermedia module. Learning styles were measured using Kolb's *Learning Style Inventory*. They found that there was significant learning using the hypermedia module; however, there was no significant difference in learning according to style.

Chen and Macredie (2004) examined the relationships between cognitive styles and learners' perceptions and attitudes toward web-based instruction. Riding's *Cognitive Styles Analysis* was used to determine cognitive styles of the 61 volunteer master's students in a university based information systems and computing program. They found that field independent students significantly more positively rated the web-based instruction more positively and appreciated that the program allowed them to study topics in whatever order they prefer, allowing them to work at their own pace. The field dependent students reported negative attitudes toward the web program stating they felt confused over the option choices when trying to acquire the content. They differed in their preference for the navigational tools and content presentation; however, both field independent and field dependent felt confident in their understanding of the content.

Freeman and Tijerina (2000) compared distance education and on-site delivery methods in relationship to learning styles for a sample of convenience for 66 physician assistant students studying Clinical Laboratory Methods. Kolb's *Learning Style Inventory* was used to determine learning style. They did not find any significant differences between learning styles (Kolb's Active Experimentation-Reflective Observation axis only) and the method of delivery (teleconferencing and on-site delivery method) and their effect on examination scores.

Federico (2000) used Kolb's *Learning Style Inventory, Form LSI-IIa* to assess learning styles of 234 students and a researcher-developed instrument to survey the students to determine their attitudes about computer-based instruction. The Assimilator and the Accommodator were more open toward various components of computer-based instruction than students who were Convergers or Divergers.

Thiele (2003) conducted a study with 64 RN students seeking their baccalaureate degree. She studied a research course that was taught in two semesters. The students had three face-to-face classes and 12 asynchronous online classes. The learners (91%) reported being more independent in their learning because of their online course.

Andrusyszn, et al. (2001) studied 86 students in a primary health care nurse practitioner program in Canada. They examined the relationships between seven distance education delivery methods, preferred learning styles, content, and achievement. They found that the majority of the respondents preferred to look at the "big picture" and liked to learn on their own or in small groups. They preferred print-based material most frequently and audio material was least preferred. They found that the timing of the course content, ability to be self-directed, and convenience were more pressing considerations versus learning style or delivery method.

Workman (2004) investigated how cognitive styles influence performance and perceived effectiveness of computer-based education via a CD-ROM and computer-aided education which is web-based. He used Sternberg's *Thinking Style Inventory* to determine the cognitive styles of 174 college students enrolled in a JAVA programming course. The web-

based section of the course had 115 students and the CD-ROM based independent study section included the remaining 59 students. He found that students who were more abstract (high global) performed better in the web based instruction and those learners who preferred concrete details did better with the CD-ROM version of the course. He also found that those who preferred collaborative learning performed better in the web-based learning environment.

DiBartola, et al. (2001) examined 56 psychology students using two different learning environments and comparing learning outcomes to their learning styles as identified by the *Kolb Learning Style Inventory*. The sample was evenly divided into two learning environments with the traditional classroom having 29 students and the distance education course having 27 participants. The outcome was measured by grades with 90% of all students receiving above average scores; the distance education groups had 34% A grades and the classroom learning had 29% A grades. The Assimilators accounted for 40% of all students and 47% of the classroom learners compared with 37% of the distance education students. The researchers found that the in-class and distance education groups had similar learning outcomes and felt that the learning environment did not influence learning outcome. They also found that for both groups, learning style did not appear to affect outcomes; however, they did find that the Diverger style seemed to prefer distance education.

Sabry and Baldwin (2003) examined the learning styles and perceptions of students using a web-based learning environment with a mixed method research design. The sample was 189 undergraduates and postgraduates in the UK. They examined three aspects of web-

based interaction, which include learner-tutor, learner-learner, and learner-information. They found that 68% of the learners tended to be Sequential learning style. Learner-information interaction was the most used and was perceived to be the most useful.

Ford and Chen (2001) explored 73 postgraduate students in a computer-based learning environment, studying the relationship between matching/mismatching instructional presentation styles with the learner's cognitive style using Riding's *Cognitive Styles Analysis* for field-dependence and field-independence dimensions. The matched condition was for the field-dependent individual to use breadth-first instructional materials and the field-independent student to use depth-first teaching materials. They found that students matched on their cognitive style and the way material was presented, such as depth-first versus breadth-first, performed better compared to mismatched conditions.

James-Gordon and Bal (2001) studied automotive design engineers to determine what their learning styles were and if they were different from other professional populations. They also wanted to examine if design engineers were different from managerial engineers in their learning style preferences. They administered two learning style questionnaires, Honey and Mumford's *Learning Style Questionnaire* and Felder's *Index of Learning Styles*, to 45 people: 27 design engineers and 15 managerial engineers and compared them to a professional population of 3500 who worked in the industry or commerce in the UK. They found that both types of engineers were visual learners, preferring diagrams, sketches, schematics, pictures videos, and computer graphics.

Ross, et al. (2001) examined the effects of cognitive learning styles on academic

performance using the *Gregorc Style Delineator*. Data was collected over a four-year period on a sample of 974 in two university-level computer applications courses. In the computer science course (n=804), 20% of all dominant Abstract Sequential learners and 23% of all dominant Concrete Sequential students received a grade of A. Only 10% dominant Concrete Random and 7% dominant Abstract Random students received As. Students who withdrew (70%) and those who earned an F (62%) were dominant Abstract Random learning style. In the computer application in education course (n=168), 46% dominant in the Concrete Sequential dimension and 48% dominant in the Abstract Sequential style receive A grades. Fewer of the Concrete Random dominant (30%) and 18% of the Abstract Random students receive A grades. These learning styles accounted for 9% (Abstract Random dominant) and 8% (Concrete Random dominant) of the grades below a C earned in the class. The researchers concluded that academic performance was affected by learning style.

McKay (1999) explored the effect of graphic metaphors on the performance of 28 adults learning computer programming. Cognitive Styles were measured using Riding and Cheema's *Cognitive Styles Analysis* (CSA) and the participants were paired based on their CSA ratio. One of each pair was given a text-plus-textual metaphor treatment (control group) while the other group was given a text-plus-graphical metaphor treatment. Pre- and post-tests were done and performance was measured. McKay found that the all subjects performed better in the treatment with the graphical metaphor and that Verbalisers in particular performed best.

Harris, Dwyer, and Leeming (2003) investigated the effect of learning style on

performance in a web-based introductory psychology course. Learning styles were determined using Kolb's *Learning Styles Inventory (LSI-IIa).* Volunteer university students (n=159) in two large classes of an introductory psychology course were randomly assigned to one of two online training modules (one was enhanced with more multimedia and more interaction). They found learning style did not affect performance or preference for the web-based module.

Fleming, et al. (2003) researched the relationship between learning styles, performance, and attitudes toward web-based module and slide/audiotape module to study radiographic anatomy of the mandibular and maxillary bone structures. Thirty-one first year students in a university dental hygiene program were randomly assigned to one of two groups: web-based format and slide/audiotape format. Learning styles were determined using Kolb's *Learning Style Inventory* and a survey was used to determine instructional format preference. The majority (70%) of the subjects preferred the web-based format. They found that learning style did not predict preference nor did the different instructional methods affect performance across any of the four learning styles.

Simulation

Beyond being able to recall knowledge, educators expect learners to apply knowledge. Educators strive to teach students to be able to think critically and to be able to do more than "know the answer". The healthcare professions are practice disciplines, but healthcare providers are understandably hesitant to "practice" on the patients. In other words, healthcare providers are hesitant to take action when there is *any* ambiguity about the

consequences to the patient. Yet, because healthcare is a practice discipline, it is important to "practice" integrating the steps of the care delivery to allow transfer of learning and understanding.

Simulation is defined as a teaching technique that reproduces actual events and processes in a learning environment (Seropian, Brown, Gavilanes, & Driggers, 2004). Simulation is one strategy to enhance critical thinking because it encourages learners to synthesize the knowledge they have learned to date by applying it to a "real" situation (Friedrich, 2002; McCausland et al., 2004; Nelson, 2003; Reznek, Harter, & Krummel, 2002). Simulators provide a realistic learning experience - an intermediate step between the "static" manikins where learners are able to understand in theory what to do and the actual patient where learners are called on to apply what they know.

Simulation experiences can be an effective approach to helping adults learn because simulation allows for valuing the experience the learner brings to the learning process. The learner is forced to be an active participant in the learning process. It may be more challenging for learners to be asked to think for themselves and to apply their knowledge in a simulated environment.

Historically, simulation has been used in various fields to prepare its learners for the complexity of the task they will be expected to perform (Lupien & George-Gay, 2004). In Notes on Nursing, Florence Nightingale states she honestly believes that it is impossible to learn [nursing] from a book . . . that it can only be thoroughly learnt in the wards of a hospital" (Nightingale, 1969, p. 127). In her era, that is exactly what happened. The student

nurse learned through his or her experiences on the wards.

Healthcare, including nursing, has used simulation for many years. The first "simulator" was the human cadaver. The traditional training models, live patients, while they still exist are not as readily available, nor should they be. No longer can the patient be the foundation of our clinical teaching. Obviously, using the patient as a practice model places the patient at an increased risk of complications. Historically, because of lack of satisfactory alternative teaching models, this inherent risk was considered a "necessary evil" (Reznek et al., 2002).

The Human Patient Simulator represents the latest in state-of-the-art simulation technology for training clinicians at all levels. The Human Patient Simulator is a computer-model-driven, full-sized manikin that delivers training experiences in true-to-life scenarios that swiftly change to meet the educators' goals. This sophisticated and highly versatile high fidelity manikin blinks, speaks, breathes, and urinates. It has a heartbeat with a pulse and accurately mirrors human responses to such procedures as Cardiopulmonary Resuscitation, intravenous medications, intubation, and assisted ventilation. Palpable carotid, radial, brachial, femoral, and pedal pulses are provided, all of which synchronize to the electrocardiogram.

The Human Patient Simulator automatically regulates the simulated patient's physiology in accordance with the type of patient defined. For example, a healthy 30 year old, a middle-aged male with hypertension and chronic obstructive pulmonary disease (COPD), a young woman experiencing an allergic reaction either to a drug or to a bee sting, a

female of childbearing age with complications associated with pregnancy, or an elderly patient with cardiovascular disease that progresses to a life-threatening event such as pulmonary edema, are just a few examples of type of patients that can be simulated.

Coates, et al. (2003) used blind randomized checklists to compare 31 fourth year medical students on their achievement of dyspnea and assessment of acute abdominal pain content using either problem based learning (PBL) or a full-scale high fidelity human patient simulation. They found students who were taught using the simulator demonstrated better clinical management skills than those using the PBL format.

Vaidyanathan and Rochford (1998) explored whether effectiveness of simulations as a teaching strategy is influenced by differences in student learning preferences. They studied 133 students in five sections of a marketing class taught by two different instructors. Data were collected on learning preference using the Productivity Environmental Preference Survey (PEPS) by Dunn, Dunn, and Price. Performance was measured on exams and a marketing simulation team project. They found simulation performance is positively correlated with exam performance. Their results were confounding because they found that the students who had better exam grades had a high preference for learning by reading and had a low preference for working with others. This is contrary to findings of other research on the use of simulation which report it as a positive interactive group activity. The difference might be explained that the simulation was a computer simulation and not hands-on interactive learning.

Keller, Whittaker and Burke (2001) examined the use of student debates across 4

groups of 11 students (n=44) second-year Masters of social work students to determine if knowledge and policy skills were promoted. Using a pre- post-test format, they found that knowledge and skills were significantly greater for topics they debated and half of the students also showed an increase in knowledge with observation. The study supported that having students be involved in an active participatory role in the simulation increases their learning.

Sonnenwald and Li (2003) studied 40 upper level university students in a natural science program using an experimental design. They examined student's perception of scientific collaboratory system and their social interaction learning styles using Owens and Straton's *Learning Preference Scale: Students (LPSS).* The LPSS has three preferences: cooperative, competitive and individualistic. Twenty pairs of students conducted two labs: one face-to-face and the other remotely with 3D visualization and haptic technology. Haptic pertains to touch or the science of the touch sense (Venes, 2005). No significant differences were found in the perceptions of the collaboratory system based on the students' cooperative learning style preferences.

Summary

In summary, human behavior, knowledge, learning style, and personality types are complex and difficult issues to quantify. The literature is vast and confusing without clear directions for new researchers. The researcher must decide what information is to be gathered and for what purpose. Understanding personality types and preference for instructional methods can inform research design as well as curriculum development. The importance of a

sound theoretical framework such as Jung's theory and an instrument with robust psychometrics such as the MBTI is evident. Ways to increase the impact of the proposed research have been identified by contrasting and comparing the proposed, albeit small, sample with CAPT's norm reference data. Guidance from experienced researchers about statistical analysis will help to avoid other methodological concerns.

There is agreement that educators need to try to accommodate learners' type preferences and to choose appropriate instructional methods to assist learners to understand the content in order to provide the most effective and meaningful learning experience (Gough, 1996; Hayes & Allinson, 1996; Riding & Rayner, 1998). Psychological type theory would be able not only to determine how people learn but also to guide them towards techniques that could enhance their learning. Garner (2000) argues that the goal should not be to identify and label a learner as a certain "style" [or type], but rather to increase a person's self-development through knowledge about the advantages and disadvantages of different learning models. The more aware learner will then be better equipped to "choose the most appropriate learning strategy from a wide range of options to fit the particular task [at] hand" (Coffield et al., 2004, p. 50).

When educators invest in understanding personality types and are deliberate in their selection of appropriate type instruments, they will make a difference. Educators must be willing to deliberately experiment with different instructional methods in each teaching event not only to meet the objectives but also to cultivate the personality type of their students (Larkin-Hein & Budny, 2000). It is possible that any type preferences are diluted over time

by experience with certain types of instructional methods, especially for those who have had advanced education (Harris et al., 2003). Students adapt learning strategies that allow them to learn regardless of their personality type. Information must be taken in and processed regardless of personality type, so it is logical that type alone does not affect performance (Harris et al., 2003).

One might hypothesis that learners will find the experience satisfying when the educator makes the content interesting, respects the contributions of the learner, and is friendly and approachable. Focus on personality type helps students gain confidence in the things they do well. Students are better able to understand how they learn most effectively and efficiently and can be empowered to develop diverse approaches to challenging situations in work and life. Once a learner succeeds, both the learner and the educator are empowered to find success in different areas.

Much research has been done with the MBTI to investigate academic achievement, aptitude, and persistence. Research on student retention, leadership, resident life and extracurricular activities has been done (Myers et al., 2003). The MBTI has also been used to examine careers in adults. In psychological, educational, medical, and CAPT database searches, there were no studies found that examined the correlation between personality type as measured by the MBTI and preference for instructional methods. No research was available exploring the association of personality type and the use of high fidelity simulators such as the human patient simulator. Research to explore people's preference for learning using the human patient simulator as an instructional strategy correlated with their

personality type has not been found. As more and more curricula are seeking how to best use the high fidelity simulators, understanding people's preference for instructional methods and the correlation with their personality type can be informative to instruction. This study will explore the relationship of the Jungian concept of personality type as measured by MBTI and instructional methodological preferences.

Hayes and Allison (1998) found that the personality type of the learner influenced the acquisition and processing of information. So, it is important to examine personality type in learners, not only to design better educational experiences but also to help the learner most effectively and efficiently manage their own learning environments. The examination of personality type and instructional method preference will add to the literature about optimal educational practices.

Chapter Three
Methodology

The purpose of this study was to examine the preference for instructional modalities and their *Myers-Briggs Type Indicator* personality types, education, ethnicity, or age in a sample of nurses in North Carolina. Better knowledge of the influence of personality type on preferred instructional modalities can benefit nursing educators as they meet the learning needs of nurses. This study provided insights into learners' preference for instructional methods allowing educators to optimize the design of educational experiences and learning environments.

Research Design

This study was a cross-sectional, non-experimental research design (Johnson, 2001). This design was appropriate for social science research because determining personality type and preferences for instructional methods did not lend itself to experimentation (Kerlinger & Lee, 2000). Many variables are of interest for behavioral research but it was either impossible or unethical to manipulate or control for many of these variables in an experimental research design (Gravetter & Forzano, 2003). Thus the cross-sectional, non-experimental research design was applicable when variables were not manipulated as in this study.

Population and Sample

The population included all RNs and LPNs who completed one of fourteen continuing education programs entitled: *Nurse Educator Institute - Improving the Care of Acutely Ill Elders; Role of the RN in Improving the Care of Acutely Ill Elders, or Role of the*

LPN in Improving the Care of Acutely Ill Elders, between 2003 and 2006 held at the University of North Carolina School of Nursing. The sampling frame was a non-random, sample of convenience. The participant list was obtained from The University of North Carolina School of Nursing Continuing Education Department. A few of the workshops admitted nursing students. These students were excluded from the sample population because the target population was practicing nurses; since the students had not completed their program of study nor started their nursing practice, they did not fit the inclusion criteria. The North Carolina State University Institutional Review Board for the use of Human Subjects in Research approved the study to ensure that the rights of human subjects were protected. Since the subjects were obtained from continuing education offerings at The University of North Carolina at Chapel Hill, their Office of Human Research Ethics – Institutional Review Board deferred the oversight of this study to The North Carolina State University Institutional Review Board for the use of Human Subjects in Research. All workshop attendees were solicited to participate in the study through a mailed packet that included the consent form (see Appendix A) and am explanation of the study. The three-part data collection instruments: *Learner's Evaluation of Instructional Methods (*see Appendix B, Part I); demographic information (see Appendix B, part II); and instructions for completion of the online version of the MBTI-Form M (see Appendix B, part III). Their completion of the research surveys implied consent to participate. Instructions of how to assess the MBTI online were included in the mailed packet and are found in Appendix C. To enhance the return rate, a follow-up email was sent (see Appendix D).

Instrumentation

Three data collection instruments were administered to a sample of convenience of nurses who completed continuing education workshops from Fall 2003 through Spring 2006 at The University of North Carolina at Chapel Hill. Each survey had a unique identifying code to allow for confidentiality, anonymity, and follow-up. The data collection instruments were self-administered. Part I was the *Learner's Evaluation of Instructional Methods* (see Appendix B, part I). The second part was a survey to solicit demographic information (see Appendix B, part II). The third part of data collection was the online version of the MBTI-Form M (see Appendix B, part III).

Learner's Evaluation of Instructional Methods Questionnaire

The *Learner's Evaluation of Instructional Methods* questionnaire was adapted from Marsh's instrument *Student's Evaluation of Education Quality (SEEQ)* (see Appendix E). The SEEQ was developed as a student evaluation of teaching effectiveness. This instrument was appealing to be used to evaluate learner's preferences for teaching modalities because it was multidimensional in its examination of teaching effectiveness. The SEEQ consisted of 35-items that measured nine evaluation factors: Learning/Value, Instructor Enthusiasm, Organization/Clarity, Individual Rapport, Group Interaction, Breadth of Coverage, Examinations/Grading, Assignments/Readings, and Workload/Difficulty (Marsh, 1982, 1983, 1984, 1987, 1991).

The SEEQ was developed from a large pool of items generated through a literature

review, examination of other teaching evaluation instruments, and interviews with faculty and students (Marsh, 2007). Rating of the items for importance and usefulness by faculty and students and psychometrics properties contributed to the identification of items to include in the instrument providing evidence of content validity (Marsh, 1991; Marsh, 2007). The factor structure of the SEEQ was examined in many studies and found to be strong. Marsh and Hocevar (1991) used 50,000 sets of class average ratings from 1 million SEEQ surveys and found that the nine factors were supported. The average correlation scores were over .99 (Marsh, 2007; Marsh & Hocevar, 1991).

Permission was granted from Marsh to adapt the SEEQ instrument and to use it for data collection for this study. The adaptations of the SEEQ for this study were as follows. Of the nine factors, there were four that seemed to be relevant to this research: Learning/Value, Organization/Clarity (Clarity), Breadth of Coverage (Breadth), Examination/Grading (Feedback). One question was dropped from each of the selected four factors prior to the study because they did not relate to the focus of the study. For example from Learning/Value, “overall course rating” was dropped and from Organization/Clarity, the question “lectures facilitated note taking” was dropped because it did not add to the focus of the study objectives. The factors that were not included were: *Enthusiasm* because there was not an instructor present for each modality, specifically online; *Group Interaction* because the focus of group activities such as class discussions, were not a part of this workshop; *Individual Rapport* because there was not a ongoing relationship with an instructor; *Assignments* because there were no reading assignments; and *Workload/Difficulty* because there were no

workload issues for the one day workshop. The *Student's Evaluation of Education Quality (SEEQ)* was adapted and 12 items were selected to elicit each respondent's perspective on lecture, online and simulation. The wording for the questions was tweaked to include the modality placing the question into the context of the instructional modality. The twelve items were then repeated for each of the teaching modalities: lecture, online and simulation within the context of each modality. These questions allowed the participant to evaluate each teaching modality they had experienced not only in their educational experience but more specifically the continuing education offering they had attended. The labels and position of the response scale were changed with 5= "strongly agree" to 1= "strongly disagree".

The new instrument was called the *Learner's Evaluation of Instructional Methods* and consisted of a total of thirty eight questions: Lecture (12-items), Online (12-items), and Simulation (12-items). Two additional questions asked the participants to indicate the percentage of their educational experiences that involved lecture, online or human patient simulators and then to rank their teaching/learning modality preference from 1 "most preferred" to 3 "least preferred" for lecture, online, and human patient simulator. The instrument is found in Appendix B, part I.

After adaptation of the SEEQ, instrument design and education experts reviewed the instrument to determine content validity. The revised instrument was tested with a small sample of people to examine its readability and to determine if the instructions were easy to follow. Since the instrument was altered, prior to the analysis of the study data, simple exploratory factor analysis was planned to determine construct validity and reliability for the

Learner's Evaluation of Instructional Methods questionnaire.

Demographic Survey

The second section of the data collection instrument contained nine mixed response questions**.** The descriptive demographics included job title (1=Nurse Practitioner, 2=Nurse Educator, 3=Registered Nurse, 4=Licensed Practical Nurse, and 5=other); highest degree held (1=doctorate, 2=masters, 3=baccalaureate, 4=associate, 6=technical, 7=other); years in current position; number of years experience as a nurse; number of average patients per week; age; sex (1=female and 2=male); ethnic background (1=African-American, 2=Asian-American, 3=Euro-American, 4=Hispanic or Latino, 5=Native American, 6=other); and number of years since last formal educational experience. Lastly, an open-ended "additional comments" was included which allowed subjects to comment about anything the survey triggered but did not ask.

After examining the frequencies and means of the demographic data, the data was used to describe the sample. The nursing population was compared to the North Carolina workforce data. Additionally, the sample was compared to a national sample of MBTI personality types.

Myers-Briggs Type Indicator (MBTI®)

The third section of the three-part instrument was the Myers-Briggs Type Indicator (MBTI) Step 1 (Form M) online (1998). The MBTI was used to determine personality type for each respondent with both dichotomous and continuous scale information reported. The MBTI Step 1 (Form M) allowed for immediate yet comprehensive results about a person's

personality type. It has been standardized based on a large national sample of adults. It has been designed to identify the type preference for the respondent and is considered a Step I assessment compared to a Step II assessment that provides a finer level of detail about personality type variation. MBTI Step 1 (Form M) follows the same principles and construction assumptions as earlier forms of the type indicator but this updated version used *item response theory* to enhance the instrument so that a person's true score correlated with their choice of preference on the skill (Myers et al., 2003).

Extensive research has been done using the MBTI in a variety of disciplines including education, and it has been purported to be the most widely used personality inventory in the world (CPP, 2004; Lawrence, 1993; Patrina, 2007). It has also been translated into over 30 languages. The 2008 MBTI bibliography search engine reveals 10,850 entries using the Myers-Briggs Type Indicator (CAPT, 2008) since its inception in 1946. The first article was published in 1957 (Hammer, 1996). The MBTI has been widely used across all levels of education. Nursing has been a profession of interest from the earliest days of development research with the MBTI when Isabel Myers did research involving students in the health professions including medicine and nursing (DiTiberio, 1996). DiTiberio (1996), in a review of a decade of statistically significant studies, found that learner characteristics were the focus of interest for the research inquiry.

The MBTI instrument was based on years of observations by psychologist Carl Jung and by the instrument's authors, Isabel Myers and Katharine Briggs (Myers et al., 2003). The MBTI has four separate dichotomies that make up type: Extraversion versus Introversion,

Sensing versus iNtuition, Thinking versus Feeling and Judging versus Perceiving (Myers et al., 2003). Myers, et al. (2003) cautioned that both ends of the continuum were valuable qualities and it has been assumed that people use components of all eight of the dichotomies that represent personality type; but, that they prefer one to the other. Caution should be taken to avoid judgments about "right and wrong" or "better" type. It has also been important to avoid assumptions about the names of the scales. The words may have familiar everyday meanings, but Myers, et al. (2003) cautioned that "Extravert does not mean talkative or loud"; "Introvert does not mean shy or inhibited"; "Feeling does not mean emotional"; "Judging does not mean judgmental", and "Perceiving does not mean perceptive" (Myers et al., 2003, p. 10, *capitalization mine*).

The scale dichotomies are: Extraversion (E) or Introversion (I) which indicates where a person focuses his or her attention and from which he or she draws his or her energy; Sensing (S) or iNtuition (N) describes how a person gathers and takes in information; Thinking (T) or Feeling (F) describes the way a person prefers to make decisions; and Judging (J) and Perceiving (P) describes how a person deals with the outside world (CPP, 2004; Myers et al., 2003).

The preferences can be scored either on an interval scale from 0 to 30, which produce a continuous score, or the preferences can be treated as dichotomous scores. This study will use the dichotomous scores in the analysis. To assist the lay person to interpret their MBTI, Myers created a graph that indicated the preference clarity indexes (pci). Each participant received, as part of their MBTI report, a table illustrating where they fell on the continuum of

clarity for their reported preferences. The clarity for each of the dichotomies was ranked from 0-30. The ranges for clarity are 0-5 = slight, 6-15 = moderate, 16-25 = clear, and 26-30 = very clear. A sample of the *Clarity of Reported Preferences* can be found at http://www.cpp.com/images/reports/smp261145.pdf. Myers used "very clear" to mean the preference was clearly chosen consistently, while "slight" means the choices were more evenly divided (CPP, 2004).

The MBTI Step 1 (Form M) has been refined and the language has been updated using a large nationwide sample of adults. While most items were forced choices between two dichotomous options in previous versions, for MBTI Step 1 (Form M) all items were made to be forced choice with 2 responses. The MBTI Step 1 (Form M) online consists of 93 items, all scored for type. To assure the most accurate prediction of type, the instrument was scored using item response theory. This version of the instrument was intended for people 14 years old or older. It is designed at a 7th grade reading level. The MBTI Step 1 (Form M) was available as a self-scorable version or online. This study used the online version, using SkillsOne software to score the MBTI and to generate a report for each participant. The report was purchased by the researcher and sent to each participant as an incentive for participating in the research. Most people found the questionnaire enjoyable and subsequent report useful. It took 15-25 minutes to complete.

The MBTI® Step 1 (Form M) was divided into three parts. Part I contained 26 word phrases in which the subject was asked to select an answer from 2 true forced choice response options. Part II contained 47 pairs of words. Part III included 20 word phrases.

Examples from each part of the MBTI® Form M instrument are found in Appendix B, part III by special permission of the Publisher, CPP, Inc., Mountain View, CA 94043. All rights reserved. Further reproduction is prohibited without the Publisher's written consent.

All items received a weight of one and were electronically scored when submitted online through SkillsOne, CPP's online assessment system. This format was chosen because it was ideal for ease of administration and interpretation of results. Ties rarely occurred but when they did, they were broken in favor of Introvert, iNtuition, Feeling, and Perceiving on the respective dichotomies (CPP, 2002; Myers et al., 2003). The logic behind tie breaking in this direction was based on the belief that socially desired responses would be toward the Extravert, Sensing, Thinking and Judging dichotomies and to balance these, the tie breaking would be in the opposite direction (Myers et al., 2003).

There was strong psychometrics associated with the MBTI. Meta analyses for more than a decade has provided a wealth of information regarding the reliability and validity of the MBTI. Summary of the data regarding reliability and validity follows.

Reliability of the MBTI.

Reliability is the degree that an instrument consistently measures what it intends to measure with a relative absence of measurement errors (Kerlinger & Lee, 2000). Estimates of internal consistency for the MBTI were done using split-half reliabilities and examining internal consistencies based on coefficient alpha. Split-half reliability examines the correlation of two equivalent halves of the test (Kerlinger & Lee, 2000).

Split-half reliability for the MBTI Form M was performed by paring items according

to item statistics using the following considerations: "item format (word pair versus phrase question); item-to-total correlations; average value of the difficulty parameter defined by the Item Response Theory (IRT); maximum amount of item information (a function of IRT parameters); subscale coverage; whether the item was an original Form G item or a new or revised item and is referred to as logical split-half" (Myers et al., 2003, p. 160). Additionally the instrument was divided into half, where the first set of consecutive items represented the first half and the last set of consecutive items represented the second half (Myers et al., 2003).

Using the Spearman-Brown formula to examine Form M, the logical split-half and reliabilities were found to be high ranging from .89 to .93 on the continuous scores (Myers, et al., 2003). The national sample (n=3,300) was identified as a stratified random sampling procedure to collect data in 1996 with an attempt to be representative of the US population. The sample varies from US census data by having an under representation of African American males, non-representation of American Indian, Asian/Pacific Islander, or Eskimo, and an over representation of Caucasian females. Thus the sample was weighted on gender and ethnicity to approximate the US census data (Myers et al., 2003).

Cronbach's coefficient alpha allows assessment of internal consistency reliability estimates for instruments with continuous versus binary scoring scales. Every item is correlated with each other (Kerlinger & Lee, 2000).

Myers et al. (2003) research findings support the type theory that respondents who have a better understanding of the items and more accurately self-report type preferences are

more likely to be consistent and have higher reliability coefficients. The reliability of the continuous MBTI preference scores is .84 and .86 for internal consistency measures and .76 for temporal stability. The reliability coefficients are acceptable for the MBTI.

Further support for type was supported by comparing the national sample with a variety of other samples (Myers et al., 2003). The coefficients for the Extravert - Introvert scale ranged from .89 - .95, for the Sensing - iNtuition scale ranged from .86 - .95, for the Thinking - Feeling scale ranged from .86 - .93, and for the Judging - Perceiving scale ranged from .88 - .94. The Thinking - Feeling scale had the lowest coefficient alphas of the scale (CAPT, 2008; Myers et al., 2003). Research indicates that when the reliabilities are scored as continuous scores, they are as good as or better than other personality instruments (CAPT, 2008).

Test-retest reliability estimates were performed on the MBTI using two methods. The purpose of the test-retest reliability estimate is to measure stability or replication over time (Kerlinger & Lee, 2000). One method was to administer the test to the sample group of people after an adequate amount of time has lapsed to allow for decay of memory from their previous response choices to determine if their type preference was stable over time. The second method to gain evidence of test-retest reliability was to look at the rank order of the means.

Research was done to show the one-month test-retest product-moment correlations for Form M in three samples: Virginia Commonwealth (n=116), Public Utilities Company

(n=258), and CPP (n=50) finding that there were high correlations ranging from .83- .97. The samples used were the national sample as described above plus a sample of 50 employees of the Consulting Psychologists Press with a mean age of 36 and gender representation of 68% females and 32% males; 258 employees of the Public Utilities Company with a mean age of 44 and gender representation of 50% female and 50% males, and 116 college students from the Virginia Commonwealth University with a mean age of 25 and gender representation of 82% females and 18% males (Myers et al., 2003). The test-retest reliabilities of continuous scores for the preference clarity indexes (pci) ranges for the combined test-retest samples were also found to be greater than .70 except for the clarity range of slight=1-5 which had lower coefficients ranging from .22 to .52.

Reliability estimates for continuous and dichotomous scales for the four type preference scales revealed the percentages of persons reporting the type preferences the same at a month retest. Test-retest dichotomies ranged from .84 to .96 and the test-retest for continuous was .83 to .97 (CPP, 2004; Myers et al., 2003). The correlations for the four continuous scores were important to understanding the psychometrics regarding the MBTI; however, the likelihood that an individual would chose the same four types on the dichotomous domains was of particular interest.

Sixty-five percent of the combined population had the same type preference on all four domains. There were 28% who were the same on three of the scales, 6% on two of the scales and 1% who only remained the same on one scale after one month. Historical data, not directly related but interesting to note, looked across a 50-year interval of a sample of a 1943

high school graduating class. Thirty-nine of the 87 members retook the test with 21% staying the same, 33% changing on one letter, 41% changing on two letters and 5 % changing on three letters. It is interesting to note that no one changed on all four letters either historically or more recently (Myers et al., 2003). The test-retest probabilities are significantly higher than what could be expected by chance (6.25%). Test-retest agreement is not ever expected to reach 100% since the scales measure a complex and multifaceted psychological construct. Additionally, the whole type (four letters) is measured by individual scales which increasing the chance of measurement error of self-report. There is evidence that the test-retest reliabilities of the MBTI show consistency over time. If a person has a change in type, it is usually on one preference and in the scale that initially was near the mid-point between the dichotomies which is referred to as “low preference clarity” (Myers et al., 2003).

Validity of the MBTI.

Validity is the degree to which an instrument measures what it is intended to measure and to what degree the “type” in this case has meaning (Kerlinger & Lee, 2000; Nunnally & Bernstein, 1994). For the MBTI, the question is whether the type reflects the real world with accuracy, because if it does, then it can be used to understand and predict people’s behavior.

Content validity is determining if the content is adequately sampling to measure what is intended to be measured (Kerlinger & Lee, 2000). Item response theory is used to determine that the scale items are measuring what is intended to be measured for the MBTI (Myers et al., 2003).

Criterion-related validity is comparing test or scales with external variables known to

measure the attribute under study (Kerlinger & Lee, 2000). Myers, et al. (2003) demonstrate evidence for criterion-related validity through comparisons of the MBTI with numerous other instruments. Examination of these correlation studies gives evidence for criterion-related validity.

Construct validity examines the ability of the instrument to measure psychological attributes and involves testing of hypothesized relationships (Kerlinger & Lee, 2000; Nunnally & Bernstein, 1994). Evidence for construct validity of the MBTI is established in part through factor analysis. Exploratory factor analysis is a step-wise data driven method to examine variables in a way to meet mathematical objectives to account for the most variance and to explain the "best fit" (Nunnally & Bernstein, 1994). Exploratory factor analyses of various studies have supported the hypothesized four-factor model or scales (Harvey, Murry, & Stamoulis, 1995; Thompson & Borrello, 1986; Tischler, 1994; Tzeng, Outcalt, Boyer, Ware, & Landis, 1984). Confirmatory factor analysis examines the variables to propose a specific structural model. In confirmatory factor analysis, a covariance matrix is created and compared to the sample correlation via a goodness-of-fit statistic (Nunnally & Bernstein, 1994; Kerlinger & Lee, 2000). Johnson and Saunders (1990) found clear support for the subscale to overall preference relationships. Harvey, et al. (1995), through examination of the MBTI against two other models, found strong support for the validity of the predicted four-factor models. More recently, confirmatory factor analysis gave evidence of a good fit for the four-factor model on MBTI Step 1 (Form M) using the national sample (Myers et al., 2003). DiTiberio (1996) examined 17 learning style studies and found that the validity of the MBTI

constructs was supported. Myers, et al. (2003) suggest that occupational preference/choice type tables also provide evidence for construct validity. For example, if the type table has as many or more of the type that are predicted to be in that “occupation” cell then the construct holds. In summary, exploratory and confirmatory factor analyses strongly supported evidence for the construct validity of the predicted four-factor structure of the MBTI (Hammer, 1996; Myers et al., 2003).

Data Collection

Prior to the study, Institutional Review Board for use of human subjects (IRB) approval was obtained from North Carolina State University and The University of North Carolina at Chapel Hill. The names and addresses of the workshop participants were obtained from the continuing education department. To inform potential subjects and to solicit participation, a brief description of the study was included in the consent form. The consent form was mailed with the data collection instruments and an instruction sheet of how to complete the MBTI Step 1 (Form M) online was included. Completing any portion of the research collection instruments indicated consent. The investigator was available for questions by phone and email. Scoring of the MBTI was done electronically and an individual report was generated for each participant. The researcher purchased the reports and emailed the individual report to the respective participant when they completed all portions of the data collection.

Data Analysis

Statistical analyses of results utilized SAS software, Version 9.1, SAS Institute Inc.,

Cary, NC, USA. Data analysis in this study used descriptive statistics including frequencies, means and standard deviations. Exploratory factor analysis (EFA), multivariate analysis of variance (MANOVA) and *t* test were used in analysis of the data. Statistical significance of p=.05 was selected for this study.

Research Question: Do nurses' preferences for different instructional modalities (lecture, online learning, and simulation) differ by MBTI personality type, education, ethnicity or age?

Dependent Variables

Three criterion variables (dependent variables) were used to describe instructional methods: lecture, online learning and human patient simulator. The preference for each of these instructional methods was measured as a quasi-interval scale from 1-5 on twelve items each for a total of 36 items. Means were calculated for each instructional method and used in the data analysis.

Independent Variables

The predictor variables (independent variables) were personality type, education, ethnicity, and age. Personality type was measured using the MBTI which was measured on four dichotomous scales as a categorical variable: Extraversion or Introversion; Sensing or iNtuition; Thinking or Feeling, and Judging or Perceiving. The MBTI Step 1 (Form M) online was used to assess the personality type of each participant.

Information about education was gathered by asking the sample to respond to set

options to the question “What is the highest degree that you hold? Please list the subject area such as nursing, education, or administration, etc.” with other as an option with a request to “please specify”. For analysis the sample’s responses were collapsed to the following categorical variables for education: Advanced Degree, Baccalaureate Degree, and Associate Degree.

Respondents were asked to indicate their ethnicity by answering the question, “What is your ethnic background?” selecting their ethnic background from a list which included “other” and fill in the blank as an option. For analysis the sample’s responses were categorized as: White, African American and Other which included Asian, Hispanic and Native American.

Age was requested by asking “What is your birth year?” The birth year was converted to age in years. Based on the distribution of ages, the following categories were devised: 27-38 years of age, 39-48 years of age, 49-58 years of age, and 59 + years of age.

Descriptive Statistics

Descriptive statistics were computed for all demographic variables including frequencies, means, ranges, and standard deviations. All data were summarized and reported in aggregate form to protect anonymity and confidentiality.

The Selection Ratio Type Table (SRTT) program was used for analysis of the sample and to make comparisons with the national sample on the MBTI (Granade & Myers, 1987). This statistical program, developed and administered by the Center for Applications of

Psychological Type, was developed for Isabel Myers to assist with data analysis. Myers designed the type table to provide a standard format to present information about type in various samples (McCaulley, 1985). This type of analysis and presenting of data was found to be useful in not only data interpretation but also in comparing samples across studies (McCaulley, 1985). A selection ratio (*I*) was calculated by dividing the percentage of the type in the sample by the percentage of the type in the base population such as a national sample. When the selection ratio was greater than 1.00, then the sample numbers exceeded those found in the base population. If the selection ratio was less than 1.00, there were fewer in the sample than expected when compared to the national (base) sample (McCaulley, 1985).

Factor Analysis

Factor analysis is done to determine if the instrument measures what it is intended to measure for construct validity (Thompson, 2004). Numerous studies have validated the factor structure of the SEEQ (Marsh 1977, 1981, 1982; Marsh & Overall, 1980; Marsh, Overall & Keslser, 1979; Marsh & Cooper, 1981). Since the *SEEQ* instrument was adapted for this study, an exploratory factor analysis was performed to determine the construct validity and reliability for the *Learner's Evaluation of Instructional Methods.* Additionally, it was important to see if the identified factor patterns held up in the adapted form of the instrument.

Multivariate Analysis of Variance (MANOVA)

Multivariate analysis of variance (MANOVA) was used to determine whether there was a significant difference between preferences for different instructional modalities

(lecture, online and simulation) and personality type, education, ethnicity, or age (O'Rourke, Hatcher, & Stephanski, 2005). Multivariate analysis of variance (MANOVA) was appropriate for the analysis because the research design involved predictor variables measured on a nominal scale (personality type - E:I/S:N/T:F/J:P; education - advanced, baccalaureate, associate degree; ethnicity - white, African American, other; age range - 27-38, 39-48, 49-58 and 59 + years of age) and multiple criterion variables (instructional methods: lecture, online and simulation) measured on an interval scale (O'Rourke et al., 2005). MANOVA assessed the effect of the predictor variables on all of the criterion variables simultaneously (O'Rourke et al., 2005). For example, the means of the Extraverts (E) were compared with the means for lecture, then with the means of online, then with the means of simulation and so forth. The analysis examined each of the 8 types, education level, ethnicity, and age with the means for each of the instructional methods. MANOVA tests for the overall effect of personality type, education, ethnicity, and age on instructional preferences (O'Rourke et al., 2005).

The multivariate measure of association called Wilk's Lambda was used. Values range from 0 to 1 with those values nearest 0 indicating a strong relationship between the predictor variable and the multiple criterion variables (O'Rourke et al., 2005).

Significance was set at an alpha level of .05 for the *F* statistic. If the multivariate *F* statistic derived from the Wilk's Lambda is significant, then the univariate ANOVAs were examined to identify which criterion variable had a statistically significant *F* value (O'Rourke et al., 2005). If significance was found, for a given criterion variable, the "results

of a post hoc test such as Tukey's multiple comparisons test [were examined to] determine which pairs of groups are significantly different from one another" (O'Rourke et al., 2005, p. 280). Tukey was especially useful in groups containing unequal numbers of subjects (O'Rourke et al., 2005).

The information in the study records were kept strictly confidential. Data was stored securely in a locked room. No reference was made in oral or written reports that could link participants to the study. Unique identifying codes were used to link the different data collection forms. The participant codes were stored in a separate secure file.

Chapter Four
Results

Chapter four presents the descriptive and inferential statistics using the methodology described in the preceding chapter to answer the following research question.

Research Question: Do nurses' preferences for different instructional modalities (lecture, online, and simulation) differ by MBTI personality type, education, ethnicity, or age?

The results of the analysis are presented in five sections. In the first section, Description of Sample, descriptive statistics are provided for the sample, and comparisons are made with the North Carolina nursing workforce on education, ethnicity and age. The second section, Psychometrics of the *Learner's Evaluation of Instructional Methods* questionnaire, presents the reliability and Exploratory Factor Analysis (EPA) - construct validity of the instrument. The third section, Sample Reponses to Myers-Briggs Type Indicator (MBTI), provides description of the sample's responses to the MBTI. The fourth section, Comparison of Study Nurses to Populations of Nurses from Center for Applications of Psychological Type (CAPT)–MBTI Data Bank, contrasts the respondent sample to a comparable national sample of nurses from the CAPT data bank. The fifth section, Descriptive Statistics for Variables, provides descriptive statistics for the variables. The sixth section reports the Multivariate Analysis of Variance (MANOVA) which answers the research question determining if there were significant differences between preference for instructional methods and MBTI personality types, education, ethnicity, and age. The univariate analysis findings and the independent samples *t* test results are discussed and the results of the MANOVA are summarized at the conclusion of the sixth section.

Description of Sample

This study was done using a sample of convenience of nurses attending continuing education workshops entitled *Improving the Care of the Acutely Ill Elders* across three years (2003-2006). All 275 workshop attendees were solicited to participate in the study through a mailed packet that included a consent letter explaining the study and the three-part data collection instruments: *Learner's Evaluation of Instructional Methods* (see Appendix B, part I); demographic information (see Appendix B, part II); and instructions for completion of the online version of the MBTI- Form M (see Appendix B, part III). Returning the completed questionnaire connoted consent to be a participant in the study.

Of the 275 workshop attendees who were potential respondents, 104 were lost due to changes in postal addresses, email addresses, and/or phone numbers, reducing the target sample to 171. Eleven (11) female respondents withdrew from the study and no other descriptive data were available for these women. Follow-up was done with 66 non-responders through post-cards, emails, and phone calls. There were a total of 94 respondents, yielding a 55% response rate.

Sample Comparisons with North Carolina Workforce

Since the study participants were North Carolina nurses, the sample was compared to the workforce trends for North Carolina over 20 years from 1987-2006 for 81,308 nurses which included the time span of data collection for the study. The workforce data was organized by registered nurses (RNs) and licensed practical nurses (LPNs). Since both RNs and LPNs were represented in the study sample, the data were compared across both types of nurses.

Education Demographics.

The most commonly reported educational preparation for the study sample was a baccalaureate degree in nursing (n=30, 32%), which closely reflects the NC workforce (n=25,565, 31.4%) (Lacey & McNoldy, 2007). The sample population was composed of 32% with advanced degrees in contrast to the North Carolina's in which 6.6% hold a master's degree and .6% with doctorates, indicating this sample was more highly educated (Lacey & McNoldy, 2007). The study sample had fewer nurses with associate degrees, (n=23, 24%) than the NC workforce (n=34,668, 43%) (Lacey & McNoldy, 2007).

In summary, the study sample was overrepresented by participants who held advanced degrees. An explanation could be that several of the workshops were targeted to nurse educators who often are required to have advanced degrees. The sample was under represented by males. Otherwise, the study sample was comparable to that of North Carolina's nursing workforce during the data collection timeframe.

Ethnicity Demographics.

Whites represented 68% (n=65) of the study sample which was slightly less than that in the North Carolina workforce of RNs (85.2%) and LPNs (70.4%). African American ethnicity represented 21% (n=20) in the study, whereas African American nurses account for 9.5% of the RNs and 24.4% of LPNs in North Carolina. There were nine respondents (11%) across the other ethnicities in the study sample as compared to the 4.7% RNs and 4.5% LPNs who were non-white ethnicities in the NC nursing workforce.

Age and Gender.

For the analysis, the ages were categorized into age ranges: 27-38, 39-48, 49-58, and 59 years of age and over (see Table 4.1). The study sample had an average age of 51 (median=52) with a range of 26-74, compared to a mean age of 43.3 years for RNs and 46 years for LPNs (Lacey & McNoldy, 2007). The average age of nurses in the study was higher than the average age of nurses in North Carolina.

Table 4.1

Demographics: Age by Categories and Gender

	Gender					
	Female		Male		Total	
Age	%	N	%	N	%	N
27-38	9.57	9	1.06	1	10.64	10
39-48	18.09	17	1.06	1	19.15	18
49-58	46.81	44	0.00	0	46.81	44
59+	22.34	21	1.06	1	23.40	22
Total	96.81	91	3.19	3	100	94

Participants reflected the gender demographics of the nursing community in North Carolina being primarily female (n=91, 97%); however males were underrepresented at 3% in the study sample compared to 6.9% RN males and 5.3% LPN males in the 2006 North Carolina population (Lacey & McNoldy, 2007).

Psychometrics of the Learner's Evaluation of Instructional Methods Questionnaire

The purpose of this section is to present the reliability and construct validity of the *Learner's Evaluation of Instructional Methods* instrument determined by exploratory factor analysis (EFA).

Reliability of the Learner's Evaluation of Instructional Methods Questionnaire.

Reliability is the degree that an instrument consistently measures what it intends to measure with a relative absence of measurement errors (Kerlinger & Lee, 2000). While the instrument scale of 1-5 is not a true interval scale, according to O'Rourke, et al. (2005) in social science research, it is not unusual to treat this type of scale as a quasi-interval scale. Since the scale is treated as a quasi-interval scale, reliability was assessed by calculating the coefficient alpha (Cronbach, 1951). Reliability estimate for the lecture subscale was 0.89. Nunnally and Bernstein (1994) recommend the coefficient be .70 or greater, which was the case for this scale.

Exploratory Factor Analysis of the Learner's Evaluation of Instructional Methods Questionnaire - Construct Validity.

Exploratory factor analysis (EFA) was done to examine the construct validity of the instrument used in this study, *Learner's Evaluation of Instructional Method.* Construct validity examines the ability of the instrument to measure the psychological attributes and involves testing of hypothesized relationships (Kerlinger & Lee, 2000; Nunnally & Bernstein, 1994). Exploratory factor analysis is a step-wise data driven method to examine variables in a way to meet mathematical objectives to account for the most variance and to explain the "best fit" (Nunnally & Bernstein, 1994). EFA considers the correlations between every pair of items on a scale to determine the fewest factors that convey information about a larger number of underlying psychological constructs (Jaeger, 1990).

The instrument used for this study, *Learner's Evaluation of Instructional Methods,* was adapted from an instrument used to evaluate teaching effectiveness (Marsh, 1991). The

adaptation of the SEEQ from 9 factors to 4 factors was discussed in Chapter 3. In comparing the study instrument to the SEEQ, it was worthy to note that the factor structure determined by Marsh (1982) was mostly supported by the factor analysis in this study. The interesting difference was the factor "Relevancy" emerged as a combination of two of Marsh's factors referred to as "Breadth of Coverage" and "Examination/Grading". This difference may be due to the removal of two questions: "giving different points of view" and "tested content was emphasized" from each factor respectively. The remaining items grouped as a factor about relevancy.

Since the instrument was changed, an exploratory factor analysis to determine the underlying constructs in the revised instrument was done. The twelve items selected were originally focused on lecture. To gain information about online and simulation as well as lecture, the 12 lecture questionnaire items were modified with minor word changes to put the question into the context of online or simulation learning experiences. The same questions were used for lecture, online and simulation with the adaptation for contextual meaning across each modality.

Exploratory factor analysis using squared multiple correlations as prior communality estimates were done on the responses to the 12-item lecture questionnaire. The principal factor method was used to extract the factors, followed by a promax (oblique) rotation.

For interpretations of the rotated factor pattern in Table 4.2 an item was said to load on a given factor if the factor loading equaled to or was greater than .40 for that factor and it loaded at that level on only one factor (O'Rourke et al., 2005). To solve for the factors, the

interpretability criteria found in the statistical literature was also used to solve for the factors:

- Are there at least three variables (items) with significant loading on each retained factor?
- Do the variables that load on a given factor share some conceptual meaning?
- Do the variables that load on different factors seem to be measuring different constructs?
- Does the rotated factor pattern demonstrate "simple structure"?
    - Most of the variables have relatively high factor loading on only one factor, and near –zero loading for the other actors
    - Most factors have relatively high factor loading for some variables and near zero loading for the remaining variables.

(Hatcher, 1974, p. 85-86)

The factor solution for the 12-item lecture scale grouped into 3 factors. Factor 1, subsequently labeled Understanding (eigenvalue=5.13), accounted for 74% of the variance and included 4 items about learning (see Table 4.2). Factor 2, labeled Relevancy (eigenvalue=1.18), accounted for 17% of the variance and was composed of 5 items about how background material and current developments were made relevant to the learning (see Table 4.2). Factor 3, labeled Clarity (eigenvalue=0.67) accounted for 10% of the variance and was comprised of 3 items in which the clarity and consistency of the lecture was the construct (see Table 4.2). While the eigenvalue for factor 3 was less than one, it accounted for 10% of the variance and thus was kept; this is consistent with criteria found in the statistical literature (Suhr, 2009). Questionnaire items and corresponding factor loading are presented in Table 4.2. The inter-factor correlations were .44 for factors 1 and 2, .54 for factors 1 and 3, and.59 for factors 2 & 3 (see Table 4.2).

Table 4.2

Learner's Evaluation of Instructional Methods: Lecture Questionnaire Items and Corresponding Factor Loadings from the Promax (Oblique) Rotated Factor Pattern (Standardized Regression Coefficients)

#	Questionnaire Item	Factors 1 Understanding	2 Relevancy	3 Clarity
1	Lecture is intellectually challenging and stimulating.	.62*	.15	.06
2	Through lecture, I learn material I consider valuable.	.87*	-.02	-.05
3	My interest in subjects has typically increased as a consequence of lecture.	.82*	.01	.00
4	Through lecture, I learned and understood the subject materials presented.	.65*	-.06	.16
5	Lecture class expectations were clear.	.11	-.13	.79*
6	Lecture class materials were well prepared and carefully explained.	-.01	.12	.76*
7	Lecture class objectives agreed with what was actually taught.	.06	.10	.74*
8	In lecture, the implications of the material covered were contrasted with clinical practice.	.05	.66*	-.04
9	Background materials for concepts were presented in lecture.	.14	.63*	.11
10	Current developments in the field were discussed adequately in lecture.	-.01	.43*	.36
11	In lecture, feedback on my performance was valuable.	.02	.76*	-.12
12	Methods of assessment were fair and appropriate in lecture classes.	-.11	. 61*	.18

Note. N = 89, missing=5
*factor loading ≥.40
Cronbach coefficient alpha =.89

Variance	Factors 1	2	3
Eigenvalue	5.13	1.18	0.67
Percent of Explained Variance	0.74	0.17	0.10
Cumulative Percent of Explained Variance	0.74	0.91	1.00
Inter- Factor Correlations			
Factor 1	1.00		
Factor 2	.44	1.00	
Factor 3	.54	.59	1.00

Summary.

In summary, the instrument had evidence of a strong factor structure prior to the adaptations for this study. Again, because the questions were essentially the same except for context, the factor analysis was only done on the lecture questions. Marsh's factor "Learning/Value" and "Organization" paralleled this study's factor of "Understanding" and "Clarity" respectively. The two factors "Breadth of Coverage" and "Examinations/Grading" collapsed into one factor that this investigator called "Relevancy". In conclusion, the factor analysis supported the factor structure found by Marsh (1982) for two of the four factors used in this study. The changes in the items and the deletion of select questions may have contributed to the other two factors collapsing to one factor in the current study.

Sample Reponses to Myers-Briggs Type Indicator (MBTI)

The Myers-Briggs Type Indicator (MBTI) was used to assess personality type for the sample. The MBTI has four dichotomies which are assessed to measure mental processes (Myers et al., 1998). The sample distribution across the four MBTI dichotomies: Extraversion/Introversion (E/I), Sensing/iNtuition (S/N), Thinking/Feeling (T/F), and Judging/Perceiving (J/P) are summarized in Table 4.3. People have skills in both components of the dichotomies but prefer one over the other (Lawrence, 1997).

The E-I dichotomy describes how people like to focus their attention. The sample nurses were essentially equally divided between preferring an externally stimulating environment identified as Extraversion (E: n=43, 49.43%) and preferring to gain their energy from an inward focus known as Introversion (I: n=44, 50.57%) (Myers et al., 1998).

Extraverts gain energy when they have an outward focus and are drained when they are in introverted situation (Lawrence, 1997). Likewise Introverts are energized when they have the opportunity to be reflective and tend to feel drained when faced with situations that demand an outward focus (Lawrence, 1997).

Sensing and iNtuition are ways to describe the way we become aware or our perception (Lawrence, 1997). In terms of learning, the S-N dichotomy reflects how knowledge is taken in by the learner. INtuitive learners are more deductive, taking in the overall picture and using hunches to see beyond the facts to possibilities (Lawrence, 1997; Myers et al., 1998). The nurses in this sample were more Sensing (S: n=50, 57.47%) than iNtuitive (N: n=37, 42.53%) (see Table 4.3). Sensing types are inductive and like to take in what is actually happening, paying attention to the specific details with a more practical focus (Myers et al., 1998).

Thinking and Feeling are ways in which we reason or make judgments (Lawrence, 1997). The sample nurses tended to prefer Feeling (F: n=57, 65.52%) rather than Thinking (T: n=30, 34.48%) (see Table 4.3). When making a decision, Feeling types are empathetic and consider personal factors that are important to themselves as well as others. They value people and treat them as unique individuals. The effect on the feelings of others is considered when the person using Feeling judgment makes decisions (Lawrence, 1997). Thinking types use a more logical and objective approach to problem solving looking for cause and effect (Lawrence, 1997). They are known to be fair and adhere to standards (Myers et al., 1998).

Table 4.3

Myers-Briggs Type Indicator (MBTI) Dichotomies and Sixteen Complete Types Distribution for Study Nurses (n=87, missing=7)

MBTI Dichotomies		MBTI Sixteen Complete Types			
Extraversion n=43 (49.43%)	Introversion n=44 (50.57%)	ISTJ n=9 (10.34%)	ISFJ n=15 (17.24%)	INFJ n=2 (2.30%)	INTJ n=6 (6.90%)
Sensing n=50 (57.47%)	iNtuition n=37 (42.53%)	ISTP n=1 (1.15%)	ISFP n=5 (5.75%)	INFP n=5 (5.75%)	INTP n=1 (1.15%)
Thinking n=30 (34.48%)	Feeling n=57 (65.52%)	ESTP n=1 (1.15%)	ESFP n=4 (4.60%)	ENFP n=11 (12.64%)	ENTP n=5 (5.75%)
Judging n=54 (62.07%)	Perceiving n=33 (37.93%)	ESTJ n=4 (4.60%)	ESFJ n=11 (12.64%)	ENFJ n=4 (4.60%)	ENTJ n=3 (3.45%)

Note. E= Extraversion, I =Introversion, S=Sensing, N= iNtuition, T=Thinking, F=Feeling, J=Judging, P=Perceiving

Judging and Perceiving represent how people deal with the outer world. If a person prefers Judging, Thinking or Feeling is evident in their external life while their perceiving work of Sensing or iNtuition is done quietly (Lawrence, 1997). The sample nurses preferred Judging (J: n=54, 62.07%) rather than Perceiving (P: n=33, 37.93%) (see Table 4.3). Judging learners enjoy a more structured, organized learning environment. They like adhering to schedules and getting things done prior to moving on to the next thing. If a person prefers Perceiving, Sensing or iNtuition is evident in their external life while their judging work of Thinking or Feeling is done quietly (Lawrence, 1997). Perceiving types like to experience life through spontaneous and flexible schedules. They like to be open to last-minute opportunities and consider themselves to be adaptable (Myers et al., 1998).

The various combinations of the four MBTI dichotomies result in sixteen personality “types” with generalized characteristics and values. These types are presented as a person’s

MBTI type and are listed as four letter combinations. All sixteen of the complete type combinations were represented in the study sample, and the distribution can be found in Table 4.3. Four of the sixteen complete types ISTJ, ISFJ, ENFP, and ESFJ accounted for 53% of the type distribution in the study sample (see Figure 4.3). The highest percentage of the study nurses were ISFJ (n=15, 17.24%) a personality type that is often found in health care occupations where people like to help people behind the scenes (Hammer, 1993). The complete MBTI types of ENFP and ESFJ were the next highest occurring types at 13% each (n=11). Three of the sixteen types (ISTP, INTP, and ESTP) had only one subject each, which represented 1.15% of the sample.

Comparison of Study Nurses to Population of Nurses from CAPT-MBTI Data Bank.

To determine how the study sample compared to the population of nurses, the sample's type distribution was compared to a sample of registered nurses available from the CAPT – MBTI Data Bank (1986). This data bank consists of all the MBTI records (n= 59,784) with usable occupational codes submitted to CAPT for scoring between 1971 and 1984. The data bank has been used in the preparation of several key publications such as the *MBTI Career Report Manual* (Hammer & Macdaid, 1992). While the source was *CAPT Atlas of Type Table* (1986), they are found to be still viable after more than two decades (J. R. Johnson, personal communication, February 12, 2009). Macdaid has done follow-up studies on the Atlas Type Tables and found that they held true unless something changed in the field that might affect type, which has not been the case for nursing (J. R. Johnson, personal communication, February 12, 2009). So the type tables offer viable comparisons for the study's sample of nurses.

The comparison sample was of 1880 registered nurses. There is no further data about nursing specialty, gender, race or educational level from these archived data banks. To determine how the study sample compared to the population of nurses, the sample's type distribution was compared to a sample of 1880 registered nurses from the CAPT-MBTI Data Bank using the Selection Ratio Type analysis (Granade & Myers, 1987). The selection ratio (*I*) is the self-selection index and represents the ratio of the percent of type in the sample compared to the percent of type in the registered nurse sample (Granade & Myers, 1987). When the selection ratio equals one then the study sample and registered nurse sample have the same distribution of type. When the selection ratio is greater than one, there are more subjects in the study sample who selected that particular type compared to the registered nurse sample and conversely when the section ratio is less than one, there are fewer subjects in the study sample who prefer this type than there are in the registered nurse sample (Granade & Myers, 1987). As compared to the registered nurses' sample there are no overall statistically significant differences between any of the four dichotomous preferences. In four of the personality type factors: iNtuition, Sensing, Feeling, and Perceiving, the study sample had a slightly higher representation than the registered nurse sample (E, $I = 1.07$, S, $I = 1.01$, F, $I = 1.01$, and P, $I = 1.02$). The sample nurses' type preferences were slightly lower than the registered nurses' sample for Introversion ($I = 0.94$) while iNtuition, Thinking and Judging were essentially the same in both samples ($I = 0.99$). Figure 4.2 provides visual comparisons of the MBTI dichotomies for the study sample and the CAPT-MBTI RN sample.

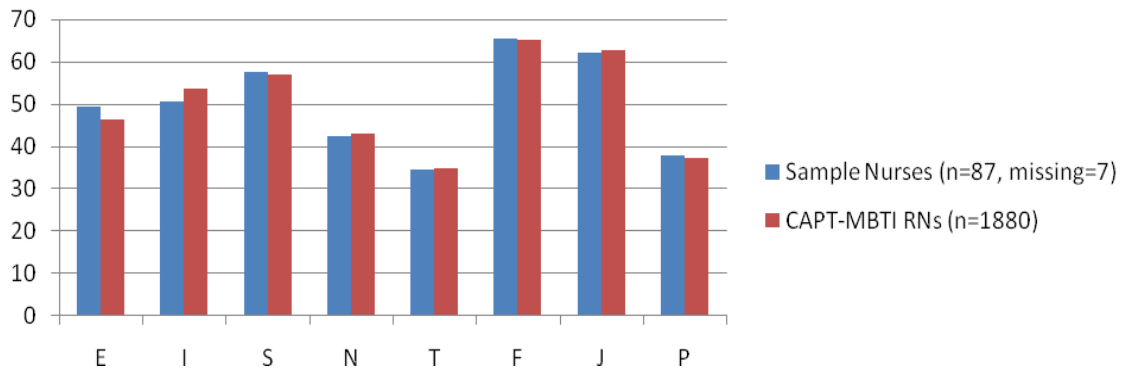

Figure 4.2. MBTI Dichotomy Distributions for Sample Nurses and CAPT RNs.

Figure 4.3 shows the comparisons of the complete MBTI types with the study sample and the CAPT-MBTI RN sample. The two samples were comparable for the most prevalent four of the sixteen complete types ISTJ, ISFJ, ENFP, and ESFJ (see Figure 4.3). The noted increased variance in several of the other 12 complete types may be due to the smaller study sample. In summary, the study nurses' type preferences were comparable to the larger population of RNs by approximating the type distribution of the CAPT-MBTI RN sample on the dichotomies with similarity in the most prevalent complete types with differing levels of variance for the remaining of the sixteen type distribution.

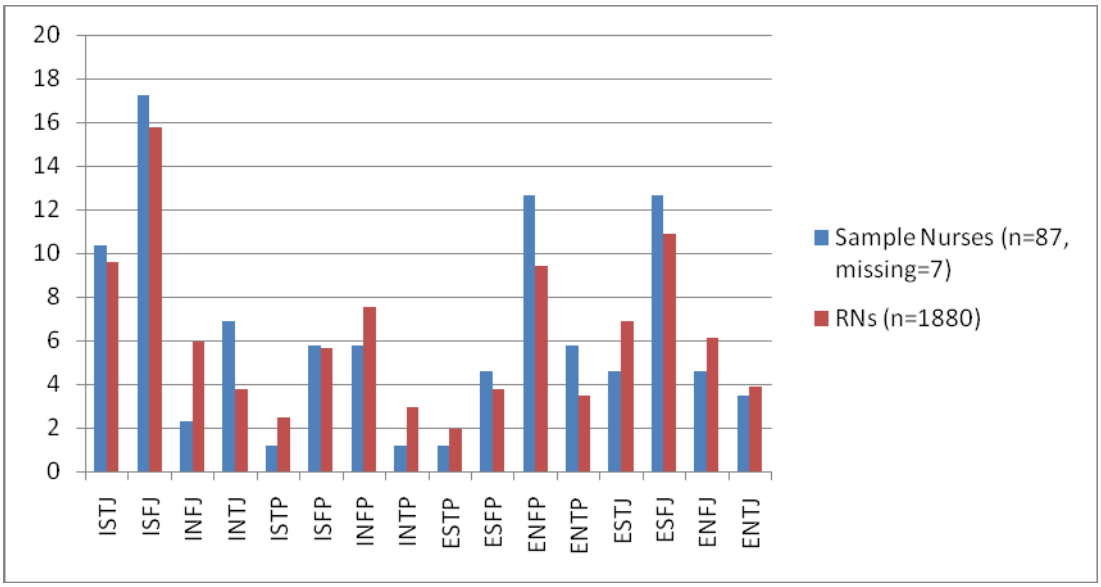

Figure 4.3. MBTI Sixteen Type Distributions for Sample Nurses and CAPT RNs.

Descriptive Statistics for Variables

This study examined whether the learners' preference for teaching modality (lecture, online, or simulation) were different for the reported MBTI type preferences, education, ethnicity, or age. On the *Learner's Evaluation of Instructional Methods* questionnaire, participants were asked to circle the number that best described their experiences with various components of lecture, online and simulation with 5= Strongly Agree and 1=Strongly Disagree. Descriptive statistics for each of these questions for lecture, online and simulation is found in Table 4.4. It is notable that the standard deviations were large which indicates there was considerable variance among the sample. The scale questions found in Appendix B-part I inquire about the characteristics of the instructional modalities. For example, the first question allows participants to select which response (strongly agree (5) to strongly disagree (1)) best describes their experiences with lecture being "intellectually challenging and

Table 4.4

Means and SDs for Lecture, Online and Simulation Questionnaires by Each Question

Question #	Teaching Modality	N	Mean	SD
1	Lecture	85	3.906	0.796
	Online	84	3.607	0.919
	Simulation	84	4.452	0.648
2	Lecture	85	4.223	0.643
	Online	84	3.845	0.857
	Simulation	84	4.369	0.690
3	Lecture	85	3.988	0.794
	Online	84	3.631	0.991
	Simulation	84	4.167	0.879
4	Lecture	83	4.120	0.593
	Online	84	3.821	0.779
	Simulation	84	4.357	0.652
5	Lecture	85	4.153	0.646
	Online	83	3.880	0.802
	Simulation	84	4.143	0.661
6	Lecture	85	4.129	0.593
	Online	84	3.845	0.799
	Simulation	84	4.155	0.736
7	Lecture	85	4.212	0.656
	Online	84	3.940	0.700
	Simulation	84	4.262	0.623
8	Lecture	85	3.788	0.788
	Online	83	3.614	0.853
	Simulation	84	4.226	0.766
9	Lecture	85	3.918	0.790
	Online	84	3.726	0.841
	Simulation	84	3.905	0.770
10	Lecture	85	3.906	0.825
	Online	84	3.690	0.905
	Simulation	84	4.036	0.842
11	Lecture	84	3.619	0.956
	Online	83	3.663	0.901
	Simulation	83	4.133	0.823
12	Lecture	84	3.726	0.782
	Online	83	3.759	0.820
	Simulation	84	4.143	0.730

Note. Likert Scale: 5= Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1-Strongly Disagree *Missing=9-11*

stimulating". The majority of the responses were positive with 47 nurses who selected "agree" and 17 who chose "strongly agree". Nineteen selected the "neutral" response and two individuals selected "strongly disagree". This spread out the responses and affected the standard deviations. This is evident for all 12 questions on each modality. While there may be some clustering of responses around agree and strongly agree when there are respondents who select strongly disagree, the standard distribution can be easily influenced when there are one or two extreme scores. The means and standard deviations for lecture, online and simulation can be found in Table 4.5.

Table 4.5

Means and Standard Deviations for Lecture, Online and Simulation

	N	Mean	SD	Minimum	Maximum
Lecture	85	3.98	0.51	2.5	5.0
Online	84	3.75	0.65	2.0	5.0
Simulation	84	4.20	0.55	3.0	5.0

MBTI Dichotomies and Instructional Modality

The statistical summary of response variables are displayed in Tables 4.6 through 4.9. Table 4.6 provides the means and standard deviations for the independent variable, MBTI dichotomies, by each response variable: lecture, online and simulation. There is little variance in means across all three modalities. Simulation was found to be preferred across all of the MBTI dichotomies; with lecture second and online the least preferred (see Table 4.6). The MANOVA was not found to be significant.

Table 4.6

Means and Standard Deviations for MBTI and Instructional Modality

	E N=41 (50%)	I N=41 (50%)	S N=48 (59 %)	N N=34 (41%)	T N=29 (35%)	F N=53 (65%)	J N=52 (63%)	P N=30 (37%)
Lecture	4.04 (0.50)	3.89 (0.53)	4.03 (0.54)	3.87 (0.48)	4.04 (0.45)	3.92 (0.55)	4.07 (0.46)	3.78 (0.56)
Online	3.79 (0.74)	3.73 (0.56)	3.85 (0.64)	3.63 (0.67)	3.73 (0.58)	3.78 (0.70)	3.87 (0.63)	3.56 (0.66)
Sim	4.16 (0.59)	4.22 (0.51)	4.31 (0.52)	4.02 (0.54)	4.11 (0.57)	4.23 (0.53)	4.26 (0.52)	4.06 (0.58)

Note. E= Extraversion, I =Introversion, S=Sensing, N= iNtuition, T=Thinking, F=Feeling, J=Judging, P=Perceiving
Standard Deviation in parenthesis below Means
N=82, missing=12

Education and Instructional Modality

Table 4.7 provides the means and standard deviations for the independent variable, education - advanced, baccalaureate and associate degrees, compared with each response variable - lecture, online and simulation. Regardless of the level of educational level, simulation was reported as the preferred instructional method. Additionally, across all education levels, lecture was the next preferred instructional modality. Finally, across all education levels, online learning was the least desired.

Table 4.7

Means and Standard Deviations for Education and Instructional Modality

	Advanced Degree N=24 (29%)		Baccalaureate N=29 (35%)		Associate Degree N=29 (35%)	
	M	SD	M	SD	M	SD
Lecture	4.04	0.47	3.86	0.44	4.00	0.61
Online	3.93	0.69	3.68	0.57	3.70	0.70
Simulation	4.28	0.55	4.07	0.52	4.24	0.57

Note. N=82, missing=12

Ethnicity and Instructional Modality

Table 4.8 provides the means and standard deviations by the independent variable, ethnicity: white, African American, or other compared with each response variable: lecture, online and simulation. African Americans rated simulation higher than the other ethnic groups. The highest mean score for lecture and online learning was among the "other" ethnic group.

Table 4.8

Means and Standard Deviations for Ethnicity and Instructional Modality

	White N=60 (73%)		African American N=13 (16%)		Other N=9 (11%)	
	M	SD	M	SD	M	SD
Lecture	3.87	0.51	4.19	0.54	4.25	0.36
Online	3.71	0.64	3.81	0.75	4.02	0.61
Simulation	4.10	0.55	4.48	0.53	4.36	0.41

Note. N=82, missing=12

Age and Instructional Modality

Table 4.9 provides the means and standard deviations by the independent variable *age* for each response variable: lecture, online and simulation. The ages of the participants ranged from 27 to 74 years. As a reminder, for analysis, the participants' ages were categorized into age ranges: 27-38, 39-48, 49-58, and 59 years of age and over. Across all age groups simulation was most preferred followed by lecture and online, respectively. The highest mean score for simulation was in the youngest age group, 27-38 years (*M*=4.48). The 27-38

years age group had the highest mean scores for all three learning modalities. The lowest mean score was for online learning in the age group, 39-48 years.

Table 4.9

Means and Standard Deviations for Age and Instructional Modality

	Age Range 27-38 N=9 (11%)		Age Range 39-48 N=16 (20%)		Age Range 49-58 N=37 (45%)		Age 59+ N=20 (24%)	
	M	SD	M	SD	M	SD	M	SD
Lecture	4.18	0.49	3.90	0.52	3.98	0.49	3.89	0.57
Online	4.09	0.68	3.72	0.79	3.75	0.61	3.66	0.60
Simulation	4.48	0.51	4.26	0.46	4.10	0.52	4.17	0.65

Note. N=82, missing=12

Multivariate Analysis of Variance (MANOVA)

Research Question: Do nurses' preferences for different instructional modalities (lecture, online, and simulation) differ by MBTI personality type, education, ethnicity, or age?

Multivariate analysis of variance (MANOVA) was used to answer this research question by determining the main effects of the categorical variables of personality type, education, ethnicity, or age on the multiple dependent quasi-interval variables: lecture, online and simulation.

This analysis involved four independent variables and three dependent variables. The operationalization of variables can be found in Table 4.10. The independent variables were

Table 4.10

Operationalization of Dependent and Independent Variables

Variable Label	Definition	Operationalization	Measurement
Dependent Variables			
Lmean	Mean of lecture questions L1-L12. Respondent's responses to the following Likert scale (on right) for each item 1-12 about lecture were summed and means were obtained.	5 = Strongly Agree 4 = Agree 3 = Neutral 2 = Disagree 1 = Strongly Disagree	Quasi-interval
Omean	Mean of online questions O1-O12. Respondent's responses to the following Likert scale (on right) for each item 1-12 about online learning were summed and means were obtained.	5 = Strongly Agree 4 = Agree 3 = Neutral 2 = Disagree 1 = Strongly Disagree	Quasi-interval
Smean	Mean of simulation questions S1-S12. Respondent's responses to the Likert scale (on right) for each item 1-12 about human patient simulation were summed and means were obtained.	5 = Strongly Agree 4 = Agree 3 = Neutral 2 = Disagree 1 = Strongly Disagree	Quasi-interval
Independent Variables			
MB1	Myers Briggs dichotomy Extraversion or Introversion	E = Extraversion I = Introversion	Nominal
MB2	Myers Briggs dichotomy Sensing or iNtuition	S = Sensing N = iNtuition	Nominal
MB3	Myers Briggs dichotomy Thinking or Feeling	T = Thinking F = Feeling	Nominal
MB4	Myers Briggs dichotomy Judging or Perceiving	J = Judging P = Perceiving	Nominal
Ed	Education – This variable provides the highest degree held at the time of the survey. The respondents' were asked to specify the subject in which the degree was granted.	1= Doctorate 2= Masters 3=Baccalaureate 4=Associate 5=Technical 6=High School 7=Other, please specify	Nominal
Ethnic	Ethnicity- This variable provides the respondent's ethnicity.	1=African American 2=Asian American 3=Euro-American 4=Hispanic 5=Native American 6=Other, please specify	Nominal
Age	This variable calculated the respondent's age at the time of the survey using the birth year. For analysis this ratio variable was collapsed to allow mutually exclusive categories for age creating a nominal value.	What is your birth year? ____ The age calculation was converted into a nominal variable using the following age categories: 27-38, 39-48, 49-58, and 59+	Nominal

personality type, education, ethnicity, and age. Personality type was measured using the MBTI as a nominal scale. The MBTI has four embedded scales: **E**xtraversion/**I**ntroversion (coded as MB1), i**N**tuition/**S**ensing (coded as MB2), **F**eeling/**T**hinking (coded as MB3), and **J**udging/**P**erceiving (coded as MB4). Education and ethnicity were nominal variables. Education was categorized into three levels coded by degree obtained: advanced, baccalaureate, or associate. Ethnicity was categorized into three levels: white, African American, or other, which included Asian, Hispanic and Native American. Age was collected as birth year so that age could be calculated as a continuous variable but for data analysis were collapsed into four categories: 27-38 years of age, 39-48 years of age, 49-58 years of age, and 59+ years of age, making age a nominal variable. The three dependent variables, lecture, online, and simulation, were measured on a quasi-interval scale (O'Rourke et al., 2005). The quasi-interval scale as described by O'Rourke, et al. (2005) is used in social science research when an assumption is made that there are equal differences between the scale values.

Results were analyzed using a MANOVA, between-groups design. The MANOVA simultaneously determined whether there was a statistically significant difference between mean ratings on the three instructional modalities and personality type, education, ethnicity, age and modality. Wilks' lambda was the multivariate analysis measure of association, where the smaller values indicated a stronger relationship between personality type, education, ethnicity, age, and modality (O'Rourke et al., 2005). Wilks' lambdas are reported on Table 4.11 and indicate weak relationships.

MANOVA for MBTI, Education, Ethnicity and Age

The MANOVA failed to find a significant multivariate analysis effect for instructional modality by MBTI, personality type, education, ethnicity, or age (see Table 4.11). There was no significant difference in the means of the MBTI dichotomies: Extraversion/Introversion, Sensing/iNtuition, Thinking/Feeling or Judging/Perceiving and the nurses' preference for either of the dependent variables: lecture, online, and simulation.

In summary, across the instructional modalities of lecture, online and simulation, there was no significant multivariate analysis effect for MBTI personality type, education, ethnicity, or age.

Table 4.11

MANOVA for Independent Variables: MBTI, Education, Ethnicity and Age

Variables	Wilks' Lambda	F Value	DF	Pr > F
Extraversion/Introversion (MB1)	0.93	1.71	3	0.17
Sensing/iNtuition (MB2)	0.97	0.80	3	0.50
Thinking/Feeling (MB3)	0.93	1.83	3	0.15
Judging/Perceiving (MB4)	0.94	1.53	3	0.22
Education	0.94	0.72	6	0.64
Ethnicity	0.86	1.77	6	0.11
Age	0.85	1.23	9	0.28

ANOVA for Lecture by MBTI Dichotomies, Education, Ethnicity and Age.

The univariate analyses were examined and were interpreted cautiously since the multivariate analysis results were not significant. A significant univariate effect for personality type and modality was found for lecture. There was a small effect size (F=1.90, p=.05). The R^2 statistic, which measures the extent of the treatment effect, reveals that 23% of the variance for lecture is accounted for by personality type, education, ethnicity, and age. This indicates a weak relationship between the independent variables and lecture. The statistics for the univariate analysis of variance for lecture are found in Table 4.12. There was a significant effect for lecture and the personality type of Extraversion/Introversion (F=3.66, p=.05) and for the personality type of Judging/Perceiving (F=4.19, p=.04). Participants with

Table 4.12

ANOVA for Lecture by MBTI Dichotomies, Education, Ethnicity and Age

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Etraversion/Introversion	1	0.867	0.867	3.66	0.05*
Sensing/iNtuition	1	0.076	0.076	0.32	0.57
Thinking/Feeling	1	0.182	0.182	0.77	0.38
Judging/Perceiving	1	0.993	0.993	4.19	0.04*
Education	2	0.045	0.022	0.09	0.91
Ethnicity	2	1.095	0.547	2.31	0.11
Age	3	0.689	0.230	0.97	0.41

Note. * $p < .05$

Extraversion/Introversion and Judging/Perceiving had different opinions regarding lecture. For Extraversion and Introversion, the Tukey's HSD (honestly significant difference) test showed no significant difference, but there does appear to be some directionality. The Extraverts (M=4.04) rated lecture slightly higher as a modality than the Introverts (M=3.89) (see Table 4.6). For the Judging and Perceiving learners, while the multivariate analysis was not significant, the univariate analysis significance was confirmed by the post hoc Tukey's HSD test for Judging and Perceiving. Judging learners rated lecture significantly higher (Tukey's HSD test mean 4.07) than the Perceiving learners (Tukey's HSD test mean 3.78). Sensing and iNtuitive learners did not demonstrate a significant difference between groups for lecture with the follow-up statistic of Tukey's HSD test. Likewise, Tukey's HSD test confirmed the univariate analysis statistic of no difference between groups for lecture with Thinking and Feeling learners.

ANOVA for Online by MBTI Dichotomies, Education, Ethnicity and Age.

There were no significant univariate analysis effects for personality type and online learning (F=1.16, p=0.33). Personality type, education, ethnicity, and age accounted for 15% of the variance (R^2=0.15) in preference for online learning. Again, there was a weak relationship between the independent variables and the modality. The statistics for the univariate analysis of variance for online are found in Table 4.13. Tukey's HSD test confirmed the univariate analysis for Extraverts and Introverts as well as Sensing and iNtuitive learners, indicating that there was not a significant difference between groups for online learning. While there was a significant univariate analysis, Tukey's HSD test did not

support a difference between groups for either Sensing and iNtuitive or Thinking and Feeling. Tukey's HSD test showed that there were no significant differences between the subjects who were Extraverted type or Introverted Type in the way they preferred to focus their attention outwardly or inwardly. For Judging and Perceiving learners, Tukey's HSD test revealed a significant difference between Judging (*M*=3.87) and Perceiving (*M*=3.56), but it was non-conclusive (see Table 4.6). The directionality revealed Judging learners rated online learning higher than the Perceiving types.

Table 4.13

ANOVA for Online by MBTI Dichotomies, Education, Ethnicity and Age

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Extraversion/Introversion	1	0.523	0.523	1.25	0.27
Sensing/iNtuition	1	0.719	0.719	1.72	0.19
Thinking/Feeling	1	0.150	0.150	0.36	0.55
Judging/Perceiving	1	0.863	0.863	2.06	0.16
Education	2	1.151	0.576	1.37	0.26
Ethnicity	2	0.055	0.028	0.07	0.94
Age	3	1.074	0.358	0.85	0.47

ANOVA for Simulation by MBTI Dichotomies, Education, Ethnicity and Age.

A significant univariate analysis effect for personality type and modality was found for simulation. There was a larger, albeit still small, effect size (*F*=2.03, *p*=.04). The R^2

statistic revealed that 24% of the variance was accounted for by personality type, education, ethnicity, and age for simulation. This indicated a weak relationship between the independent variables and simulation. Statistics for the univariate analysis of variance for simulation are found in Table 4.14. There was a significant effect between simulation and race (F=3.49, p=.04) (see Table 4.14). While the multivariate analysis was not significant, the follow-up statistics were found to be significant. Tukey's HSD test confirmed the univariate analysis results, indicating that there was a significant difference between Sensing (M=4.31) and iNtuitive (M=4.02) type learners (see Table 4.6). The Sensing learners rated simulation higher than the iNtuitive learners. These results have to be considered in the context that the overall model was not significant. Tukey's HSD test revealed no significant difference between Thinking and Feeling learners when rating simulation.

Table 4.14

ANOVA for Simulation by MBTI Dichotomies, Education, Ethnicity and Age

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Extraversion/Introversion	1	0.015	0.015	0.06	0.81
Sensing/iNtuition	1	0.408	0.408	1.56	0.22
Thinking/Feeling	1	0.699	0.699	2.67	0.11
Judging/Perceiving	1	0.230	0.230	0.88	0.35
Education	2	0.526	0.263	1.00	0.37
Ethnicity	2	1.83	0.914	3.49	0.04*
Age	3	1.864	0.621	2.37	0.08

Note. * $p < .05$

Independent samples t test

Given the univariates suggested there might be a relationship that was not found with the MANOVA analysis, the data was further analyzed using independent-samples *t* tests. The analysis revealed a significant difference between the two groups Sensing and iNtuition for the simulation modality (see Table 4.15) and a significant difference between the two groups Judging and Perceiving for lecture and online (see Table 4.16). The analysis failed to reveal significant differences between the MBTI dichotomies of Extraversion and Introversion (see Table 4.17) or Feeling and Thinking (see Table 4.18).

The analysis revealed a significant difference between the two groups Sensing and iNtuition for simulation modality (t (82)=-2.26; p<.05). The sample means are displayed in Table 4.15, which showed that Sensing individuals were significantly higher on preference for the simulation modality than iNtuitive individuals (Sensing, M=4.31, SD=0.52; iNtuition, M=4.04, SD=0.55).

Table 4.15

Independent samples t test: MBTI iNtuition and Sensing and Instructional Modality

	iNtuition	Sensing	*t*	*df*
Lecture	3.91	4.03	-1.07	83
	(0.48)	(0.54)		
Online	3.62	3.85	-1.59	82
	(0.65)	(0.64)		
Simulation	4.04	4.31	-2.26*	82
	(0.55)	(0.52)		

Note. Standard Deviation in parenthesis below means.
*= p < .05

The analysis revealed a significant difference between the two groups of Judging and Perceiving for lecture modality (t (83)=2.29; p<.05), and between the two groups of Judging and Perceiving for online modality (t (82)=2.26; p<.05). The sample means are displayed in Table 4.16, which shows that Judging nurses were significantly higher on preference for the lecture modality than were Perceiving nurses (Judging, M=4.07, SD=0.46; Perceiving, M=3.81, SD=0.56). Table 4.16 shows that the sample means for Judging nurses were significantly higher on preference for the online modality than those for Perceiving nurses (Judging, M =3.87, SD=0.63; Perceiving, M =3.55, SD=0.64).

Table 4.16

Independent samples t test: MBTI Judging and Perceiving and Instructional Modality

	Judging	Perceiving	*t*	*df*
Lecture	4.07 (0.46)	3.82 (0.56)	2.29*	83
Online	3.87 (0.63)	3.55 (0.64)	2.26*	82
Simulation	4.26 (0.52)	4.08 (0.58)	1.49	82

Note. Standard Deviation in parenthesis below means.
*= p < .05

For all other MBTI dichotomies, the analysis failed to reveal a significant difference between the groups; nurses demonstrated preferences quite similar to those in the opposite dichotomy for each of the instructional modalities (see Tables 4.17 and 4.18). Whether the nurses indicated they were Extraverts or Introverts, they had similar preferences for the instructional modality as did those who indicated they were Feeling or Thinking.

Table 4.17

Independent samples t test: MBTI Extraversion and Introversion and Instructional Modality

	Extraversion	Introversion	*t*	*df*
Lecture	4.05	3.91	1.26	83
	(0.50)	(0.52)		
Online	3.79	3.72	0.49	76.4
	(0.74)	(0.56)		
Simulation	4.18	4.21	-0.25	82
	(0.59)	(0.50)		

Note. Standard Deviation in parenthesis below means.

Table 4.18

Independent samples t test: MBTI Feeling and Thinking and Instructional Modality

	Feeling	Thinking	*t*	*df*
Lecture	3.79	3.89	-0.97	83
	(0.55)	(0.44)		
Online	3.58	3.51	0.24	82
	(0.69)	(0.58)		
Simulation	4.10	3.89	1.05	82
	(0.53)	(0.57)		

Note. Standard Deviation in parenthesis below means.

Summary

In this sample no overall statistical significant differences for the multivariate analysis were found in nurses' preference for lecture, online and simulation regardless of the MBTI dichotomies, education, ethnicity, and age. There was no significance found in the multivariate statistical analysis. However, there were two main findings in the univariate analysis. There was a significant difference between the Extraversion and Introversion types, for the preferred instructional modality. Extravert nurses demonstrated a higher preference

than Introvert nurses for the instructional method of lecture, which was supported directionally in the post hoc Tukey's HSD test. Secondly, there was a significant difference between Judging nurses and Perceiving nurses for lecture, in which Judging nurses demonstrated a greater preference and this was confirmed by the post hoc Tukey's HSD test. The univariates were supported by the *t* test differences between Sensing and iNtuition for the simulation modality and between Judging and Perceiving for lecture and also online instructional delivery method.

It was interesting to note that across all three methods: lecture, online and simulation, Judging nurses rated the instructional methodology higher than Perceiving nurses. While race emerged in the univariate analysis as significant, Tukey's HSD post hoc test did not find a difference between the groups. It was decided that this was a statistical artifact due to the limited sample size. Across the three modalities of lecture, online and simulation, neither education, nor ethnicity, nor age made a difference, confirmed by the univariate analysis and the Tukey's HSD post hoc tests.

Chapter Five
Conclusions

Introduction

The purpose of this study was to examine whether nurses' preferences for instructional modality (lecture, online and simulation) varied by differences in personality type, education, ethnicity, or age. The multivariate analysis results of this study failed to demonstrate a significant relationship between preference for instructional modalities, personality types, and demographics. This chapter will discuss the significant univariate analysis findings which must be considered cautiously given the lack of significance in the multivariate analysis. To further explore the findings highlighted by the univariate analysis, independent sample *t* test were performed and significant results will be discussed along with the univariate analysis. Key findings in relation to relevant literature will be discussed. Implications for practice, strengths and limitations of the current study, and suggestions for future research will also be discussed.

Sample Comparisons with the Myers Briggs Type Indicator (MBTI)

The study sample approximated the dichotomy distributions for the CAPT-MBTI comparison RN sample on all dichotomies (see Figure 4.2). The distribution of the study sample across the sixteen personality types was comparable to the CAPT-MBTI RN comparison sample. In the comparison sample, there were four primary complete types that emerged: ISFJ, ESFJ, ISTJ, and ENFP. The first and second most prevalent complete types were ISFJ and ESFJ respectively for both the study sample and the comparison sample. The next two most prevalent complete types for both samples were ISTJ and ENFP, with the

study sample having more ENFP types followed by ISTJ in prevalence as compared to the CAPT-MBTI RN comparison sample that had more ISFJ followed by ENFP (see Figure 4.3).

The personality types for nurses in the study sample are similar to those reported in the literature. Bean and Holcombe (1993) found that the ISFJ was the dominate personality type among their sample of registered nurses. Van Ham (1994) found that there were more Thinking types among nurse managers than among staff nurses who were more likely to be Feeling. While the study sample was a mix of nurse educators and staff nurses, the majority were Sensing and Feeling which is comparable to the staff nurses in Van Ham's study. Gambles, et al. (2003) found their sample of nurses to be Extraverted. This study's sample is evenly distributed between Extraversion (49.43%) and Introversion (50.57%) which was also found by Horstein (1995) in a nursing sample.

The demographics of the study sample were compared to the North Carolina nursing workforce in terms of education, ethnicity, and age. The study sample was more highly educated than the North Carolina workforce which may be explained in two ways. First, some of the workshops were targeted to nurse educators who often hold advanced degrees. Secondly, it is surmised that those with higher levels of education continue to seek additional educational offerings and hold positions that afford them greater opportunities and financial resources to attend continuing education programs. Whites were underrepresented in the study sample in comparison to the NC nursing workforce. Other ethnic groups in the sample approximated the North Carolina workforce. The age of nurses in the study sample was greater than in the North Carolina workforce. This may be related to the percentage of nurse

educators in the study sample. Nurses usually obtain nurse educator positions after years of experience.

Research Question: Do nurses' preferences for different instructional modalities (lecture, online, and simulation) differ by MBTI personality type, education, ethnicity, or age?

Multivariate Analysis of Variance (MANOVA)

The multivariate analysis results of this study failed to demonstrate a significant relationship between preference for instructional modalities, personality types, and demographics. Possible explanations for the lack of significance may be due to the study's design marginally meeting the assumptions underlying multivariate analysis of variance. These assumptions include: level of measurement, independent observations, random sampling, multivariate normality, homogeneity of covariance matrices (O'Rourke et al., 2005). Each of these will be discussed below.

The level of measurement for MANOVA requires that each criterion variable be assessed on an interval or ratio level of measurement (O'Rourke et al., 2005). The criterion (dependent) variable of Instructional Method was measured on a quasi interval scale (Likert scale from 1-5). There was very little variance between the means for the modalities and very large standard deviations limiting the ability of the statistical test to reveal difference. The predictor (independent) variable should be at a nominal or categorical and the independent variable for this study fit this criterion (O'Rourke et al., 2005). The assumption of independent observations was met, where an observation is not dependent on the observation

in another group, across respondents (O'Rourke et al., 2005).

The assumption of random sampling was not met. The sample was drawn from a group of nurses practicing in the field of gerontology with select workshops targeting nurse educators. This study's sample of convenience did not meet the underlying assumption of random sampling for the MANOVA. Furthermore, the failure to detect difference may be related to the small sample size.

The assumption of multivariate normality was not achieved. The scores on the instructional modality (dependent variables) did not have a normal distribution. O'Rourke, et al. (2005) state that "when the data are platykurtic (form a relatively flat distribution), the power of the test is significantly attenuated" (p. 303). The MANOVA did not have the power to detect an actual deviation from the null hypothesis and a Type II error occurred (Agresti & Finlay, 1997).

The assumption of homogeneity of covariance matrices where the variance of E/I, for example, who prefer lecture must equal the variance in S/N who prefer lecture and so forth (O'Rourke et al., 2005). It is notable that the standard deviations were large which indicates there was a lot of variance among the sample. O'Rourke, et al. (2005) acknowledge this is rarely satisfied in research however, it affects the power of the MANOVA. The effects on power possibility contributed to the lack of significance in the MANOVA.

While the multivariate analysis did not yield any significant findings, the results of the univariate analysis were significant. However, these findings must be considered cautiously given the lack of significance in the multivariate analysis.

Univariate and t test Analysis for Lecture

The data were examined in an effort to discover trends in relationships between preference for instructional modalities, MBTI personality types and demographic variables. The univariate analysis showed that the nurses with Judging (*M*=4.07, *SD*=0.46) personality type had a greater preference for lecture than the nurses with Perceiving (*M*=3.78, *SD*=0.56) personality type. This was supported with a significant *t* test. This directionality for lecture is consistent with the MBTI literature. Judging type individuals were found to prefer clearly structured learning experiences such as lecture that allow them to know where they are going and the expectations along the way (Myers et al., 2003). This type of structure is often found in the overview given at the start of a lecture and would appeal to the Judging types. Judging types also enjoy attending class and learning course content (Elliott & Sapp, 1988). Beishline and Homes (1997) found that students preferred to learn from the expert through lecture but wanted a mixed format including discussion and demonstrations. Several studies found students performed better when exposed to their preferred method (Beets & Lobinger, 2001; Ford & Chen, 2001).

The study sample was nearly equally divided between Extraversion (49.43%) and Introversion (50.57%). A significant univariate analysis effect for personality type and lecture was found with Extraverts (*M*=4.04, *SD*=0.50) preferring lecture more than Introverts (*M*=3.89, *SD*=0.53). This is contrary to what was expected based on the MBTI literature that shows Introverts have a preference for lecture formats that allow them to reflect as they learn (DiTiberio, 1996). Extraverts prefer collaborative, active experimentations. Myers and

associates (2003) stated that Extraverts can focus their attention when required; such as in lecture, but prefer interspersed activity. Lecture may be appealing to the Extravert because the external world (faculty) directs them on how to proceed and lecture can be very goal directed. In addition, lecture might be preferred because there is less effort and time to get information. It is very likely that the previous educational experiences of most nurses in the sample were in a lecture format. Nursing education programs typically present didactic content in lecture classes. Thus, familiarity with this method may have contributed to their preference for lecture; people tend to prefer the familiar versus the unfamiliar. The past experience in nursing education with lecture may have trained the Extraverts in this sample to adapt to this format. Again, the univariate analysis effect was small and conclusions need to be considered with caution.

Based on his review of numerous studies, Bligh (2000) concluded that while lecture was not more effective, it was as effective as any other method in teaching information. Charles and Mamary (2002) found that nurse practitioners preferred lecture type conferences, then self directed learning through print based materials, while interactive video conferences were least preferred. This was supported by Cobb (2004) who did a literature review to find that face to face continuing education was preferred. Several studies found that lecture and print-based tutorials were preferred (Andrusyszn et al., 2001; Buch & Bartley, 2002; Sadler-Smith & Riding, 1999). Smith (2001) found that older learners preferred instructor-led environments while younger learners preferred discussion and social interaction.

Several studies found that lecture alone was not appealing to learners (Beets & Lobinger,

2001; Beishline & Homes, 1997; Thompson & Sheckly, 1997). Students preferred a combination of discussion, interaction, and relevant content. Lecture was the preferred instructional modality reported in several studies (Buch & Bartley, 2002; Cobb, 2004; Sadler-Smith & Riding, 1999). In addition, those attending continuing education offerings preferred in-person classes (Charles & Mamary, 2002; Worthington & Clay, 1995).

In summary, the preference for lecture by Judging types and Extraverts found in this sample is consistent with the literature (Andrusyszn et al., 2001; Buch & Bartley, 2002; Cobb, 2004; Rezaei & Katz, 2004; Sadler-Smith & Riding, 1999; Worthington & Clay, 1995). Given that Judging and Extravert type nurses comprise the majority of the current sample, their preference for lecture may be experienced as an efficient way to obtain information that is seen as relevant and presented by an expert.

Univariate and t test Analysis for Online

Consistent with other studies, online was the least preferred instructional strategy reported in the current study (Berry, 2002; Worthington & Clay, 1995). The univariate analysis revealed no significant relationship between preference for online learning and MBTI type. The results of the independent samples *t* test revealed a significant relationship with Judging type nurses preferring online more than the Perceiving types, although there were no other differences noted for the MBTI personality types and the learners' preference for online learning. One explanation of this finding might be that Judging individuals have been reported to enjoy educational games and independent learning (Myers et al., 2003). Online learning is an independent learning activity that requires navigation within a web site,

which may resemble playing a computer game. In addition, the novelty of this approach to nursing education may have evoked some of the same excitement as playing a computer game, which may have increased the appeal to the Judging types.

Learners often select online options because of flexibility. The moderate cost of online learning contributes to its appeal. Andrusyszn, et al. (2001) found that issues of convenience were more important to a sample of nurses than instructional method or learning style. Thompson (1998) found that passive, trusting and emotionally stable learners succeed more often in distance education. Thompson also found that the distance education nurses wanted more autonomy in their education which parallels iNtuitive types. Aragon, et al. (2002) found that students in the online courses were more reflective and preferred abstract conceptualization compared to those in lecture; this is consistent with iNtuitive type preference (McCaulley, 1985).

Many studies did not show a difference in preference for online (including distance education) or lecture by personality type or learning style (Berry, 2002; DiBartola et al., 2001; Freeman & Tijerina, 2000; Gary et al. 2004; Harris et al., 2003; Mupinga, Nora, & Yaw, 2006). Even when online learning was the preferred instructional method, learning style did not predict preference (Fleming et al., 2003).

Conversely, several studies found that online learning was a preferred instructional modality (Buch & Bartley, 2002; Cicco, 2007; Federico, 2000; Fleming et al., 2003; Jeffries, 2001; Kelly & Schorger, 2002; Thiele, 2003; Workman, 2004). It is interesting to note that Workman (2004) found collaborative learners, whose personality traits are similar to

Extraverts and Sensing types according to Elliott and Sapp (1998), performed better in web-based learning versus CD-ROM programs. Kelly and Schorger (2002) found that Extravert, iNtuition, Thinking and Judging (ENTJ) personality types did best with online instruction.

In summary, the nurses in the current study rated online learning as their least preferred instructional modality. Nurses in the study were asked to rate their experience with online learning based on a one hour session in the workshop. In this session, they were introduced to a new website and were required to navigate through menus and screens to complete one online case study within an hour time frame. In some instances, nurses were assigned to the online learning sessions in groups of two or three persons who had to share one computer. This may have impacted their learning experience and appreciation for the online learning. In addition, there are varying levels of experience and comfort with computer technology. Nurses who are not accustomed to using the computer may have been uncomfortable with the online learning modality and, therefore, would have given it a lower rating.

As the technology and the delivery methods for web-based/online instruction continues to evolve and educators become more equipped to teach online, the appeal of online learning would be expected to increase. Online instruction can be designed to incorporate diverse instructional methods that can target a variety of learning styles (Berger et al., 1994; Clark, 1985; Friend & Cole, 1990; Rezaei & Katz, 2004). Understanding personality type and employing diverse teaching strategies within online education can benefit learners (Graff, 2003; Mupinga et al., 2006; Petracchi & Patchner, 2000). Cobb

(2004) postulated that online offerings were gaining popularity but the lack of computer skills and technical difficulties provided barriers. The lack of computer skill and/or internet access was found to be a barrier in this study and affected the response rate. This should be considered in future research design.

Univariate and t test Analysis for Simulation

A significant univariate analysis effect for personality type and modality was found for simulation. There was a larger, albeit still small, effect size (F=2.03, p=.04). The R^2 statistic revealed that 24% of the variance was accounted for by personality type, education, ethnicity, and age for simulation. Further analysis with the independent samples t test analysis showed that the nurses with Sensing (M=4.31, SD=0.52) personality type preferred simulation more than the nurses with iNtuitive (M=4.04, SD=0.55) personality type. It is interesting to note that for all MBTI dichotomies simulation was preferred followed by lecture then online, respectively (see Table 4.6). This was also true for all age categories with the 27-38 year old category of nurses rating simulation the highest of all the age groups (see Table 4.9). This youngest group of learners among the study sample represents those who are most familiar and comfortable with computer technology. This might be explained by their exposure to more advanced technology in teaching. The younger age group has had more opportunities for computer based, technology rich educational experiences in contrast to older colleagues. They have also been exposed to more technological developments in the work place and may be more at ease with the use of human patient simulators as a teaching tool.

Additionally, across all levels of education, nurses preferred simulation more than lecture and online (see Table 4.7). In contrast to those with lesser education, nurses holding advanced degrees demonstrated a stronger preference for simulation which may indicate that they see the advantages of simulation as a student centered interactive instructional strategy. Because many of the students were nurse educators, they may have been more familiar with simulation as an instructional modality. While all ethnic groups indicated a preference for simulation, African American nurses clearly rated this as their most preferred instructional modality (see Table 4.8). Simulation as an instructional method creates the context for the learner by using case-based scenarios to create the realism necessary to place the learner into the context of the learning; in this case, the context of patient care.

The preference for simulation among the nurses in the study may have been related to the interactive nature of the simulation sessions. There was direct interaction with the instructor who facilitated the case and with other workshop participants who were assigned to the same small group. The novelty of simulation technology to many of the learners may have enhanced its appeal as a learning modality. In addition, the “fun” factor involved in the sessions may have put the learners more at ease. While the simulation scenario and nursing actions were serious, there was some laughter interspersed throughout as the participants tried to work as a team to provide the best patient care.

The relationship between personality type and preference for simulation was demonstrated in this study. Sensing type nurses comprised 58% of the study sample; these nurses preferred simulation significantly more favorably than iNtuitive type nurses. Sensing

and iNtuition describe how people take in knowledge (Myers et al., 1998). Sensing learners prefer to follow standard operating procedures and the simulated clinical environments associated with simulation allow them to make connections to patient care policies and procedures. They like to verify concrete data by their senses. The realism of the simulator allows connections to be made as the learner assesses vital signs, listens to heart and lung sounds, and interviews the simulated "patient".

Coates, et al. (2003) found that students demonstrated better clinical management skills when taught using the human patient simulator than when using problem based learning. Sensing types like the more practical and applied teaching strategies frequently associated with active and experiential learning that simulation provides. They prefer more practical learning that is oriented to the present and concerned with facts.

Sensing types like to get the specifics first and move toward the big picture (Lawrence, 1997). Nurses are often gathering the details about the patient (the specifics) in order to put the big picture together. The hands on experience with the patient simulator allows learners to use their senses to see, touch, and manipulate the "patient' and the environment, providing them a sense of practicality and relevance to what they are learning. Simulation provides interactive learning within the context of a case study creating an appealing modality for Sensing learners.

Sensing individuals were significantly higher on preference for the simulation modality than iNtuitive individuals. INtuitive type nurses comprised 43% of the study sample. INtuitive types are divergent thinkers who consider many possibilities. They like to

gather data which they add to a scaffold of meaning they construct (Allen, 2007). The use of simulation could be frustrating for the iNtuitive learner. There is an urgency to implement interventions in a simulation that does not allow time for focusing on patterns, examining the meaning of data or clarifying ideas prior to putting them in practice (Myers et al., 1998).

There was no significant relationship between the MBTI type of Extraversion and Introversion and preference for simulation. The MBTI types of Extraversion and Introversion were almost equally represented in the current sample. Simulation incorporates many learning activities which appeals to both Extraverts and Introverts. In the simulation learning activity in this study, the nurses worked in groups to deliver nursing care to the simulated patient. In the debriefing following the simulation, they were allowed time to verbalize what they had learned and to reflect on their performance. Extraverts enjoy active learning and being stimulated by the external environment allowing trial and error of new ideas as they occur (Jensen, 1987; Lawrence, 1997; Myers et al., 2003). The experience of role playing, working in groups, and verbalizing their learning may have been a portion of the appeal of simulation for the Extravert which would be consistent with the findings of other authors (Lawrence, 1997; Keller, Whitaker, & Burke, 2001; Myers et al, 2003). From our understanding of Introverts, it would appear that simulation would not have been appealing. Unexpectedly, the mean scores indicating preference for simulation were higher for Introverts than for Extraverts. It can be hypothesized that being able to pool ideas of how to approach patient care from their internal resources and anticipating what might be needed within the simulated patient care scenario was appealing to the Introvert. The ability to

reflect about their actions during the debriefing immediately following simulation with access to the expert faculty member might have added to the appeal of simulation for Introverts.

A previous study found that older learners liked reflection and less hands-on; however nurses in the current sample favored simulation as a learning modality (Truluck & Courtenay, 1999). This might indicate that the older nurses find simulation as a learning modality transfers readily to the hands on nature of their work. This is consistent with the findings of Thompson and Sheckley (1997). In related work using simulated activities students demonstrated improvement in clinical management skills and exam performance (Coates et al., 2003; Vaidyanathan & Rochford, 1998).

In summary, simulation was well received by the nurses in this study as an instructional modality. It was the preferred instructional modality across MBTI types, education, ethnicity and age of the nurses. The nature of simulation as a learning experience incorporates elements of several learning modalities. It would seem that simulation appeals to this population of predominately Sensing, equally Extraverted/Introverted, older, and more educated nurses. Simulation was also found to appeal to younger nurses (27-38 year olds) and the African American subgroups.

Implications for Practice

Although the multivariate analysis did not demonstrate statistically significant relationships between MBTI personality type, education, ethnicity or age, there are important implications and insights for the practice of nursing education that can be gleaned from this

research investigation. Educators in nursing education programs and staff development educators in health care agencies are among those who can benefit from the study findings. The findings can be used to design educational offerings that appeal to the learners and enhance the learning experiences. Those who stand to gain the most are the learners themselves who will participate in educational sessions and programs provided by the nurse educators.

Faculty in academic nursing programs, as well as staff development departments in healthcare agencies, are trying to improve the educational offerings for their learners. A goal is to optimize learning experiences using instructional methodologies that appeal to the learners and promote their interest and desire to learn. Learning preferences vary based on age levels and personality types, among other factors, Awareness of these factors can assist educators in planning and implementing effective learning experiences.

There is a significant amount of literature related to personality type and education (Ahn, 1999; Bezner & Boucher, 2001; DiTiberio, 1996; Lawrence, 1993). Several studies have examined the effect of matching personality type with academic aptitude and achievement, as well as matching teacher and student personality type (Ford & Chen, 2001; Keri, 2002; Weng, 2001).

Myers, et al. (2003) suggested that different people have distinct type structures. Designing any course or program offering requires an understanding of the target audience. Knowledge about personality type and instructional preferences can impact the design and success of educational offerings. Additionally, this information can inform future educational

endeavors targeted to nurses during times of severe staffing shortages and when resources are limited (e.g. taking the simulator to the agency to provide continuing education on site).

This study supports that educators do not have to tailor learning experiences for a particular personality type but rather, they can develop learning experiences incorporating many instructional modalities. While lecture continues to be well received, simulation was preferred and should be included when developing educational opportunities. Educators can offset the negative effects experienced by learners when the instructional method does not match their personality type by acknowledging that the content is best delivered via the simulation instructional method and, in turn, will provide the best experience for the learner (Sadler-Smith & Riding, 1999). Additionally, educators can assist learners to learn how to use their lesser preferred type dichotomy.

The structure of continuing education programs can be enhanced by the information gained from this study. Continuing education programs are attended by nurses who inevitably have a range of personality types, education levels, ethnic backgrounds, and ages. The results of this study suggest that incorporation of simulation may be an efficient, effective, and appealing instructional modality for this group.

The major implication of this study is that nurses, regardless of personality type or demographics found all three learning modalities favorable; however, there is strong data to support the use of simulation as an instructional modality for this population. Exposure to simulation allows nurses to develop skills that directly transfer to the clinical setting.

As academic institutions and health care agencies are exploring simulation as an

instructional strategy, they are often faced with cost versus benefit issues. Simulation technology can be very expensive. This study provides evidence of the appeal of this technology to learners, which helps to justify the purchase of the equipment. In addition, with the current economic crisis in the United States, attendance at continuing education programs is down. Health care agencies are providing less money to send their nursing staff to educational programs and nurses as individuals are less apt to attend educational programs that are self-pay. The use of simulation in continuing education programs can attract participants who enjoy this type of learning modality. The realism and hands on care of the simulation scenarios may enhance the clinical skills of nurses who attend, thus increasing the likelihood that health care agencies may want to send their employees to programs using simulation.

While nursing educators typically are not aware of the personality types of their learners, a general knowledge about the most prevalent types among nurses may help to guide planning of educational offerings to most effectively meet the needs of the learners. The highest percentages of the nurses in this study and in the national sample of CAPT-MBTI RN sample were ISFJ (see Figure 4.3). Awareness of the prevalent personality types in nursing populations and learning preferences as shown in this study can help educators in designing learning experiences that will be preferred by the nurses.

The findings of this study support the inclusion of lecture, online, and simulation as instructional modalities in nursing education. Additionally, working with the time limited nature of continuing education and with groups of experienced, practicing nurses, simulation

is the preferred modality for efficient and effective teaching.

Limitations of the Study

Sample

A major factor impacting the lack of significance of study findings was the size of the study sample. An additional limitation of this study was the bias introduced by using a sample of convenience and voluntary participation. Including only those nurses who self-selected to attend the workshops biased the sample. This study was limited to attendees of Continuing Education (CE) Department *Improving the Care of the Acutely Ill Elder* workshops at The University of North Carolina at Chapel Hill, North Carolina. The target audiences for the CE workshops were nurse educators, registered nurses, and licensed practical nurses who worked in long-term-care and acute geriatric nursing. Males were significantly underrepresented.

The cross-sectional sample was also a limitation. The study participants attended workshops that were offered over a three year period. Using a more longitudinal sample of nurses who attended workshops over more years would provide a larger, more representative sample of nurses who attend CE programs.

Methodological issues of design affected response rates. Nurses were asked to complete the online version of the MBTI. Lack of access to internet services and a large number of non-technological savvy nurses in the sample created unexpected limitations in data collection.

Instrumentation

The complexity and multidimensionality of learner preference was not adequately addressed due to the limits of the instrumentation. This study was limited by part I of the instrumentation *Learner's Evaluation of Instructional Methods.* While the instrument had been adapted from the *Student Evaluation of Educational Quality* (Marsh, 1982), that has strong psychometrics, it was changed for this study, which created unknowns regarding the strength of the instrument. The analysis revealed good validity and reliability. However, there continues to be a need for identification of better instrumentation to determine best practices in lecture, online and simulation as instructional methods. Adaptation of an instrument designed for faculty/course evaluation to determine learning preferences might not have been the most effective approach. Repeating the lecture questions with only a change in context for online and simulation did not yield the rich variance hoped to delineate differences in the three modalities.

Another limitation of this study is that it examined a small number of characteristics of learning preference. There are other factors that are likely to influence one's preference for instructional modality that were not included in this study.

Recommendations for Future Research

Recommendations for future research provide an avenue for reflection. The ability to pass on *lessons learned* is important to further professional knowledge and research. In this section, the various components of the research process: conceptual framework, research and methodology including instrumentation, sample, and analysis are reflected upon and

recommendations are made for future research.

Conceptual Framework

While examination of preferences for instructional modalities was the focus of this research, the outcome that learners can learn what they need to know is supported by Jones and Reichard (2003). Use of human patient simulators in nursing is relatively new. Research to understand the best way to integrate simulation into the curriculum would be helpful. Should the learning experiences be structured so that they are blended with lecture, case studies, and/or skill stations? Studying how to best utilize simulation, online and lecture when most learners are used to lecture would impact instructional design as well as learner satisfaction. A future study to examine the placement of simulation in the curriculum could assist faculty to plan leveled experiences. Research examining the performance outcomes for learners, provided different levels of preparation through lecture or online - varying from no materials to guided study questions or case study prior to the simulated experience, could be informative. The integration of simulation into nursing education is a rich field of study. The current study revealed simulation was a preferred instructional modality and future research could focus on how to better assist practitioners to transfer knowledge into practice using simulation.

In future research about simulation as an instructional strategy, Jeffries and Rogers (2007) theoretical framework, *The Nursing Education Simulation Framework* might be used. The framework components include teacher, student educational practices, simulation design characteristics and outcomes. This framework could be modified to include personality type

as a component of the student descriptors which are listed as: program, level and age. Schön's (1983) reflective practice might be included as an important outcome, adding to the existing list of: learning (knowledge), skill performance, learner satisfaction, critical thinking and self-confidence. Additional elaboration of Schön's reflection-in-action and reflection-on-action would be the reflection-before-action work done by Greenwood (1998).

Research Design and Methodology

Instrumentation.

One of the instruments used in this study, *Learner's Evaluation of Instructional Methods*, was originally developed by Marsh to evaluate teaching effectiveness of lecture. Through research, the items of the SEEQ have been balanced to reflect the components of teaching (Marsh, 1984). For this study the instrument was expanded to determine preference for instructional methods of lecture, online or simulation based on the assumption that a learner's preference for an instructional modality may be directly related to their perception of the *effectiveness* of teaching examined in the instrument. The researcher selected key items from the original instrument that were applicable to lecture and then repeated the same questions changing only the context of the wording for online and simulation. This did not create a very satisfactory research instrument because it did not allow for much differentiation of preference for instructional modality.

The MBTI is a core framework for studying personality types and as such was chosen as the instrument for this study (Curry, 1983). Claxton and Murrell (1987) found the MBTI provided a complete picture of the higher education learner. Lawrence (1993) considered

MBTI type as a method to allow educators to assist learners to use their strengths to enhance their education. Lawrence (1993) stated that understanding the MBTI dichotomy preference can be effective in assisting students to improve their knowledge and skills.

Given that the objective is to learn, the learner will do what is needed to gain the information. Knowledge about how the brain works could provide broader understanding of the ways nurses learn. Zull (2002) suggested providing interactive experiences that evoke the senses, require creativity and allow time for reflection. These strategies may allow educators to integrate brain function with learning processes.

Research might better be spent on ways to measure the translation of the knowledge, skills and attitudes into practice versus people's preference for learning. The questions should not be "can people learn through various teaching modalities?" but rather "how do we measure the translation into clinical practice of what has been learned?"

Sample.

The data collection method used in this study was postal survey because it allowed surveying of large number of nurses from a broad geographic area in North Carolina. A critical methodological issue in the use of surveys is the response rate. Response rates are important because larger samples allow for collection of more representative data that can be generalized to the population of interest (Krathwohl, 1993). Gore-Felton, Koopman, Bridges, Thoresen and Spiegel (2002) reported that physicians, nurses, and clinical psychologists typically have low response rates to surveys. They propose that this is because they are busy with patient care issues and have little time to complete a survey unless there is some

intrinsic interest to them. Asch, Jedrziewski, and Christakis (1997) reviewed 168 manuscripts published in 1991 to examine response rates and found that the mean response rate was 60% which is comparable to the 59.3% response rate for this study. Asch and associates (1978) found that anonymous surveys, which were the case for this study, had lower response rates. Given Asch et al.'s findings, a response rate of approximately 55% was satisfactory for this type of sampling.

The initial research design for this study was to have the nurses complete the data collection instruments at the conclusion of the workshops with the researcher present to provide directions and clarification; however, the workshops and data collection time frames did not coincide. The research was designed to capture a sample size of 300, but provided a sample of 94 respondents with usable data. Many surveys were lost due to invalid postal addresses. Current society has become so mobile; it is difficult to maintain current mailing addresses.

In future studies of this type, investigators might provide onsite computer based methods of data collection. When follow-up was done, it quickly became evident that many in this study's sample did not have a computer, were unfamiliar with computer technology, and/or did not have access to the internet. The lack of internet access for a large number of the target sample presented two barriers: on-line completion of the MBTI was impossible and email follow-up for non-responders was problematic. One factor to consider for increasing response rates may be to provide access to the internet. As a researcher in an academic setting, one becomes immersed in the digital age and loses sensitivity that not all people have

access to communication technologies such as emails. In 2004, only 55% of American households had internet access (US Census, 2006). Future research should consider these issues around the use of technology when designing studies to include older nurses and LPNs. Even when participants had access to emails, it was not uncommon for them to change internet providers and email addresses more than once across the data collection period. This quandary of maintaining current contact information including emails from the initial contact through the completion of data collection was a challenge.

Myers, et al. (2003) stated that the distribution of MBTI type in an occupation align with the dominant gender. Since men were significantly underrepresented in the study sample, it would be important to increase the number of males in future studies. Myers, et al. (2003) reported that men more often endorse Thinking type; future research might explore the relationship between the MBTI of male nurses and their preferred instructional modality. This study did not find a difference between the dichotomy of Thinking and Feeling in the sample nurses and this may reflect, in part, the small number of males in the sample.

Using the findings of this study, data collection techniques could be expanded to increase the sample size. Implementing strategies tried by other researchers may improve the survey design and increase response rate. Dillman (2007) reports success rates of greater than 60% for mailed surveys using his *Total Design Method* which includes four strategically timed mailings with detailed attention to personalization. Careful review of proposed survey methodologies in future research designs including considering access to alternate technologies if email is a component for follow-up or if there are web-based data collection

instruments.

In designing another study, it might be important to collect data at the time of the workshop, while perspectives and impressions are fresh in the participants' mind versus retrospectively as was the design of this study. When electronic forms are part of the research design, having someone designated to provide support both through internet access and assistance in navigating e-forms would be beneficial. The issues of computer literacy and access would be expected to diminish across time but sensitivity to those populations who do not have the resources to support such technology should be considered when designing studies which include non-technological savvy target populations.

Broadening the sample would be an important consideration in future research to allow for more sophisticated analysis and to allow for generalization. A future study might focus on a sample of undergraduate students either across admission cycles or at multiple sites with the additional opportunity to do a longitudinal study across their nursing program.

While this study focused on participants of workshops related to geriatric nursing, it would be interesting to design a similar study that sampled nurses attending workshops related to other nursing specialties. Other questionnaires might be used to evaluate learner preferences for teaching modalities and findings compared with this study.

A future study might be designed to incorporate other factors that influence learning preference. Learning style, educational experience, work experience, age, ethnicity, reading comprehension skills, and personality type are some of the variables that might be included.

Analysis.

A different type of analysis should be explored in future research. The use of a MANOVA may not have been the best statistical method for analysis. The MANOVA tests for significant differences between means. In future research, it might be better to use a regression model. Multiple regression might be used to determine variables that are significant predictors of learning preferences.

Summary

The purpose of this study was to examine the relationship between the personality type as measured by the Myers-Briggs Type Indicator (MBTI), education, ethnicity, age and preference for instructional delivery methods: lecture, online and simulation. This study found no statistically significant multivariate difference in preference for instructional modality (lecture, online, simulation) and MBTI, education, ethnicity or age. This finding concurs with several studies that also reported no difference (Freeman & Tijerina, 2000; Gary, et al., 2004; McNeal & Dwyer, 1999; Truluck & Courtenay, 1999). *T* test revealed statistically significant differences between the two groups Sensing and iNtuition for the simulation modality and a significant difference between the Judging and Perceiving for lecture and online instructional delivery methods.

Educational programs are challenged to prepare nurses for increasingly complex patient care. Nurses are required to apply what they know as they also continually update their knowledge with the ever evolving current evidence. They are asked to work in interprofessional teams to provide safe and quality patient care. Billings (2007) stated that the

“current educational programs and pedagogical approaches are no longer sufficient” (p.ix). It is incumbent upon the educator to design educational experiences for the learner. This study supports that the instructional modality, simulation, was the preferred method across MBTI types, education, ethnicity and age. However, given the finding that the MBTI types for nurses compared to the CAPT-MBTI database and this sample were predominantly Sensing and almost equally divided between Extraversion and Introversion, it is recommend that nursing education include a variety of instructional modalities to meet the differing needs of this population. Given the clear preference for simulation as an instructional modality, increased use of simulation is recommended for nursing education and continuing education settings.

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APPENDICES

APPENDIX A

Consent Form

North Carolina State University
INFORMED CONSENT FORM for RESEARCH

Title of Study: Personality Type and Preference for Instructional Methods in Gerontology Nurses

Principal Investigator: Carol F. Durham, RN, EdD(c) Faculty Sponsor: Duane Akroyd, Ph.D

We are asking you to participate in a research study. The purpose of this study is to examine the correlation between personality type and preference of instructional methods in a sample of practicing gerontology nurses in North Carolina. Better knowledge of the relationship between personality type and preference can lead to enhanced understanding of the learning needs of continuing education participants which can positively impact the selection of instructional methods. The study will also attempt to provide insights into learners' preference for instructional methods to optimize the design of educational experiences and the learning environment.

You were selected from the participant list from The University of North Carolina School of Nursing Continuing Education programs entitled: *Nurse Educator Institute - Improving the Care of Acutely Ill Elders, Role of the RN in Improving the Care of Acutely Ill Elders, and Role of the LPN in Improving the Care of Acutely Ill Elders*, between 2003 and 2006. A total of 310 nurses have been chosen from the workshops attendees between 2003 and 2006. Your participation in this study is completely voluntary.

To participate in the study you would complete the *Myers-Briggs Type Indicator online*, MBTI® Step I (Form M) and the enclosed two-part questionnaire: *Learner's Evaluation of Instructional Methods* and *Demographic Survey*. Enclosed is an instruction sheet that informs you how to complete the MBTI assessment online, please follow the instructions exactly. Also complete the two-part questionnaire enclosed and return to us in the enclosed postage paid envelope. The *Learner's Evaluation of Instructional Methods* is composed of questions addressing your educational experiences with lecture, online learning, and human patient simulators, and your preferred instructional method. The *Demographic Survey* asks some questions that will be used to describe the respondents in this study. Completion of the questionnaires, including the online MBTI assessment, should take no longer than 30 minutes. You are free to answer or not answer any particular question and have no obligation to complete answering the questions once you begin.

RISKS
There is no anticipated risks should you participate in this study. If answering these questions does upset you, you may talk with the researcher about your feelings after finishing answering the questions, or you may stop answering the questions at any time. There is no cost to you or financial benefit for your participation.

BENEFITS
Upon receipt of your complete study data collection packet, you will receive information about your *Myers-Briggs Personality Type*. Additionally, understanding both learner preferences for instructional methods and learner personality type can be very informative to educators as they strive to plan the best possible learning experiences. There will also be professional benefit from this study, as the

information we obtain will be communicated to the profession through publication in the literature, presentation at professional meetings and directly dissemination to the professional associations.

CONFIDENTIALITY
The information in the study records will be kept strictly confidential. Data will be stored securely in locked filing cabinets, inside a locked office, and inside a locked building. The code sheet linking data and your identity will be kept in a separate locked filing cabinet at a separate site. All data obtained in this study will be reported as group data. No individual can be or will be identified. We plan on publishing the results of this research as well as communicating these results to professional organizations. The only persons who will have access to these data are the investigators named on this letter and the faculty on this doctoral dissertation committee. No reference will be made in oral or written reports that could link you to the study.

CONTACT
If you have questions at any time about the study or the procedures, you may contact the researcher, Carol Durham, 508 New Grady Brown School Road, Hillsborough, NC 27278, 919-906-2653 or carolfdurham@yahoo.com. A committee that works to protect your rights and welfare reviews all research on human volunteers. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Matthew Zingraff, Chair of the NCSU IRB for the Use of Human Subjects in Research Committee, Box 7514, NCSU Campus (919.513.1834) or Mr. Matthew Ronning, Assistant Vice Chancellor, Research Administration, Box 7514, NCSU Campus (919.513.2148).

PARTICIPATION
Because we want to encourage the participation of as many nurses as possible, we will be sending you a reminder email approximately 10 days after you receive this letter. Your participation in this study is voluntary; you may decline to participate at any time without penalty. If you withdraw from the study before data collection is completed your data will be destroyed.

CONSENT
Returning your completed questionnaire connotes your consent to be a participant in this study. Thank you for considering participation in this study. If you decide to participate, please complete the *Myers-Briggs Type Indicator online*, MBTI® Step I (Form M) and return the enclosed two-part questionnaire by **as soon as you can to carolfdurham@yahoo.com or mail to 508 New Grady Brown School Road, Hillsborough, NC 27278**. We hope that we can share your views with the greater professional community and use your response to help shape recommendations for addressing the design of future educational experiences.

Sincerely,
Carol
Carol Durham, RN, EdD(c)

APPENDIX B

Instrumentation

Part I **Learner's Evaluation of Instructional Methods**

Part II **Demographic Survey**

Part III **MBTI – Form M (online) sample items**

North Carolina State University – Adult & Higher Education

Part I – **Learner's Evaluation of Instructional Methods***

This survey is Part II of a three-part instrument and is designed to provide information regarding personality type and preference for instructional methods. Read each item carefully. Using the scale on the right, **circle** the number that best represents your experiences with each of the three instructional methods: **Lecture**, **Online Learning**, and **Human Patient Simulator**. The scale values are: 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, and 1= Strongly Disagree. Please indicate your answers directly on this form.

Lecture

For this section, consider your educational experiences with **LECTURE** to date, including the Gero Workshop and circle the number that best describes your experiences.

Learning Value – Lecture	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1. Lecture is intellectually challenging and stimulating.	5	4	3	2	1
2. Through lecture, I learn material I consider valuable.	5	4	3	2	1
3. My interest in subjects has typically increased as a consequence of lecture.	5	4	3	2	1
4. Through lecture, I learned and understood the subject materials presented.	5	4	3	2	1
Clarity – Lecture	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
5. Lecture class expectations were clear.	5	4	3	2	1
6. Lecture class materials were well prepared and carefully explained.	5	4	3	2	1
7. Lecture class objectives agreed with what was actually taught.	5	4	3	2	1
Breadth – Lecture	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
8. In lecture, the implications of the material covered were contrasted with clinical practice.	5	4	3	2	1
9. Background materials for concepts were presented in lecture.	5	4	3	2	1
10. Current developments in the field were discussed adequately in lecture.	5	4	3	2	1
Feedback – Lecture	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
11. In lecture, feedback on my performance was valuable.	5	4	3	2	1
12. Methods of assessment were fair and appropriate in lecture classes.	5	4	3	2	1

Online Learning

For this section, consider your educational experiences with **ONLINE Learning** to date, including the Gero Workshop and circle the number that best describes your experiences.

Learning Value – Online	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
13. Online learning is intellectually challenging and stimulating.	5	4	3	2	1
14. Through online, I learn material I consider valuable.	5	4	3	2	1
15. My interest in subjects has typically increased as a consequence of online learning.	5	4	3	2	1
16. Through online, I learned and understood the subject materials presented.	5	4	3	2	1
Clarity – Online	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
17. Online class/module expectations were clear.	5	4	3	2	1
18. Online class/module materials were well prepared and carefully explained.	5	4	3	2	1
19. Online class/module objectives agreed with what was actually taught.	5	4	3	2	1
Breadth – Online	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
20. Through online class/module, the implications of the material covered were contrasted with clinical practice.	5	4	3	2	1
21. Background materials for concepts were presented.	5	4	3	2	1
22. Current developments in the field were discussed adequately in online class/module.	5	4	3	2	1
Feedback – Online	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
23. Feedback on my performance was valuable in online learning.	5	4	3	2	1
24. Methods of assessment were fair and appropriate in online learning.	5	4	3	2	1

* Adapted from *Students' Evaluation of Education Quality* (SEEQ) with permission from Dr. Herbert Marsh.

Human Patient Simulator

For this section, consider your educational experiences with **HUMAN PATIENT SIMUALTORS (HPS)** to date, including the Gero Workshop and circle the number that best describes your experiences.

Learning Value – HPS	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
25. Human Patient Simulator (HPS) is intellectually challenging and stimulating.	5	4	3	2	1
26. Through Human Patient Simulator (HPS) I learn material I consider valuable.	5	4	3	2	1
27. My interest in subjects has typically increased as a consequence of HPS.	5	4	3	2	1
28. Through HPS, I learned and understood the subject materials presented.	5	4	3	2	1
Clarity – HPS	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
29. HPS class expectations were clear.	5	4	3	2	1
30. HPS class materials were well prepared and carefully explained.	5	4	3	2	1
31. HPS class objectives agreed with what was actually taught.	5	4	3	2	1
Breadth – HPS	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
32. Implications of the material covered were contrasted with clinical practice in HPS.	5	4	3	2	1
33. Background materials for concepts were presented through HPS.	5	4	3	2	1
34. Current developments in the field were discussed adequately in HPS.	5	4	3	2	1
Feedback – HPS	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
35. Feedback on my performance was valuable in HPS.	5	4	3	2	1
36. Methods of assessment were fair and appropriate in HPS.	5	4	3	2	1

37. In your educational experience to date, including the Gero Workshop, please indicate below the percentage of time you have had with education experiences in **LECTURE**, **ONLINE**, and **HUMAN PATIENT SIMULATOR**. Note the values should total 100%.

Lecture _____ **%**
Online _____ **%**
Human Patient Simulator _____ **%**
Total **100 %**

38. Please rank your preferred instructional method from **1 = "most preferred"** to **3 = "least preferred"** for lecture, online, and human patient simulator.

Rank 1-3 _____ Lecture____ Online____ Human Patient Simulation

Part II - **Demographic Survey**

39. What is your birth year? _____

40. What is your gender? (Circle one)
    1. female
    2. male

41. What is your ethnic background? (Circle one)
    1. African American
    2. Asian American
    3. Euro-American
    4. Hispanic
    5. Native American
    6. Other, please specify _____

42. What is the highest degree that you hold? Please list the subject area such as nursing, education, or administration, etc.
    1. Doctorate in _____
    2. Masters in _____
    3. Baccalaureate in _____
    4. Associate in _____
    5. Technical in _____
    6. High School
    7. Other, please specify _____

43. How many years has it been since your last formal education experience? ___ years

44. What is your job title?
    1. Nurse Practitioner
    2. Nurse Educator
    3. Registered Nurse
    4. Licensed Practical Nurse
    5. Other, please specify _____

45. How many years have you been in your current position? _____ years
46. How many years of experiences have you had as a nurse? _____ years
47. If working as a patient care nurse, what is the average number of patients per week for whom you provide care? _____ pts/wk
48. Additional comments:

Part III - **MBTI Form M (online)**

The online version of MBTI-Form M online was used for data collection. Sample questions are included here with permission.

Sample Items
From the

Myers-Briggs Type Indicator Instrument® Form M

By Katharine C. Briggs and Isabel Briggs-Myers

Your answers will help show you how you like to look at things and how you like to go about deciding things. There are no "right" and "wrong" answers to these questions. Knowing your own preferences and learning about other people's can help you understand what your strengths are, what kinds of work you might enjoy, and how people with different preferences can relate to one another and contribute to society.

Part I: Which answer comes closest to telling how you usually feel or act?

16. Are you inclined to
    A. value sentiment more than logic, or
    B. value logic more than sentiment?

20. Do you prefer to
    A. arrange dates, parties, etc., well in advance,
       or
    B. be free to do whatever looks like fun when the time comes?

Part II: Which word in each pair appeals to you more? Think about what the words mean, not about how they look or sound.

36. A. systematic
    B. casual

58. A. sensible
    B. fascinating

Part III: Which answer comes closest to describing how you usually feel or act?

59. When you start a big project that is due in a week, do you
    A. take time to list the separate things to be done and the order of doing them, or
    B. plunge right in?

67. At parties do you
    A. do much of the talking, or
    B. let others do most of the talking?

Part IV: Which word in each pair appeals to you more? Think about what words mean, not about how they look or how they sound.

79. A. imaginative
    B. realistic

91. A. devoted
    B. determined

APPENDIX C

MBTI –Form M
Online Instructions

MBTI –Form M Online Assessment Instructions

To Take an Assessment

1. Using a web browser (i.e., Microsoft® Internet Explorer), access the CPP Online Assessment site. See below for technical requirements.	https://online.cpp.com
2. Enter the following Login.	cyberbme
3. Enter the following Password.	cyberwolf
4. Leave the "User ID" blank unless you are returning to complete an assessment.	Click: LOGIN
5. From the menu, select: MBTI® Step I (Form M).	Click: BEGIN
6. From the menu enter the Batch Name assigned exactly as shown	UNC-CH GERO Workshop

- You will be prompted to fill out a demographics page
  - Select the batch name you have been instructed to use: UNC-CH GERO Workshop.
  - Provide the requested demographic information. It is important to include your preferred email address in order to receive your MBTI profile. The profile will be emailed to you after all your research instruments have been received.
  - Click CONTINUE.
- Follow all directions to complete your assessment.
- Respond to every item, answering the questions as spontaneously as possible. Don't think about how you "should" answer the question. The right answer is how you most accurately feel about the answer.
- After completing the assessment click CONTINUE at the bottom of the page.
- Write down your USER ID.
- If you have completed everything you have been instructed to take, click LOGOUT.
- If for any reason you cannot complete an assessment in its entirety, be sure to click SAVE & COMPLETE LATER, so your responses will be saved and can be recovered when you resume.
  - Write down the User ID number so you can resume and/or take additional assessments using the same User ID.
  - Click LOGOUT and close your browser session
  - To continue the assessment, return to item 1 above and start again, entering your USER ID in Step 4 and clicking RESUME in Step 5.

If you have any questions during the self-administration process, please contact Carol Durham, principal investigator at 919-906-2653 or email carolfdurham@yahoo.com. Thank you for your participation.

Technical Requirements

For this site to function properly, your Internet browser must meet the minimum requirements of Microsoft® Internet Explorer Version 5.0 or higher or Netscape® Navigator® Version 4.72 or higher. The site may not function or display properly in other browsers or browsers versions (such as Netscape 6.0). In general, browser providers (such as AOL) are supported as long as they are using the base applications noted above. To verify your current browser version, launch your Netscape Navigator or Internet Explorer browser and go to the Help button on the toolbar at the top of the screen. When you click on About Internet Explorer or About Netscape Navigator (Communicator), you will be given the exact browser version you are currently using. The minimum requirements to use the Consulting Psychologists Press, Inc. web sites are Microsoft® Internet Explorer 4.01 Service Pack 2 (Version 4.72.3612.x ; "x" will vary with different Operating Systems) or Netscape Navigator™ (Communicator) Version 4.72 or later. While it is not a system requirement to do so, we recommend that you update your browser from either www.microsoft.com or www.netscape.com. As with any software installation, it will be necessary to verify that sufficient hard drive/memory space is available, prior to downloading and installing the browser upgrade.

APPENDIX D

Email Follow-up

Email follow-up

Dear ,

Approximately 28 days ago you received a packet of research materials for the study *Personality Type and Preference for Instructional Methods in Gerontology Nurses.* It was in an over sized brown envelope with neon labels.

I have received your questionnaire. This is a gentle reminder to complete and return the research data collection materials. Part I is the on line version of the MBTI® Step I (Form M) – refer to the salmon colored instruction sheet included in packet**. I am attaching the instruction sheet to this email.** Please complete the online MBTI assessment by

July 31, 2006.

Your participation in this study is voluntary; you may decline to participate at any time without penalty.

If you have questions at any time about the study or the procedures, you may contact the researcher, Carol Durham, 508 New Grady Brown School Road, Hillsborough, NC 27278, 919.906.2653 or carolfdurham@yahoo.com. A committee that works to protect your rights and welfare reviews all research on human volunteers. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Matthew Zingraff, Chair of the NCSU IRB for the Use of Human Subjects in Research Committee, Box 7514, NCSU Campus (919.513.1834) or Mr. Matthew Ronning, Assistant Vice Chancellor, Research Administration, Box 7514, NCSU Campus (919.513.2148).

Thank you for your participation.

Carol Durham, RN, EdD(c)

Principal Investigator

APPENDIX E

Marsh's Student Evaluation of Educational Quality (SEEQ) Instrument

Student Evaluation of Educational Quality (SEEQ) Instrument

AS A DESCRIPTION OF THIS COURSE/INSTRUCTOR, THIS STATEMENT IS:

(SELECT THE BEST RESPONSE FOR EACH OF THE FOLLOWING STATEMENTS. LEAVING A BLANK ONLY IF IT IS CLEARLY NOT RELEVANT)

		Very Poor	Poor	Mo (Avg)	Good	Very Good
LEARNING						
1	You found the course intellectually challenging and stimulating.	1	2	3	4	5
2	You have learned something which I consider valuable……..	1	2	3	4	5
3	My interest in the subject has increased as a consequence of this course…….	1	2	3	4	5
4	You have learned and understood the subject materials in this course…….	1	2	3	4	5
ENTHUSIASM						
5	Instructor was enthusiastic about teaching the course……...	1	2	3	4	5
6	Instructor was dynamic and energetic in conducting the course...	1	2	3	4	5
7	Instructor enhanced presentations with the use of humor…….	1	2	3	4	5
8	Instructor's style of presentation held my interest during class…	1	2	3	4	5
ORGANIZATION						
9	Instructor's explanations were clear……..	1	2	3	4	5
10	Course materials were well prepared and carefully explained…..	1	2	3	4	5
11	Proposed objectives agreed with those actually taught so you knew where course was going……...	1	2	3	4	5
12	Instructor gave lectures that facilitated taking notes…….	1	2	3	4	5
GROUP INTERACTION						
13	Students were encouraged to participate in class discussions…	1	2	3	4	5
14	Students were invited to share their ideas and knowledge……	1	2	3	4	5
15	Students were encouraged to ask question and were given meaningful answers……	1	2	3	4	5
16	Students were encouraged to express their own ideas and/or question the instructor……...	1	2	3	4	5
INDIVIDUAL RAPPORT						
17	Instructor was friendly towards individual students……..	1	2	3	4	5
18	Instructor made students feel welcome in seeking help/advice in or outside of class……..	1	2	3	4	5
19	Instructor had a genuine interest in individual students……	1	2	3	4	5
20	Instructor was adequately accessible to students during office hours or after class…….	1	2	3	4	5
BREADTH						
21	Instructor contrasted the implications of various theories…….	1	2	3	4	5
22	Instructor presented the background or origin of ideas/concepts developed in class……..	1	2	3	4	5
23	Instructor presented points of view other than his/her own when appropriate…….	1	2	3	4	5

24	Instructor adequately discussed current developments in the field……	1	2	3	4	5

EXAMINATIONS

25	Feedback on examinations/graded materials was valuable……...	1	2	3	4	5
26	Methods of evaluating student work were fair and appropriate…	1	2	3	4	5
27	Examinations'/graded materials tested course content as emphasized by the instructor…….	1	2	3	4	5

ASSIGNMENTS

28	Required reading/texts were valuable……	1	2	3	4	5
29	Readings, homework, etc. contributed to appreciation and understanding of subject……	1	2	3	4	5

OVERALL

30	Compared with other courses you have taken at USC, this course was……..	1	2	3	4	5
31	Compared with other instructors you have had at the USC, this instructor was…….	1	2	3	4	5

STUDENT AND COURSE CHARACTERISITICS

(LEAVE BLANK IF NO RESPONSE APPLIES)

32	Course difficulty, relative to other courses was…… (1-very easy…3-medium…5-very hard)	1	2	3	4	5
33	Course workload, relative to other courses, was……... (1-very light…3-medium…5-very heavy)	1	2	3	4	5
34	Course pace was…… (1-too slow, 3-about right.5-too fast)	1	2	3	4	5
35	Hours/week required outside of class…… 1) 0 to 2, 2) 2 to 5, 3) 5to7, 4) 8 to 12, 50 Above 12	1	2	3	4	5
36	Level of interest in the subject prior to this course…… (1-very low…3-medium…5-very high)	1	2	3	4	5
37	Overall GPA at USC…….. 1) Below 2.5, 2) 2.5 to 3.), 3) 3.0 to 3.4, 4) 3.4 to 3.7, 5) Above 3.7	1	2	3	4	5
38	Expected grade in the course……. (1-F, 2-D, 3-C, 4-B, 5-A	1	2	3	4	5
39	Reason for taking this course……. 1-Major require, 2-Major elective, 3-General Ed require, 4-Minor/Related Field, 5-General interest only – SELECT the **ONE** which is best	1	2	3	4	5
40	Year in school…… 1) FRESH 2) SOPH 3) JR, 4) SR, 5) GRAD	1	2	3	4	5
41	Major Department…….. 1) Soc Sci/Comm, 2) Nat Sci/Math, 3) Humanities, 4) Business, 5) Education, 6) Engineering, 7) Perf. Arts, 8) Pub. Affairs, 9) Other, 10) Undeclared/Undecided	1	2	3	4	5
		6	7	8	9	10

APPENDIX F

SAS Output

Descriptive Statistics

Exploratory Factor Analysis

Multivariate Analysis of Variance

Descriptive Statistics
SAS Output

The FREQ Procedure

Ethnicity

Ethnic	Frequency	Percent	Cumulative Frequency	Cumulative Percent
African American	20	21.05	20	21.05
Asian	4	4.21	24	25.26
Euro American	65	68.42	89	93.68
Hispanic	1	1.05	90	94.74
Native American	3	3.16	93	97.89
Other	2	2.11	95	100.00

Highest Degree

Ed	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Doctorate in Nursing	1	1.05	1	1.05
Masters in Nursing	29	30.53	30	31.58
Baccalaureate in Nursing	30	31.58	60	63.16
Associate Degree in Nursing	23	24.21	83	87.37
Technical Degeree in Nursing	10	10.53	93	97.89
High School Degree	1	1.05	94	98.95
Other	1	1.05	95	100.00

The MEANS Procedure

Analysis Variable : age

Mean	Median	Minimum	Maximum	N
51.1627907	52.5000000	26.0000000	74.0000000	86

The FREQ Procedure

Table of age_c by Gender

age_c Gender(Gender)

Frequency Percent Row Pct Col Pct	1	2	Total
27	9 9.57 90.00 9.89	1 1.06 10.00 33.33	10 10.64
39	17 18.09 94.44 18.68	1 1.06 5.56 33.33	18 19.15
49	44 46.81 100.00 48.35	0 0.00 0.00 0.00	44 46.81
59	21 22.34 95.45 23.08	1 1.06 4.55 33.33	22 23.40
Total	91 96.81	3 3.19	94 100.00

Frequency Missing = 221

The FREQ Procedure

VAR7	Frequency	Percent	Cumulative Frequency	Cumulative Percent
ENFJ	4	4.60	4	4.60
ENFP	11	12.64	15	17.24
ENTJ	3	3.45	18	20.69
ENTP	5	5.75	23	26.44
ESFJ	11	12.64	34	39.08
ESFP	4	4.60	38	43.68
ESTJ	4	4.60	42	48.28
ESTP	1	1.15	43	49.43
INFJ	2	2.30	45	51.72
INFP	5	5.75	50	57.47
INTJ	6	6.90	56	64.37
INTP	1	1.15	57	65.52
ISFJ	14	16.09	71	81.61
ISFP	5	5.75	76	87.36
ISSF	1	1.15	77	88.51
ISTJ	9	10.34	86	98.85
ISTP	1	1.15	87	100.00

Frequency Missing = 8

MB1

MB1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
E=Extraversion	43	49.43	43	49.43
I=Intoversion	44	50.57	87	100.00

Frequency Missing = 8

MB2

MB2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
N=Intuition	37	42.53	37	42.53
S=Sensing	50	57.47	87	100.00

Frequency Missing = 8

The FREQ Procedure

MB3

MB3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
F=Feeling	57	65.52	57	65.52
T=Thinking	30	34.48	87	100.00

Frequency Missing = 8

MB4

MB4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
J=Judging	54	62.07	54	62.07
P=Perceiving	33	37.93	87	100.00

Frequency Missing = 8

The MEANS Procedure

Variable	Label	N	Mean	Std Dev	Minimum	Maximum
L1	L1	85	3.9058824	0.7961743	1.0000000	5.0000000
L2	L2	85	4.2235294	0.6432150	1.0000000	5.0000000
L3	L3	85	3.9882353	0.7942369	1.0000000	5.0000000
L4	L4	83	4.1204819	0.5925882	2.0000000	5.0000000
L5	L5	85	4.1529412	0.6456057	2.0000000	5.0000000
L6	L6	85	4.1294118	0.5933809	3.0000000	5.0000000
L7	L7	85	4.2117647	0.6563630	2.0000000	5.0000000
L8	L8	85	3.7882353	0.7882186	2.0000000	5.0000000
L9	L9	85	3.9176471	0.7899934	2.0000000	5.0000000
L10	L10	85	3.9058824	0.8255378	2.0000000	5.0000000
L11	L11	84	3.6190476	0.9557028	1.0000000	5.0000000
L12	L12	84	3.7261905	0.7815830	1.0000000	5.0000000
O1	O1	84	3.6071429	0.9185879	2.0000000	5.0000000
O2	O2	84	3.8452381	0.8572026	2.0000000	5.0000000
O3	O3	84	3.6309524	0.9912845	2.0000000	5.0000000
O4	O4	84	3.8214286	0.7786413	2.0000000	5.0000000
O5	O5	83	3.8795181	0.8023987	1.0000000	5.0000000
O6	O6	84	3.8452381	0.7990061	1.0000000	5.0000000
O7	O7	84	3.9404762	0.7002786	2.0000000	5.0000000
O8	O8	83	3.6144578	0.8529908	2.0000000	5.0000000
O9	O9	84	3.7261905	0.8409861	2.0000000	5.0000000
O10	O10	84	3.6904762	0.9048223	1.0000000	5.0000000
O11	O11	83	3.6626506	0.9009089	1.0000000	5.0000000
O12	O12	83	3.7590361	0.8203265	2.0000000	5.0000000
S1	S1	84	4.4523810	0.6476047	3.0000000	5.0000000
S2	S2	84	4.3690476	0.6903773	2.0000000	5.0000000
S3	S3	84	4.1666667	0.8758243	1.0000000	5.0000000
S4	S4	84	4.3571429	0.6520192	3.0000000	5.0000000
S5	S5	84	4.1428571	0.6611938	2.0000000	5.0000000
S6	S6	84	4.1547619	0.7362236	2.0000000	5.0000000
S7	S7	84	4.2619048	0.6232261	3.0000000	5.0000000
S8	S8	84	4.2261905	0.7660128	2.0000000	5.0000000
S9	S9	84	3.9047619	0.7702143	2.0000000	5.0000000
S10	S10	84	4.0357143	0.8423494	2.0000000	5.0000000
S11	S11	83	4.1325301	0.8230088	2.0000000	5.0000000
S12	S12	84	4.1428571	0.7304538	2.0000000	5.0000000

The MEANS Procedure

Variable	N	Mean	Std Dev	Minimum	Maximum
Lmean	85	3.9770766	0.5108745	2.5000000	5.0000000
Omean	84	3.7506614	0.6488009	2.0000000	5.0000000
Smean	84	4.1954365	0.5458395	3.0000000	5.0000000

Exploratory Factor Analysis
SAS Output

The CORR Procedure

12 Variables: L1 L2 L3 L4 L5 L6 L7 L8 L9 L10 L11 L12

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
L1	89	3.88764	0.85862	346.00000	1.00000	5.00000	L1
L2	89	4.17978	0.68360	372.00000	1.00000	5.00000	L2
L3	89	3.94382	0.81686	351.00000	1.00000	5.00000	L3
L4	89	4.08989	0.59621	364.00000	2.00000	5.00000	L4
L5	89	4.13483	0.64299	368.00000	2.00000	5.00000	L5
L6	89	4.10112	0.60387	365.00000	3.00000	5.00000	L6
L7	89	4.19101	0.65499	373.00000	2.00000	5.00000	L7
L8	89	3.78652	0.79017	337.00000	2.00000	5.00000	L8
L9	89	3.89888	0.76937	347.00000	2.00000	5.00000	L9
L10	89	3.92135	0.81498	349.00000	2.00000	5.00000	L10
L11	89	3.61798	0.97124	322.00000	1.00000	5.00000	L11
L12	89	3.75281	0.78741	334.00000	1.00000	5.00000	L12

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.886369 ,89
Standardized	0.892253

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
L1	0.633629	0.874747	0.638287	0.881573	L1
L2	0.577436	0.878014	0.579999	0.884702	L2
L3	0.603402	0.876491	0.617483	0.882695	L3
L4	0.560429	0.879356	0.566375	0.885427	L4
L5	0.582537	0.877992	0.600194	0.883623	L5
L6	0.679708	0.873965	0.687101	0.878919	L6
L7	0.701702	0.872093	0.716609	0.877300	L7
L8	0.525185	0.880978	0.511748	0.888311	L8
L9	0.694447	0.871171	0.686506	0.878951	L9
L10	0.600044	0.876689	0.605065	0.883362	L10
L11	0.499091	0.885225	0.489314	0.889485	L11

The CORR Procedure

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
L12	0.529471	0.880714	0.516738	0.888050	L12

Pearson Correlation Coefficients, N = 89
Prob > |r| under H0: Rho=0

	L1	L2	L3	L4	L5	L6
L1	1.00000	0.63497	0.59037	0.50831	0.46000	0.41666
L1		<.0001	<.0001	<.0001	<.0001	<.0001
L2	0.63497	1.00000	0.71019	0.57329	0.38373	0.36838
L2	<.0001		<.0001	<.0001	0.0002	0.0004
L3	0.59037	0.71019	1.00000	0.64048	0.38239	0.35720
L3	<.0001	<.0001		<.0001	0.0002	0.0006
L4	0.50831	0.57329	0.64048	1.00000	0.38302	0.38478
L4	<.0001	<.0001	<.0001		0.0002	0.0002

Pearson Correlation Coefficients, N = 89
Prob > |r| under H0: Rho=0

	L7	L8	L9	L10	L11	L12
L1	0.40231	0.26573	0.37825	0.32825	0.37037	0.39546
L1	<.0001	0.0118	0.0003	0.0017	0.0004	0.0001
L2	0.40464	0.28223	0.38066	0.22964	0.27577	0.10461
L2	<.0001	0.0074	0.0002	0.0304	0.0089	0.3293
L3	0.44507	0.29811	0.44289	0.33468	0.21614	0.19017
L3	<.0001	0.0045	<.0001	0.0013	0.0419	0.0743
L4	0.42113	0.18592	0.36687	0.36552	0.15810	0.26572
L4	<.0001	0.0811	0.0004	0.0004	0.1389	0.0118

The CORR Procedure

Pearson Correlation Coefficients, N = 89
Prob > |r| under H0: Rho=0

	L1	L2	L3	L4	L5	L6
L5	0.46000	0.38373	0.38239	0.38302	1.00000	0.63762
L5	<.0001	0.0002	0.0002	0.0002		<.0001
L6	0.41666	0.36838	0.35720	0.38478	0.63762	1.00000
L6	<.0001	0.0004	0.0006	0.0002	<.0001	
L7	0.40231	0.40464	0.44507	0.42113	0.66668	0.72633
L7	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
L8	0.26573	0.28223	0.29811	0.18592	0.25860	0.30773
L8	0.0118	0.0074	0.0045	0.0811	0.0144	0.0034
L9	0.37825	0.38066	0.44289	0.36687	0.34947	0.48698
L9	0.0003	0.0002	<.0001	0.0004	0.0008	<.0001
L10	0.32825	0.22964	0.33468	0.36552	0.38912	0.57051
L10	0.0017	0.0304	0.0013	0.0004	0.0002	<.0001
L11	0.37037	0.27577	0.21614	0.15810	0.17440	0.41537
L11	0.0004	0.0089	0.0419	0.1389	0.1021	<.0001
L12	0.39546	0.10461	0.19017	0.26572	0.40325	0.41165
L12	0.0001	0.3293	0.0743	0.0118	<.0001	<.0001

Pearson Correlation Coefficients, N = 89
Prob > |r| under H0: Rho=0

	L7	L8	L9	L10	L11	L12
L5	0.66668	0.25860	0.34947	0.38912	0.17440	0.40325
L5	<.0001	0.0144	0.0008	0.0002	0.1021	<.0001
L6	0.72633	0.30773	0.48698	0.57051	0.41537	0.41165
L6	<.0001	0.0034	<.0001	<.0001	<.0001	<.0001
L7	1.00000	0.38708	0.55742	0.51809	0.33037	0.42309
L7		0.0002	<.0001	<.0001	0.0016	<.0001
L8	0.38708	1.00000	0.59963	0.52066	0.41077	0.35256
L8	0.0002		<.0001	<.0001	<.0001	0.0007
L9	0.55742	0.59963	1.00000	0.62148	0.44956	0.44597
L9	<.0001	<.0001		<.0001	<.0001	<.0001

The CORR Procedure

Pearson Correlation Coefficients, N = 89
Prob > |r| under H0: Rho=0

	L7	L8	L9	L10	L11	L12
L10	0.51809	0.52066	0.62148	1.00000	0.32052	0.32352
L10	<.0001	<.0001	<.0001		0.0022	0.0020
L11	0.33037	0.41077	0.44956	0.32052	1.00000	0.58835
L11	0.0016	<.0001	<.0001	0.0022		<.0001
L12	0.42309	0.35256	0.44597	0.32352	0.58835	1.00000
L12	<.0001	0.0007	<.0001	0.0020	<.0001	

The CORR Procedure

12 Variables: 01 02 03 04 05 06 07 08 09 010 011 012

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
01	90	3.63333	0.92954	327.00000	2.00000	5.00000	01
02	90	3.85556	0.85540	347.00000	2.00000	5.00000	02
03	90	3.64444	0.95177	328.00000	2.00000	5.00000	03
04	90	3.82222	0.77282	344.00000	2.00000	5.00000	04
05	90	3.91111	0.81619	352.00000	1.00000	5.00000	05
06	90	3.85556	0.80114	347.00000	1.00000	5.00000	06
07	90	3.95556	0.71753	356.00000	2.00000	5.00000	07
08	90	3.65556	0.85013	329.00000	2.00000	5.00000	08
09	90	3.74444	0.84216	337.00000	2.00000	5.00000	09
010	90	3.71111	0.91485	334.00000	1.00000	5.00000	010
011	90	3.70000	0.90504	333.00000	1.00000	5.00000	011
012	90	3.80000	0.83733	342.00000	2.00000	5.00000	012

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.937708
Standardized	0.938836

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
01	0.718075	0.932647	0.717127	0.933887	01
02	0.769345	0.930628	0.766986	0.932088	02
03	0.710565	0.933041	0.707474	0.934234	03
04	0.756353	0.931368	0.755539	0.932502	04
05	0.640649	0.935206	0.650418	0.936266	05
06	0.738617	0.931856	0.744218	0.932912	06
07	0.732995	0.932417	0.738101	0.933132	07
08	0.665192	0.934416	0.666761	0.935686	08
09	0.754832	0.931184	0.750320	0.932691	09
010	0.705916	0.933074	0.702834	0.934400	010
011	0.687012	0.933770	0.682824	0.935115	011
012	0.804397	0.929402	0.806375	0.930653	012

The CORR Procedure

Pearson Correlation Coefficients, N = 90
Prob > |r| under H0: Rho=0

	01	02	03	04	05	06
01	1.00000	0.61093	0.67650	0.59644	0.47490	0.57687
01		<.0001	<.0001	<.0001	<.0001	<.0001
02	0.61093	1.00000	0.76426	0.72556	0.46421	0.54307
02	<.0001		<.0001	<.0001	<.0001	<.0001
03	0.67650	0.76426	1.00000	0.63105	0.39278	0.52132
03	<.0001	<.0001		<.0001	0.0001	<.0001
04	0.59644	0.72556	0.63105	1.00000	0.54468	0.50249
04	<.0001	<.0001	<.0001		<.0001	<.0001
05	0.47490	0.46421	0.39278	0.54468	1.00000	0.78777
05	<.0001	<.0001	0.0001	<.0001		<.0001
06	0.57687	0.54307	0.52132	0.50249	0.78777	1.00000
06	<.0001	<.0001	<.0001	<.0001	<.0001	
07	0.56491	0.57522	0.48663	0.59346	0.68386	0.73146
07	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
08	0.53509	0.47160	0.41629	0.60693	0.44117	0.50354
08	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
09	0.53920	0.61886	0.55822	0.55090	0.39159	0.54420
09	<.0001	<.0001	<.0001	<.0001	0.0001	<.0001
010	0.52146	0.53475	0.50010	0.57812	0.32637	0.44833
010	<.0001	<.0001	<.0001	<.0001	0.0017	<.0001
011	0.45544	0.55296	0.55306	0.45301	0.41982	0.49744
011	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
012	0.56878	0.64945	0.54421	0.63897	0.66421	0.67668
012	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

The CORR Procedure

Pearson Correlation Coefficients, N = 90
Prob > |r| under H0: Rho=0

	07	08	09	010	011	012
01	0.56491	0.53509	0.53920	0.52146	0.45544	0.56878
01	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
02	0.57522	0.47160	0.61886	0.53475	0.55296	0.64945
02	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
03	0.48663	0.41629	0.55822	0.50010	0.55306	0.54421
03	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
04	0.59346	0.60693	0.55090	0.57812	0.45301	0.63897
04	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
05	0.68386	0.44117	0.39159	0.32637	0.41982	0.66421
05	<.0001	<.0001	0.0001	0.0017	<.0001	<.0001
06	0.73146	0.50354	0.54420	0.44833	0.49744	0.67668
06	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
07	1.00000	0.56405	0.53881	0.45948	0.42909	0.65828
07		<.0001	<.0001	<.0001	<.0001	<.0001
08	0.56405	1.00000	0.61328	0.62186	0.47753	0.47037
08	<.0001		<.0001	<.0001	<.0001	<.0001
09	0.53881	0.61328	1.00000	0.73436	0.67959	0.61185
09	<.0001	<.0001		<.0001	<.0001	<.0001
010	0.45948	0.62186	0.73436	1.00000	0.64052	0.64245
010	<.0001	<.0001	<.0001		<.0001	<.0001
011	0.42909	0.47753	0.67959	0.64052	1.00000	0.69092
011	<.0001	<.0001	<.0001	<.0001		<.0001
012	0.65828	0.47037	0.61185	0.64245	0.69092	1.00000
012	<.0001	<.0001	<.0001	<.0001	<.0001	

The CORR Procedure

12 Variables: S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
S1	91	4.46154	0.63784	406.00000	3.00000	5.00000	S1
S2	91	4.38462	0.67937	399.00000	2.00000	5.00000	S2
S3	91	4.20879	0.83688	383.00000	1.00000	5.00000	S3
S4	91	4.37363	0.64375	398.00000	3.00000	5.00000	S4
S5	91	4.17582	0.65986	380.00000	2.00000	5.00000	S5
S6	91	4.19780	0.73363	382.00000	2.00000	5.00000	S6
S7	91	4.28571	0.61978	390.00000	3.00000	5.00000	S7
S8	91	4.21978	0.75722	384.00000	2.00000	5.00000	S8
S9	91	3.92308	0.76348	357.00000	2.00000	5.00000	S9
S10	91	4.04396	0.81530	368.00000	2.00000	5.00000	S10
S11	91	4.15385	0.81545	378.00000	2.00000	5.00000	S11
S12	91	4.16484	0.73430	379.00000	2.00000	5.00000	S12

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.928562
Standardized	0.930178

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
S1	0.654741	0.924124	0.655702	0.925930	S1
S2	0.667689	0.923561	0.667335	0.925479	S2
S3	0.668596	0.924032	0.670578	0.925353	S3
S4	0.715916	0.921969	0.722297	0.923333	S4
S5	0.689056	0.922839	0.693241	0.924471	S5
S6	0.695334	0.922462	0.705002	0.924011	S6
S7	0.744796	0.921159	0.749744	0.922252	S7
S8	0.583932	0.927022	0.580622	0.928813	S8
S9	0.728989	0.921090	0.724970	0.923228	S9
S10	0.754435	0.920045	0.750654	0.922216	S10
S11	0.686209	0.923093	0.681397	0.924932	S11

The CORR Procedure

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
S12	0.776612	0.919183	0.769965	0.921452	S12

Pearson Correlation Coefficients, N = 91
Prob > |r| under H0: Rho=0

	S1	S2	S3	S4	S5	S6
S1	1.00000	0.66273	0.69171	0.65777	0.33304	0.44384
S1		<.0001	<.0001	<.0001	0.0013	<.0001
S2	0.66273	1.00000	0.65845	0.65861	0.36798	0.38070
S2	<.0001		<.0001	<.0001	0.0003	0.0002
S3	0.69171	0.65845	1.00000	0.59607	0.27484	0.38442
S3	<.0001	<.0001		<.0001	0.0084	0.0002
S4	0.65777	0.65861	0.59607	1.00000	0.54988	0.52406
S4	<.0001	<.0001	<.0001		<.0001	<.0001

Pearson Correlation Coefficients, N = 91
Prob > |r| under H0: Rho=0

	S7	S8	S9	S10	S11	S12
S1	0.47781	0.43179	0.37033	0.36651	0.46011	0.57118
S1	<.0001	<.0001	0.0003	0.0004	<.0001	<.0001
S2	0.42222	0.39543	0.42184	0.43052	0.57393	0.58424
S2	<.0001	0.0001	<.0001	<.0001	<.0001	<.0001
S3	0.44068	0.40019	0.49494	0.45865	0.58739	0.59429
S3	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
S4	0.62063	0.35393	0.46605	0.49762	0.50311	0.54993
S4	<.0001	0.0006	<.0001	<.0001	<.0001	<.0001

The CORR Procedure

Pearson Correlation Coefficients, N = 91
Prob > |r| under H0: Rho=0

	S1	S2	S3	S4	S5	S6
S5	0.33304	0.36798	0.27484	0.54988	1.00000	0.79955
S5	0.0013	0.0003	0.0084	<.0001		<.0001
S6	0.44384	0.38070	0.38442	0.52406	0.79955	1.00000
S6	<.0001	0.0002	0.0002	<.0001	<.0001	
S7	0.47781	0.42222	0.44068	0.62063	0.77237	0.77848
S7	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
S8	0.43179	0.39543	0.40019	0.35393	0.38879	0.50091
S8	<.0001	0.0001	<.0001	0.0006	0.0001	<.0001
S9	0.37033	0.42184	0.49494	0.46605	0.64469	0.64242
S9	0.0003	<.0001	<.0001	<.0001	<.0001	<.0001
S10	0.36651	0.43052	0.45865	0.49762	0.66704	0.59832
S10	0.0004	<.0001	<.0001	<.0001	<.0001	<.0001
S11	0.46011	0.57393	0.58739	0.50311	0.44476	0.33860
S11	<.0001	<.0001	<.0001	<.0001	<.0001	0.0010
S12	0.57118	0.58424	0.59429	0.54993	0.51281	0.45444
S12	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Pearson Correlation Coefficients, N = 91
Prob > |r| under H0: Rho=0

	S7	S8	S9	S10	S11	S12
S5	0.77237	0.38879	0.64469	0.66704	0.44476	0.51281
S5	<.0001	0.0001	<.0001	<.0001	<.0001	<.0001
S6	0.77848	0.50091	0.64242	0.59832	0.33860	0.45444
S6	<.0001	<.0001	<.0001	<.0001	0.0010	<.0001
S7	1.00000	0.43292	0.63399	0.61255	0.43970	0.55456
S7		<.0001	<.0001	<.0001	<.0001	<.0001
S8	0.43292	1.00000	0.52927	0.52411	0.43048	0.49365
S8	<.0001		<.0001	<.0001	<.0001	<.0001
S9	0.63399	0.52927	1.00000	0.80875	0.44754	0.53817
S9	<.0001	<.0001		<.0001	<.0001	<.0001

The CORR Procedure

Pearson Correlation Coefficients, N = 91
Prob > |r| under H0: Rho=0

	S7	S8	S9	S10	S11	S12
S10	0.61255	0.52411	0.80875	1.00000	0.59137	0.63735
S10	<.0001	<.0001	<.0001		<.0001	<.0001
S11	0.43970	0.43048	0.44754	0.59137	1.00000	0.84787
S11	<.0001	<.0001	<.0001	<.0001		<.0001
S12	0.55456	0.49365	0.53817	0.63735	0.84787	1.00000
S12	<.0001	<.0001	<.0001	<.0001	<.0001	

The FACTOR Procedure

Means and Standard Deviations from 89 Observations

Variable	Mean	Std Dev
L1	3.8876404	0.85862208
L2	4.1797753	0.68360338
L3	3.9438202	0.81686138
L4	4.0898876	0.59620865
L5	4.1348315	0.64298684
L6	4.1011236	0.60386904
L7	4.1910112	0.65498793
L8	3.7865169	0.79016555
L9	3.8988764	0.76937022
L10	3.9213483	0.81498353
L11	3.6179775	0.97124122
L12	3.7528090	0.78741376

Factor Analysis Lecture Rotate

The FACTOR Procedure
Initial Factor Method: Principal Factors

Prior Communality Estimates: SMC

L1	L2	L3	L4	L5	L6
0.55970582	0.66413687	0.62325332	0.51483554	0.58193309	0.65827155
L7	**L8**	**L9**	**L10**	**L11**	**L12**
0.65793835	0.45310011	0.59569682	0.55432221	0.52062131	0.55895305

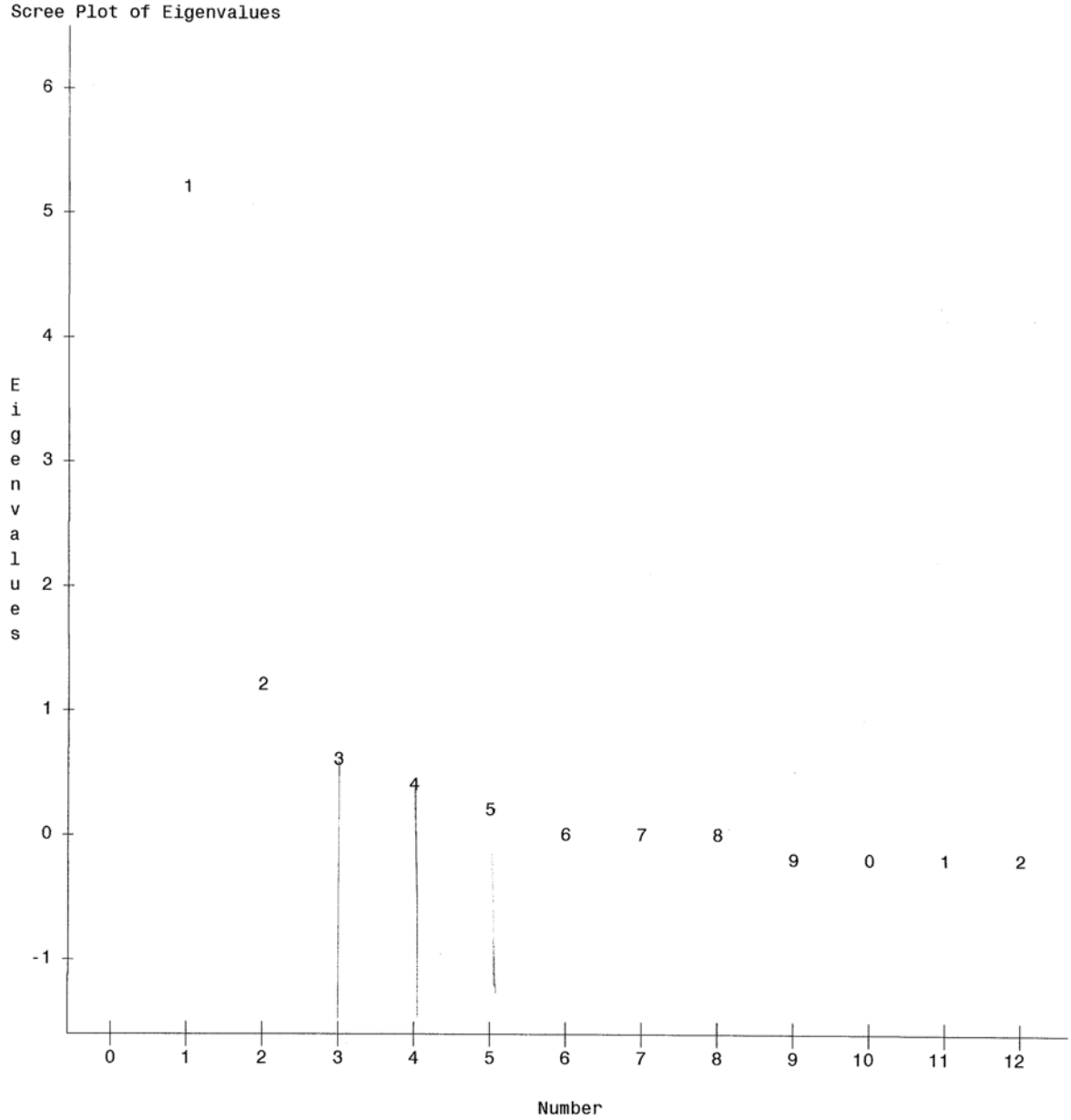
Eigenvalues of the Reduced Correlation Matrix: Total = 6.94276804 Average = 0.578564

	Eigenvalue	Difference	Proportion	Cumulative
1	5.12921047	3.95055226	0.7388	0.7388
2	1.17865821	0.51235139	0.1698	0.9086
3	0.66630682	0.16846682	0.0960	1.0045
4	0.49784000	0.36016096	0.0717	1.0762
5	0.13767904	0.06128648	0.0198	1.0961
6	0.07639256	0.05013770	0.0110	1.1071
7	0.02625486	0.12434668	0.0038	1.1108
8	-.09809182	0.01300845	-0.0141	1.0967
9	-.11110027	0.02365422	-0.0160	1.0807
10	-.13475449	0.06025105	-0.0194	1.0613
11	-.19500554	0.03561627	-0.0281	1.0332
12	-.23062181		-0.0332	1.0000

3 factors will be retained by the PROPORTION criterion.

The FACTOR Procedure
Initial Factor Method: Principal Factors

Scree Plot of Eigenvalues



Factor Analysis Lecture Rotate

The FACTOR Procedure
Initial Factor Method: Principal Factors

Factor Pattern

		Factor1	Factor2	Factor3
L1	L1	68 *	-28	12
L2	L2	65 *	-52 *	15
L3	L3	67 *	-46 *	13
L4	L4	62 *	-37	0
L5	L5	66 *	-1	-42 *
L6	L6	74 *	17	-33
L7	L7	77 *	11	-32
L8	L8	55 *	27	26
L9	L9	72 *	23	19
L10	L10	65 *	25	-3
L11	L11	53 *	33	33
L12	L12	56 *	38	11

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor

Factor1	Factor2	Factor3
5.1292105	1.1786582	0.6663068

Final Communality Estimates: Total = 6.974176

L1	L2	L3	L4	L5	L6
0.55008296	0.70738448	0.68475505	0.52101170	0.61018314	0.69103460
L7	L8	L9	L10	L11	L12
0.70458590	0.44339878	0.60786501	0.48998952	0.49667925	0.46720511

Factor Analysis Lecture Rotate

The FACTOR Procedure
Prerotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3
1	0.58969	0.57847	0.56360
2	-0.77098	0.61104	0.17950
3	0.24055	0.54037	-0.80631

Rotated Factor Pattern

		Factor1	Factor2	Factor3
L1	L1	64 *	29	23
L2	L2	82 *	14	15
L3	L3	79 *	18	19
L4	L4	65 *	13	28
L5	L5	30	15	71 *
L6	L6	23	35	72 *
L7	L7	29	34	71 *
L8	L8	17	63 *	15
L9	L9	30	66 *	29
L10	L10	18	52 *	43 *
L11	L11	14	69 *	9
L12	L12	7	61 *	29

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor

Factor1	Factor2	Factor3
2.5227421	2.3510197	2.1004137

Final Communality Estimates: Total = 6.974176

L1	L2	L3	L4	L5	L6
0.55008296	0.70738448	0.68475505	0.52101170	0.61018314	0.69103460

The FACTOR Procedure
Prerotation Method: Varimax

L7	L8	L9	L10	L11	L12
0.70458590	0.44339878	0.60786501	0.48998952	0.49667925	0.46720511

Factor Analysis Lecture Rotate

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Target Matrix for Procrustean Transformation

		Factor1	Factor2	Factor3
L1	L1	71 *	6	4
L2	L2	100 *	0	1
L3	L3	94 *	1	2
L4	L4	81 *	1	8
L5	L5	6	1	100 *
L6	L6	2	8	87 *
L7	L7	5	7	82 *
L8	L8	2	90 *	1
L9	L9	6	66 *	7
L10	L10	2	44 *	32
L11	L11	1	100 *	0
L12	L12	0	79 *	11

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Procrustean Transformation Matrix

	1	2	3
1	1.32356645	-0.1984836	-0.2729747
2	-0.1935336	1.43990466	-0.3292165
3	-0.348299	-0.4385074	1.44187786

Normalized Oblique Transformation Matrix

	1	2	3
1	0.41273595	0.38792786	0.41022197
2	-1.0498668	0.78962604	0.23846204
3	0.43231266	0.89700485	-1.2506693

Factor Analysis Lecture Rotate

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Inter-Factor Correlations

Inter-Factor Correlations

	Factor1	Factor2	Factor3
Factor1	100 *	44 *	54 *
Factor2	44 *	100 *	59 *
Factor3	54 *	59 *	100 *

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Promax (Oblique)

Rotated Factor Pattern (Standardized Regression Coefficients)

		Factor1	Factor2	Factor3
L1	L1	62 *	15	6
L2	L2	87 *	-2	-5
L3	L3	82 *	1	0
L4	L4	65 *	-6	16
L5	L5	11	-13	79 *
L6	L6	-1	12	76 *
L7	L7	6	10	74 *
L8	L8	5	66 *	-4
L9	L9	14	63 *	11
L10	L10	-1	43 *	36
L11	L11	2	76 *	-12
L12	L12	-11	61 *	18

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Reference Axis Correlations

	Factor1	Factor2	Factor3
Factor1	100 *	-19	-38
Factor2	-19	100 *	-46 *
Factor3	-38	-46 *	100 *

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Reference Structure (Semipartial Correlations)

		Factor1	Factor2	Factor3
L1	L1	52 *	12	4
L2	L2	72 *	-2	-4
L3	L3	68 *	1	0
L4	L4	54 *	-5	12
L5	L5	9	-10	59 *
L6	L6	-1	10	57 *
L7	L7	5	8	55 *
L8	L8	4	53 *	-3
L9	L9	12	50 *	8
L10	L10	-1	34	27
L11	L11	1	61 *	-9
L12	L12	-10	49 *	14

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor Eliminating Other Factors

Factor1	Factor2	Factor3
1.5741625	1.2941163	1.1023166

Factor Structure (Correlations)

		Factor1	Factor2	Factor3
L1	L1	72 *	46 *	49 *
L2	L2	84 *	34	41 *
L3	L3	83 *	38	45 *
L4	L4	71 *	33	48 *
L5	L5	48 *	38	77 *
L6	L6	45 *	56 *	83 *
L7	L7	51 *	56 *	83 *
L8	L8	33	66 *	38
L9	L9	48 *	76 *	56 *

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Factor Analysis Lecture Rotate

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Factor Structure (Correlations)

		Factor1	Factor2	Factor3
L10	L10	38	64 *	61 *
L11	L11	29	70 *	34
L12	L12	25	67 *	48 *

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor Ignoring Other Factors

Factor1	Factor2	Factor3
3.7294228	3.7136122	3.9781220

Final Communality Estimates: Total = 6.974176

L1	L2	L3	L4	L5	L6
0.55008296	0.70738448	0.68475505	0.52101170	0.61018314	0.69103460
L7	L8	L9	L10	L11	L12
0.70458590	0.44339878	0.60786501	0.48998952	0.49667925	0.46720511

Multivariate Analysis of Variance (MANOVA) SAS Output

The GLM Procedure

Class Level Information

Class	Levels	Values
MB1	2	E I
MB2	2	N S
MB3	2	F T
MB4	2	J P
Educ	3	Adv Bac ass
Race	3	AAmer other white
age_c	4	27 39 49 59

Number of Observations Read 87
Number of Observations Used 82

The GLM Procedure

Dependent Variable: Lmean

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	4.95513093	0.45046645	1.90	0.0536
Error	70	16.57357453	0.23676535		
Corrected Total	81	21.52870546			

R-Square	Coeff Var	Root MSE	Lmean Mean
0.230164	12.27498	0.486585	3.964043

Source	DF	Type I SS	Mean Square	F Value	Pr > F
MB1	1	0.48123463	0.48123463	2.03	0.1584
MB2	1	0.80448272	0.80448272	3.40	0.0695
MB3	1	0.46652121	0.46652121	1.97	0.1648
MB4	1	1.12838048	1.12838048	4.77	0.0324
Educ	2	0.14187796	0.07093898	0.30	0.7420
Race	2	1.24323286	0.62161643	2.63	0.0795
age_c	3	0.68940107	0.22980036	0.97	0.4116

Source	DF	Type III SS	Mean Square	F Value	Pr > F
MB1	1	0.86673946	0.86673946	3.66	0.0598
MB2	1	0.07610107	0.07610107	0.32	0.5726
MB3	1	0.18156553	0.18156553	0.77	0.3842
MB4	1	0.99317951	0.99317951	4.19	0.0443
Educ	2	0.04469271	0.02234636	0.09	0.9101
Race	2	1.09481157	0.54740579	2.31	0.1066
age_c	3	0.68940107	0.22980036	0.97	0.4116

The GLM Procedure

Dependent Variable: Omean

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	5.33220454	0.48474587	1.16	0.3323
Error	70	29.31515318	0.41878790		
Corrected Total	81	34.64735772			

R-Square	Coeff Var	Root MSE	Omean Mean
0.153899	17.21969	0.647138	3.758130

Source	DF	Type I SS	Mean Square	F Value	Pr > F
MB1	1	0.07621951	0.07621951	0.18	0.6710
MB2	1	1.12339556	1.12339556	2.68	0.1059
MB3	1	0.00305783	0.00305783	0.01	0.9321
MB4	1	1.41370205	1.41370205	3.38	0.0704
Educ	2	1.50832459	0.75416230	1.80	0.1727
Race	2	0.13377544	0.06688772	0.16	0.8527
age_c	3	1.07372955	0.35790985	0.85	0.4688

Source	DF	Type III SS	Mean Square	F Value	Pr > F
MB1	1	0.52302900	0.52302900	1.25	0.2676
MB2	1	0.71925221	0.71925221	1.72	0.1943
MB3	1	0.15043280	0.15043280	0.36	0.5509
MB4	1	0.86263419	0.86263419	2.06	0.1557
Educ	2	1.15109578	0.57554789	1.37	0.2598
Race	2	0.05544790	0.02772395	0.07	0.9360
age_c	3	1.07372955	0.35790985	0.85	0.4688

The GLM Procedure

Dependent Variable: Smean

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	5.83461438	0.53041949	2.03	0.0385
Error	70	18.33272979	0.26189614		
Corrected Total	81	24.16734417			

R-Square	Coeff Var	Root MSE	Smean Mean
0.241426	12.21664	0.511758	4.189024

Source	DF	Type I SS	Mean Square	F Value	Pr > F
MB1	1	0.05724932	0.05724932	0.22	0.6416
MB2	1	1.61673283	1.61673283	6.17	0.0154
MB3	1	0.15859864	0.15859864	0.61	0.4391
MB4	1	0.27700737	0.27700737	1.06	0.3073
Educ	2	0.76838558	0.38419279	1.47	0.2376
Race	2	1.09245900	0.54622950	2.09	0.1319
age_c	3	1.86418165	0.62139388	2.37	0.0776

Source	DF	Type III SS	Mean Square	F Value	Pr > F
MB1	1	0.01479592	0.01479592	0.06	0.8128
MB2	1	0.40804901	0.40804901	1.56	0.2161
MB3	1	0.69911346	0.69911346	2.67	0.1068
MB4	1	0.22945816	0.22945816	0.88	0.3525
Educ	2	0.52571608	0.26285804	1.00	0.3717
Race	2	1.82797210	0.91398605	3.49	0.0359 artifact
age_c	3	1.86418165	0.62139388	2.37	0.0776

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Lmean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.236765
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2143

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB1
A	4.0407	41	E
A			
A	3.8874	41	I

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Omean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.418788
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2851

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB1
A	3.7886	41	E
A			
A	3.7276	41	I

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Smean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.261896
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2254

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB1
A	4.2154	41	I
A			
A	4.1626	41	E

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Lmean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.236765
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2175
Harmonic Mean of Cell Sizes	39.80488

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB2
A	4.0289	48	S
A			
A	3.8725	34	N

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Omean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.418788
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2893
Harmonic Mean of Cell Sizes	39.80488

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB2
A	3.8472	48	S
A			
A	3.6324	34	N

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Smean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.261896
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2288
Harmonic Mean of Cell Sizes	39.80488

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB2
A	4.3090	48	S
B	4.0196	34	N

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Lmean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.236765
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2242
Harmonic Mean of Cell Sizes	37.4878

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB3
A	4.0402	29	T
A			
A	3.9224	53	F

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Omean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.418788
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2981
Harmonic Mean of Cell Sizes	37.4878

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB3
A	3.7752	53	F
A			
A	3.7270	29	T

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Smean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.261896
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2358
Harmonic Mean of Cell Sizes	37.4878

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB3
A	4.2327	53	F
A			
A	4.1092	29	T

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Lmean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.236765
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2225
Harmonic Mean of Cell Sizes	38.04878

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB4
A	4.0683	52	J
B	3.7833	30	P

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Omean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.418788
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.2959
Harmonic Mean of Cell Sizes	38.04878

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB4
A	3.8734	52	J
B	3.5583	30	P

The GLM Procedure

Tukey's Studentized Range (HSD) Test for Smean

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	70
Error Mean Square	0.261896
Critical Value of Studentized Range	2.82067
Minimum Significant Difference	0.234
Harmonic Mean of Cell Sizes	38.04878

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	MB4
A	4.2644	52	J
A			
A	4.0583	30	P

The GLM Procedure

Level of MB1	N	Lmean Mean	Lmean Std Dev	Omean Mean	Omean Std Dev	Smean Mean	Smean Std Dev
E	41	4.04065041	0.49969503	3.78861789	0.74351305	4.16260163	0.58983025
I	41	3.88743533	0.52582473	3.72764228	0.55809211	4.21544715	0.50482932

Level of MB2	N	Lmean Mean	Lmean Std Dev	Omean Mean	Omean Std Dev	Smean Mean	Smean Std Dev
N	34	3.87254902	0.47815728	3.63235294	0.66701937	4.01960784	0.54164096
S	48	4.02885101	0.53589353	3.84722222	0.63658491	4.30902778	0.52224690

Level of MB3	N	Lmean Mean	Lmean Std Dev	Omean Mean	Omean Std Dev	Smean Mean	Smean Std Dev
F	53	3.92235563	0.54930386	3.77515723	0.69637049	4.23270440	0.53443358
T	29	4.04022989	0.44633688	3.72701149	0.57902172	4.10919540	0.56786614

Level of MB4	N	Lmean Mean	Lmean Std Dev	Omean Mean	Omean Std Dev	Smean Mean	Smean Std Dev
J	52	4.06829837	0.46243284	3.87339744	0.63066396	4.26442308	0.51521543
P	30	3.78333333	0.55948800	3.55833333	0.65585705	4.05833333	0.58195650

Level of Educ	N	Lmean Mean	Lmean Std Dev	Omean Mean	Omean Std Dev	Smean Mean	Smean Std Dev
Adv	24	4.04444444	0.47006184	3.93055556	0.68571812	4.27777778	0.54654529
Bac	29	3.86442006	0.43898485	3.67528736	0.56797155	4.06896552	0.52044937
ass	29	3.99712644	0.61458899	3.69827586	0.70161866	4.23563218	0.56828767

Level of Race	N	Lmean Mean	Lmean Std Dev	Omean Mean	Omean Std Dev	Smean Mean	Smean Std Dev
AAmer	13	4.19114219	0.54346186	3.81410256	0.74780067	4.48076923	0.53484361
other	9	4.25000000	0.36084392	4.01851852	0.60492449	4.36111111	0.41247896
white	60	3.87194444	0.50468140	3.70694444	0.64046161	4.10000000	0.54500816

The GLM Procedure

Level of		Lmean		Omean		Smean	
age_c	N	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
27	9	4.17592593	0.49202749	4.09259259	0.67885274	4.48148148	0.51163168
39	16	3.89583333	0.52219267	3.72395833	0.79040470	4.26041667	0.45630866
49	37	3.98337428	0.49181722	3.74549550	0.61140963	4.09684685	0.52208683
59	20	3.88750000	0.57052031	3.65833333	0.60268648	4.17083333	0.64746187

The GLM Procedure
Multivariate Analysis of Variance

E = Error SSCP Matrix

	Lmean	Omean	Smean
Lmean	16.573574525	8.2893717898	6.810377518
Omean	8.2893717898	29.315153184	7.9730361466
Smean	6.810377518	7.9730361466	18.332729789

Partial Correlation Coefficients from the Error SSCP Matrix / Prob > |r|

DF = 70	Lmean	Omean	Smean
Lmean	1.000000	0.376069	0.390706
		0.0012	0.0008
Omean	0.376069	1.000000	0.343925
	0.0012		0.0033
Smean	0.390706	0.343925	1.000000
	0.0008	0.0033	

The GLM Procedure
Multivariate Analysis of Variance

H = Type III SSCP Matrix for MB1

	Lmean	Omean	Smean
Lmean	0.8667394551	0.6732977554	-0.113244022
Omean	0.6732977554	0.5230289965	-0.087969857
Smean	-0.113244022	-0.087969857	0.014795921

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for MB1
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1 Lmean	Omean	Smean
0.07557246	100.00	0.22935067	0.06195276	-0.13628040
0.00000000	0.00	-0.14543870	0.19135728	0.02457495
0.00000000	0.00	0.05909721	-0.03891154	0.22096376

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall MB1 Effect
H = Type III SSCP Matrix for MB1
E = Error SSCP Matrix

S=1 M=0.5 N=33

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.92973745	1.71	3	68	0.1725
Pillai's Trace	0.07026255	1.71	3	68	0.1725
Hotelling-Lawley Trace	0.07557246	1.71	3	68	0.1725
Roy's Greatest Root	0.07557246	1.71	3	68	0.1725

H = Type III SSCP Matrix for MB2

	Lmean	Omean	Smean
Lmean	0.07610107	0.2339569684	0.1762185184
Omean	0.2339569684	0.7192522136	0.5417473147
Smean	0.1762185184	0.5417473147	0.4080490091

The GLM Procedure
Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for MB2
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1 Lmean	Omean	Smean
0.03532169	100.00	-0.03246088	0.12408362	0.14349333
0.00000000	0.00	0.27589667	-0.04796458	-0.05546741
0.00000000	0.00	-0.00859917	-0.15579639	0.21055709

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall MB2 Effect
H = Type III SSCP Matrix for MB2
E = Error SSCP Matrix

S=1 M=0.5 N=33

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.96588337	0.80	3	68	0.4978
Pillai's Trace	0.03411663	0.80	3	68	0.4978
Hotelling-Lawley Trace	0.03532169	0.80	3	68	0.4978
Roy's Greatest Root	0.03532169	0.80	3	68	0.4978

H = Type III SSCP Matrix for MB3

	Lmean	Omean	Smean
Lmean	0.1815655342	-0.165267698	-0.356279257
Omean	-0.165267698	0.1504328018	0.324298623
Smean	-0.356279257	0.324298623	0.6991134618

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for MB3
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1 Lmean	Omean	Smean
0.08065320	100.00	-0.20174460	0.04488101	0.21602293
0.00000000	0.00	0.18425275	0.01779348	0.08564423
0.00000000	0.00	-0.05095753	0.19909533	-0.11832336

The GLM Procedure
Multivariate Analysis of Variance

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall MB3 Effect
H = Type III SSCP Matrix for MB3
E = Error SSCP Matrix

S=1 M=0.5 N=33

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.92536625	1.83	3	68	0.1503
Pillai's Trace	0.07463375	1.83	3	68	0.1503
Hotelling-Lawley Trace	0.08065320	1.83	3	68	0.1503
Roy's Greatest Root	0.08065320	1.83	3	68	0.1503

H = Type III SSCP Matrix for MB4

	Lmean	Omean	Smean
Lmean	0.9931795072	0.9256082327	0.4773815529
Omean	0.9256082327	0.8626341907	0.4449027515
Smean	0.4773815529	0.4449027515	0.2294581648

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for MB4
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1 Lmean	Omean	Smean
0.06728818	100.00	0.19956139	0.06632036	-0.00224857
0.00000000	0.00	-0.08177257	-0.04674501	0.26076081
0.00000000	0.00	-0.17531437	0.18811267	0.00000000

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall MB4 Effect
H = Type III SSCP Matrix for MB4
E = Error SSCP Matrix

S=1 M=0.5 N=33

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.93695406	1.53	3	68	0.2158
Pillai's Trace	0.06304594	1.53	3	68	0.2158
Hotelling-Lawley Trace	0.06728818	1.53	3	68	0.2158
Roy's Greatest Root	0.06728818	1.53	3	68	0.2158

The GLM Procedure
Multivariate Analysis of Variance

H = Type III SSCP Matrix for Educ

	Lmean	Omean	Smean
Lmean	0.0446927137	0.201484205	0.1388784777
Omean	0.201484205	1.1510957754	0.47490001
Smean	0.1388784777	0.47490001	0.5257160775

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for Educ
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1 Lmean	Omean	Smean
0.04421461	69.82	-0.06221175	0.15788428	0.10325957
0.01911634	30.18	-0.01263595	-0.12739992	0.23504500
0.00000000	0.00	0.27058577	-0.02848994	-0.04574459

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall Educ Effect
H = Type III SSCP Matrix for Educ
E = Error SSCP Matrix

S=2 M=0 N=33

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.93969404	0.72	6	136	0.6373
Pillai's Trace	0.06110021	0.72	6	138	0.6303
Hotelling-Lawley Trace	0.06333094	0.71	6	88.911	0.6403
Roy's Greatest Root	0.04421461	1.02	3	69	0.3906

NOTE: F Statistic for Roy's Greatest Root is an upper bound.
NOTE: F Statistic for Wilks' Lambda is exact.

H = Type III SSCP Matrix for Race

	Lmean	Omean	Smean
Lmean	1.0948115715	0.2444162598	0.9536871735
Omean	0.2444162598	0.0554478971	0.1832521108
Smean	0.9536871735	0.1832521108	1.8279721034

The GLM Procedure
Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for Race
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1 Lmean	Omean	Smean
0.11685135	74.25	0.09548547	-0.06617444	0.20558438
0.04051872	25.75	-0.25650653	0.00092364	0.16032178
0.00000000	0.00	-0.04830685	0.19388128	0.00576621

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall Race Effect
H = Type III SSCP Matrix for Race
E = Error SSCP Matrix

S=2 M=0 N=33

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.86050763	1.77	6	136	0.1101
Pillai's Trace	0.14356659	1.78	6	138	0.1078
Hotelling-Lawley Trace	0.15737008	1.77	6	88.911	0.1142
Roy's Greatest Root	0.11685135	2.69	3	69	0.0531

NOTE: F Statistic for Roy's Greatest Root is an upper bound.
NOTE: F Statistic for Wilks' Lambda is exact.

H = Type III SSCP Matrix for age_c

	Lmean	Omean	Smean
Lmean	0.6894010674	0.8075327697	0.3450529103
Omean	0.8075327697	1.0737295476	0.7879996157
Smean	0.3450529103	0.7879996157	1.8641816474

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for age_c
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1 Lmean	Omean	Smean
0.10953589	66.43	-0.09029451	-0.00594047	0.25507920
0.05405718	32.78	0.17875156	0.10037221	-0.03630954
0.00130755	0.79	-0.19272106	0.17849368	-0.04021786

The GLM Procedure
Multivariate Analysis of Variance

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall age_c Effect
H = Type III SSCP Matrix for age_c
E = Error SSCP Matrix

S=3 M=-0.5 N=33

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.85393927	1.23	9	165.64	0.2777
Pillai's Trace	0.15131296	1.24	9	210	0.2724
Hotelling-Lawley Trace	0.16490062	1.23	9	103.72	0.2831
Roy's Greatest Root	0.10953589	2.56	3	70	0.0622

NOTE: F Statistic for Roy's Greatest Root is an upper bound.