5-1-2018

A QUANTITATIVE INQUIRY INTO THE RELATIONSHIP BETWEEN LEARNING STYLES, PSYCHOLOGICAL TYPES AND STANDARDIZED ACHIEVEMENT EXAMINATION PERFORMANCE OF NURSE AIDE STUDENTS.

Sameer Ahmed
Southern Illinois University Carbondale, sameer.ahmed@siu.edu

Follow this and additional works at: https://opensiuc.lib.siu.edu/dissertations

A QUANTITATIVE INQUIRY INTO THE RELATIONSHIP BETWEEN LEARNING STYLES, PSYCHOLOGICAL TYPES AND STANDARDIZED ACHIEVEMENT EXAMINATION PERFORMANCE OF NURSE AIDE STUDENTS.

by

Sameer Ahmed

B.E., Osmania University, 2008.
M.B.A., Osmania University, 2011.

A Dissertation
Submitted in Partial Fulfillment of the Requirements for the
Doctor of Philosophy in Education

DISSERTATION APPROVAL

A QUANTITATIVE INQUIRY INTO THE RELATIONSHIP BETWEEN LEARNING
STYLES, PSYCHOLOGICAL TYPES AND STANDARDIZED ACHIEVEMENT
EXAMINATION PERFORMANCE OF NURSE AIDE STUDENTS.

by

Sameer Ahmed

A Dissertation Submitted in Partial

Fulfillment of the Requirements

for the Degree of

Doctor of Philosophy

in Workforce Education and Development

in the field of Human Resource Development

Approved by:

Dr. Seburn Pense, Committee Chair

Dr. Christopher Keith Waugh

Dr. Barbara Hagler

Dr. Thomas Wayne Hovatter

Dr. Dennis G. Nasco, Jr.

Graduate School
Southern Illinois University Carbondale
November 21, 2017

AN ABSTRACT OF THE DISSERTATION OF

Sameer Ahmed, for the Doctor of Philosophy degree in Workforce Education and Development, presented on November 21, 2017, at Southern Illinois University, Carbondale.

TITLE: A QUANTITATIVE INQUIRY INTO THE RELATIONSHIP BETWEEN LEARNING STYLES, PSYCHOLOGICAL TYPES AND STANDARDIZED ACHIEVEMENT EXAMINATION PERFORMANCE OF NURSE AIDE STUDENTS.

MAJOR PROFESSOR: Dr. Seburn Pense

The purpose of this research study was to explore the relationship between learning styles, psychological types and multiple-choice standardized achievement examination performance of nurse aide students with typology being the gross indicator using a non-experimental, comparative and descriptive approach. The study sample included nurse aide students ($N = 326$) seeking nurse aide certification selected through a stratified random sampling technique. The participation rate for completed MBTI® inventory was 58.42% ($N = 326$).

The learning styles and psychological types were measured against the Myers-Briggs Type Indicator® Form M in North American English. The multiple-choice standardized achievement examination performance of nurse aide students was determined by Illinois Nurse Aide Competency Examination (INACE) conducted in January 2017. All the research questions and hypotheses compared mean of overall test scores and means of overall test scores based on specific duty areas (i.e. communicating information, performing basic nursing skills, performing personal skills, performing basic restorative skills, providing mental health and social service needs, and providing for residents' rights) between different-groups using one-way analysis of variance (ANOVA) and one-way multivariate analysis of variance (MANOVA).

The findings of the study indicated a statistically significant relationship between mean scores of nurse aide students with Sensing (S) and Intuition (N) learning preferences by perception on overall test performance and test performance based on specific duty areas of the

INACE with the mean of nurse aide students with the Sensing (S) learning preference being numerically highest ($M = 81.85$) than Intuition (N) learning preference ($M = 79.96\%$).

Additionally, there were no statistically significant relationships between learning preferences by source of energy (Extraversion – E and Introversion – N), learning preferences by reaction to information or making decisions (Thinking – T and Feeling – F), learning preferences by preference to life style (Judging – J and Perceiving – P), learning preference combinations by orientation to energy and perception (IS, IN, ES, and EN), learning preference combinations by perception and attitude (SP, SJ, NP, and NJ), learning preference combinations by mental process (ST, SF, NF, and NT), and 16 psychological or personality types or learning approaches (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENFP, ENTP, ESTJ, ESFJ, ENFJ, and ENTJ) and Illinois Nurse Aide Competency Examination (INACE) performance among nurse aide students. The findings suggested that students with Introversion (I), Sensing (S), Thinking (T), and Perceiving (P) learning preferences had better overall test score on the Illinois Nurse Aide Competency Examination (INACE). Further research with a larger sample is recommended.

The findings from the study and review of literature will guide nurse aide trainers and students, improve Illinois Nurse Aide Competency Examination; and increase nurse aide students' retention efforts by utilizing the MBTI® assessment tool along with understanding and implementing the underlying concepts.

Keywords: Personality Type, Psychological Type, Academic Achievement, Academic Aptitude, Type Theory, Standardized MCQ Tests, Standardized Tests, Cognitive Attribute, Academic Success, Achievement Tests, Learning Styles, Myers-Briggs Type Indicator®

DEDICATION

I would like to dedicate my doctoral dissertation to Almighty Allah S. T. to have shown me and guided me through this path in pursuit of knowledge, competencies, skills, and experience as a doctoral student and candidate. A special gratitude to my loving parents, Iqbal Ahmed and Zarina Fatima whose words of encouragement and motivation, constant prayers, and push for tenacity has helped me move closer to my goal. My sister, brother-in-law, and nephew (Asra Fatima, Mazhar Hussain, and Misbah Hussain) who never left my side and are very special. My brilliant, outrageous, and supportive wife, Dina for all her love and support. My brother, Ishtiaq Ahmed who stood by me and encouraged me to move ahead and achieve my goal.

ACKNOWLEDGEMENTS

From death bed to my dissertation – though the journey was both exasperating and exhilarating, I enjoyed every moment of it and learned a lot. I am thankful for the support and assistance I have received at each stage of the process. Without the encouraging and loyal attitudes of my family and academic mentors, I could not have completed this passage. My warmest gratitude goes to my immediate family for their patience, understanding, and encouragement. Never again will you see me read through my research while sitting through a movie, on a camping trip, or during a Skype talk.

I am grateful to my parents, Iqbal Ahmed and Zarina Fatima, who gave me the opportunity to build confidence in my abilities and presented me with an appreciation for knowledge and education that is unparalleled by anything else in my life. My nephew, Misbah, you have been my grandest source of inspiration since the day you were born. This degree will be really for you. Dina, you sacrificed your time to make dinner any time I was too tired from writing, and rubbed my back regularly when I had been sitting at my desk for too long. Your constant love and kindness has been very instrumental in the completion of this project; you are the best!

My dear sister, brother and brother-in-law, Asra, Ishtiaq and Mazhar —you have gracefully taken my hand and led me through this journey with wisdom, patience, and honor. I am absolutely certain that I would not have finished writing this paper without your unconditional friendship and encouragement at each of my small successes. You were my beacon through the roughest of storms. Thank you.

A special thanks to Dr. Thomas W. Hovatter to have been a great mentor to me throughout this journey, Dr. Gina Paul to have blessed me with the wisdom of MBTI® and to

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Background of the Study

Health care is one of the largest industry sectors in Illinois. There is a wide range of

professional and non-professional workers who play an important role in health care (Illinois

Center for Nursing [ICFN], 2009). There are different types of health care providers who differ

based on jobs and roles on the health care team. Examples of these team members are doctors,

physician assistants, nurses, pharmacists, dentists, technologists and technicians, therapists and

rehabilitation specialists, emotional, social / spiritual support providers, administrative, and

support staff, etc. (ICFN, 2009).

One of the many facets of care delivery is met by nurses and according to the Illinois

Department of Public Health [IDPH] (2016) nurses are an integral part of the health care team

responsible for the following: (a) primary care such as treatment, safety, recovery of

moderately/acutely/chronically ill or injured people; (b) health maintenance of the healthy; and

(c) treatment of life-threatening emergencies in a wide range of health care settings. The

following are the types of nurses specifically trained and educated to provide nursing care in

Illinois: Certified Nurse Aide or Assistant (CNA), Licensed Practical Nurse (LPN), Registered

Nurse (RN), and Advance Practice Nurse (APN) (in order of hierarchy from lowest to highest)

(ICFN, 2009; IDPH, 2016).

The direct care workforce (nurse aides or assistants) is the third largest workforce in the

state of Illinois (Health and Medicine Policy Research Group [HMPRG], 2015). This workforce

includes home health aides, personal and home care aides, nursing aides, orderlies, attendants,

and independent providers in public programs (HMPRG, 2015). All of these titles in general are

referred to as nurse aides or assistants and words like "nurse aides or assistants", "direct care givers or workers", "caregivers", and "home care givers" are used interchangeably. Nurse aides or assistants are the basic care givers working in licensed and/or certified skilled nursing facilities, immediate care facilities, and home health agencies in the state of Illinois (IDPH, 2016).

These frontline workers are trained to assist patients with the activities of personal care (i.e., feed, groom, bathe, and assist in a variety of ways); provide hands-on care; provide emotional support to millions of elderly and younger people with chronic illnesses and disabilities; and they play a key role in the lives of their patients (IDPH, 2016). As stated by PHI State Facts [PHI] (2013), 150,000 direct-care workers currently provide up to 80% of the hands-on care and support to elders and people with disabilities across the state of Illinois. In Illinois, all nurse aides or assistants have to be certified by successfully completing a state-approved nurse aide or assistant training program, a competency test covering 21 mandated manual skills, and a written competency test (IDPH, 2016; Illinois Nurse Aide Testing [INAT], 2016). Nurse aides or assistants are the participants or subjects of interest in this study.

There are several key findings that describe significant events in the historical evolution of this research identity. The first is population growth: the U.S. Census Bureau projects the United States population to increase by 13% between now and 2025 (Dill & Salsberg, 2008). Another key finding is population aging. The baby boomers started turning 65 in 2011 and by 2030, 70 million U.S. residents will be 65 or older (Dill & Salsberg, 2008). The Illinois direct-care worker population is expected to grow by 23% in the current decade, through 2020 (PHI, 2013). Additionally, chronic disease growth is a key finding. By 2030, half of the population will have more than one chronic condition (Zywiak, 2013). Furthermore, the health care

reforms, i.e., the provision of expanded health insurance under the Patient Protection and Affordable Care Act (ACA) has increased the population of health care consumers (Illinois Center for Nursing [ICFN], 2015). With population growth, population aging, chronic disease growth, and health care reforms, the demand for care has increased (Langer, 2008; Peterson et al., 2011). As the demand has increased, the current number of staff trained to provide care is inadequate (Halstead, 2012; Kinnair, 2012). Along with the growth in home and community based support, long term care in nursing facilities is moving towards more person-centered care and a culture change movement that requires strong communication skills, teamwork, and a respectful relationship between direct-care workers, management, and the residents they support (PHI, 2013). The inadequate staffing of nurse aides or assistants will undermine patient care. When health care settings are inadequately staffed, patients are exposed to detrimental situations, such as inappropriate patient to nurse ratios, which increase the likelihood of errors (Erlen, 2001).

Secondly, according to a survey conducted by the ICFN (2015), nurse aides or assistants and LPNs are an aging group whereby 59% of this workforce falls into the upper age ranges leading to serious concerns about meeting future populations' health care needs. In addition, nurse aides or assistants aged 55 to 65 or older intend to retire leaving voids in specialties and the ones aged 25 years or under are also planning to leave in one to five years (as they plan to make career path changes or they plan to take care of their own health). Moreover, the wages and benefits are generally not competitive with other available jobs (PHI, 2013). These issues contribute to another side of the shortage equation, which is inadequate growth and a decrease in caregiver supply. The nurse aides or assistants are the basic caregivers within the nursing team and are trained to assist people with activities of daily living where they feed, groom, bathe, and

assist patients in a variety of ways (IDPH, 2016). Without their presence and qualified experience, it would be difficult to render timely, quality care.

Thirdly, within the home care workforce, turnover rates are reported as a significant concern as it ranges from 40% and 65% and the factors include low wages, unsupportive supervision, and inconsistent training (PHI, 2013). In addition, the training standards, particularly in the home care sector, are inadequate and allow inconsistency in how training is delivered. (HMPRG, 2015). Workforce turnover leads to poor quality of care because of unsupportive supervision. Workers and consumers thrive in environments that value teamwork, communication, and critical thinking. While these three are considered "soft-skills", they are essential to delivery of person-centered services and for successful quality improvement (PHI, 2013).

Finally, in order to join the workforce as a nurse aide/assistant in Illinois, the individual has to undergo an Illinois approved Basic Nurse Aide/Assistant Training Program, pass the 21-mandated manual skills assessment, and pass the competency certification examination (which is a multiple-choice test on specific duty areas of nursing) (IDPH, 2016). In addition, the pre-requisites to qualify for taking the certification examination are the completion of the training program and the 21-manual skills assessment. The overall pass rate for the certification examination averaged 85% between 2010 and 2015 and the enrollment rate has dropped since 2014 (T. W. Hovatter, personal communication, April 27, 2015).

Given the increase in demand, the inadequate caregiver supply, high turnover rates, inadequate and inconsistent training, the current certification pass rate, and the enrollment drop-out; it is clearly understood that many health care providers are struggling to meet the needs of the patient care population. There are multiple issues that have been discussed and there are

various ways to deal with these issues; including the following: enhancing educational programs for nurse aides, providing student incentives, understanding and linking competencies to training, increasing school enrollment, encouraging primary care, expanding care deliveries, and exploring ways to effectively use caregivers. One of the ways to research and address these issues is through the perspective of academic success. In order to do so, the factors that influence examination success need to be understood and, if there are "success factors", it is important to know how to enhance instruction and learning to accommodate these factors.

<div align="center">**Significance of the Problem**</div>

With the various issues discussed earlier in the background of the study, determining if students with specific personality types and learning styles have more difficulty in their path to student success or academic achievement could help in planning better instruction. Additionally, alternatively dealing with differences in learning and teaching along with providing guidance for students to better prepare for the multiple-choice Illinois Nurse Aide Competency Examination (INACE). These initiatives could improve the ability to provide an adequate supply of nurse aides or assistants to the workforce. Providing an adequate supply could enhance patient care and health care outcomes, while decreasing health care costs (Prestia & Dyess, 2012). This satisfaction is linked with hospital reimbursement, which substantially impacts health care facilities (Mathews, 2013).

Academic achievement is related to a qualified workforce (Handel, 2006). When a student fails to perform adequately, they may miss the opportunity to become a productive member of society. This lost opportunity widens the gaps between the need for qualified individuals and the availability of a skilled labor force (Whittington, 2014). In the health care arena, staffing health care centers and providing safe care is essential (Institute of Medicine,

2012). One facet of staffing that is directly related to the provision of safe care is the presence of

certified nurse aides or assistants. These individuals are responsible for providing care at the

bedside (IDPH, 2016, Administrative Rule, Section 395.300). As discussed earlier, the direct-

care workforce is to grow by 23% in the current decade, through 2020 (HMPRG, 2015).

Without an available qualified workforce, these positions will not be filled, thus impacting

patient care at the bedside.

There is no specific or scientific equation that accurately predicts what makes a student

successful in their academic endeavors since many factors play an important role in achievement

(Dearnley & Matthew, 2007). However, there are several cognitive and non-cognitive factors

that have emerged as critical in examination success (Bell, 2008). Identifying such factors that

predispose students to poor academic performance can assist the student and educational entities

in providing opportunities for remediation that positively influence the likelihood of academic

achievement (ACTE, 2006). Being able to foster academic achievement results in providing the

workforce with individuals equipped with skills needed to become successful employees. A few

variables that are linked to academic achievement are personality types and learning styles or

preferences (Lee, Lee, & Kim, 2009).

According to Mathews (2013), in order to identify patient satisfaction, the Hospital

Consumer Assessments of Healthcare Providers and Systems (HCAHPS) was developed by the

Centers for Medicare and Medicaid Services (CMS). The goal was to enhance the patient care

experience, thus positively impacting patient satisfaction. Health care facilities that have high

levels of patient satisfaction receive higher reimbursement from CMS, and are able to market

HCAHP scores strategically. This push for coordinating and providing better patient care is

labeled the "Triple Aim" and focuses on these goals: to "improve the overall health of the

population being served; improve the care experience, which goes beyond simply providing the right type of care; provide the best care possible while lowering the per-capita costs of care over time" (Mathews, 2013, p.24). With these goals in mind, a qualified workforce of nursing aides or assistants can prove instrumental.

It is essential to provide an adequate and skilled nurse aide or assistant workforce to health care facilities. The Illinois Nurse Aide Competency Examination (INACE) passage rates for 2010, 2011, 2012, 2013, 2014, and 2015 are 86%, 83%, 85%, 85%, 84%, and 85% respectively and there is a drop in enrollment rate since 2014. (T. W. Hovatter, personal communication, April 27, 2015). The need exists to enhance nurse aide or assistant students' success within their educational programs, as well as their ability to succeed in the Illinois Nurse Aide Competency Examination (INACE). Even with the current number of individuals passing, there is still a documented shortage of nurse aides or assistants available to enter the workforce (United States Department of Health & Human Services, 2004). In order to become employable in the job market, the Illinois nurse aide or assistant should successfully complete an accredited training course within an approved program, successfully pass the 21 manual skills assessment, and the INACE.

Attempting to meet the need for qualified nurse aides or assistants in the workforce is imperative, as the need to retain individuals within this field remains a concern among the aging population, health care institutions, and the United States labor market (Stone & Weiner, 2001). Understanding the role of personality types and learning styles or preferences of individuals in relation to performance on the Illinois Nurse Aide Competency Examination (INACE) within the nurse aide or assistant programs could increase student academic success, and thus potentially their retention within the academic program (Griffin, MacKewn, Moser, & VanVuren, 2013).

Increasing retention throughout the educational program allows for more individuals to be qualified to take the Illinois Nurse Aide Competency Examination. Successful completion of this competency examination provides the individual with the certification necessary to pursue employment in the health care arena as a certified nurse assistant.

Statement of the Purpose

The research purpose is to investigate whether learning preferences, learning preference combinations, and personality types are related to standardized achievement examination performance or academic achievement, i.e., overall test performance and test performance based on specific duty areas (i.e., communicating information, performing basic nursing skills, performing personal care, performing basic restorative skills, providing mental health-services, and providing for resident's rights) of nurse aide students on a multiple choice Illinois Nurse Aide Competency Examination.

Research Questions

The research questions that will be investigated in this study are as follows:

1. What are the differences between the four dichotomous pairs or levels of learning preferences determined by the Myers-Briggs Type Indicator® *Extraversion (E) - Introversion (I), Sensing (S) - Intuition (N), Thinking (T) - Feeling (F), and Judging (J) Perceiving (P)* with reference to the mean of *overall test performance* and means of *overall test performance based on specific duty areas** of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination (INACE)?

2. What are the differences between the four levels of learning preference combinations by orientation of energy and perception determined by the Myers-Briggs Type Indicator® *IS, IN, ES, and EN* with reference to the mean of *overall test performance* and means of

overall test performance based on specific duty areas* of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination (INACE)?

3. What are the differences between the four levels of learning preference combinations by perception and attitude *SP, SJ, NP, and NJ* determined by the Myers-Briggs Type Indicator® with reference to the mean of *overall test score* and means of *overall test scores based on specific duty areas** of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination (INACE)?

4. What are the differences between the four level of learning preference combinations by mental process (perception and judgment) *ST, SF, NF, and NT* determined by the Myers-Briggs Type Indicator® with reference to the mean of *overall test performance* and means *overall test performance based on specific duty areas** of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination (INACE)?

5. What are the differences between the 16 levels of psychological types or learning approaches *ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENFP, ENTP, ESTJ, ESFJ, ENFJ, and ENTJ* determined by the Myers-Briggs Type Indicator® with reference to the mean of *overall test performance* and means of *overall test performance based on specific duty areas** of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination (INACE)?

*specific duty areas include the following: communicating information, performing basic nursing skills, performing personal skills, performing, basic restorative skills, providing mental health and social service needs, and providing for residents' rights.

Delimitations

The following are the delimitations of the study:

1. The study has limited itself to investigate only nurse aide students who have completed the training, cleared the 21-mandated skills assessment, and are ready to take the Illinois Nurse Aide Competency Examination (INACE).

2. The research study has its focus only on understanding how learning styles and personality types impact performance on a multiple-choice competency examination with the perspective of typology as a gross indicator of what people have in common and the differences between them and not the learning styles which describes the basic learning ability by instructional preference or information processing (e.g., visual, auditory, etc.) but by cognitive style.

3. The eight learning preferences (Extraversion, Introversion, Sensing, Intuition, Thinking, Feeling, Judging, and Perceiving); learning preference combinations by orientation of energy and perception combination (IS, IN, ES, and EN), perception and attitude combination (SP, SJ, NP, and NJ), and mental processes combination (i.e. perception and judging; ST, SF, NF, and NT); and personality types or learning approaches (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENFP, ENTP, ESTJ, ESFJ, ENFJ, and ENTJ) were explored in this research because the review of literature only supported these entities in relevance to personality types, learning styles or preferences and academic achievement.

Definitions

Certified /Nurse Aide or Assistant (CNA) student. According to the Health Care

Worker Background Check Act (225 ILCS 46), nurse aides or assistants working in licensed or

certified nursing facilities, immediate care facilities, and home health agencies must be certified

(IDPH, 2016). The certification is achieved by completing the Illinois approved basic certified

nurse aide or assistant training program, passing a competency test covering 21 mandated

manual skills, and passing a written competency test (IDPH, 2016). The nurse aide students who

completed the training, passed the 21-mandated manual skills assessment, and took the Illinois

Nurse Aide Competency Examination in January 2017 were the participants of this research

study.

Achievement test. An achievement test is designed to measure the knowledge, skills,

and competencies that nurse aide students learn in the Illinois approved Basic Nurse Aide

Training Program so as to identify appropriate employment placement using certification.

Standardized achievement test. A test that (a) requires all test takers to answer the

same questions, and that (b) is scored in a "standard" or consistent manner, which makes it

possible to compare the relative performance of students or groups of students (Standardized test,

n.d.).

Academic achievement. The outcome of education for both students, educators, and the

industry which can be measured using a standardized achievement examination's test score or

Grade Point Average (GPA) (Malloy, 2007).

Multiple-Choice Illinois Nurse Aide Competency Examination (INACE). An 85-item

multiple choice competency examination (a standardized achievement test) designed to assess

the skills, knowledge, abilities, and competencies needed to perform the job of a nurse aide or

assistant (INAT, 2016). There are different tasks performed by nurse aides. Each task was

analyzed and evaluated by nurse aides and their supervisors and later validated in the state of

Illinois in January 2000. The 200 validated tasks (alias duty areas) were grouped in six broad

categories on which the test is usually designed: (a) Duty Area A: Communicating Information

(31 tasks); (b) Duty Area B: Performing Basic Nursing Skills (59 tasks); (c) Duty Area C:

Performing Personal Care Skills (43 tasks); (d) Duty Area D: Performing Basic Restorative

Skills (42 tasks); (e) Duty Area E: Providing Mental Health and Social Service Needs (11 tasks);

and (f) Duty Area F: Providing Residents' Rights (14 tasks) (INAT, 2016). The multiple-choice

Illinois Nurse Aide Competency Examination (INACE) is (a) designed to examine the

knowledge, skills, and competencies; (b) requires all the test takers to answer the same questions;

and (c) is scored in a standard or consistent manner which makes it possible to compare the

relative performance of nurse aide students. Therefore, the definition of *multiple choice certified*

nursing aide or assistant competency examination is synonymous with *standardized achievement*

examination or test or *academic achievement* and the terms can be used interchangeably with

this operational definition within this research study.

      The Myers-Briggs Type Indicator® (MBTI®) Form M Instrument. A 93 item self-

report questionnaire developed by Katharine Cook Briggs and Isabel Briggs Myers based on Carl

Gustav Jung's theory of psychological types which takes an approximate administration time of

15 – 25 minutes. All 93-items on MBTI Form M were used for identifying the four-letter-type

using four dichotomous (pairs of opposite categories) pairs (extraversion or introversion, sensing

or intuition or thinking or feeling, and judging or perceiving) (Bastable, 2014; Lawrence, 2009;

Myers, 1988; Myers, McCaulley, Quenk, & Hammer, 2003).

Preferences. One of each pair of the four basic mental functions and attitudes that in type theory structure an individual's personality (e.g., the Extraversion – Introversion dichotomy is a pair of mental attitude with two preferences) (Myers, et al., 2003).

Dichotomy/ies/ous. A division of two distinct parts and according to the type theory, the two parts are assumed to identify opposite domains of mental functioning or attitudes. Dichotomous constructs differ qualitatively or quantitatively from continuous variables. The four dichotomies of MBTI are Extraversion – Introversion, Sensing – Intuition, Thinking – Feeling, and Judging – Perceiving (Lawrence, 2009; Myers, et al., 2003).

Psychological types. A unique combination of mental attitudes (i.e. Extraversion or Introversion and Judging and Perceiving) and mental functions (i.e. Sensing or Intuition and Thinking or Feeling) that is more than the sum of its parts. It is one of the 16 combinations of four preferences (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENFP, ENTP, ESTJ, ESFJ, ENFJ, and ENTJ), each with specific characteristics postulated from dynamics of theory. *Type* is not used to denote a single preference (Lawrence, 2009; Myers, 1988; Myers & Myers, 1995; Myers, et al., 2003).

Learning styles. Learning styles explains the manner in which individuals perceive and process information. In accordance with this research study which focused on learning styles with typology as the broad indicator, learning styles were studied using aspects of psychological make-up in alliance with a multiple choice standardized achievement test. Learning styles with psychological make-up were studied with the aspects of (a) cognitive style in the sense of preferred or habitual patterns of mental functioning, i.e., information processing, formation of ideas, and judgement; (b) patterns of attitudes and interests that can influence a potential learning situation; (c) a disposition to seek out learning environments; and (d) a disposition to use certain

learning tools. This research tried to study all the aspects of psychological make-up; however, the actual focus was towards the aspects of psychological make-up alliance with standardized achievement examination performance.

Learning preferences. Learning preferences are learning styles determined by the MBTI® assessment tool which explains nurse aide students' learning preference by source of energy (Extraversion and Introversion), perception (Sensing and Intuition), reaction to information or making decisions (Thinking and Feeling), and preference to lifestyle (Judging and Perceiving) (Lawrence, 2009). These preferences explain how nurse aide students (a) process information, make ideas, form judgment; (b) use attitudes and interest that influence potential learning situation; (c) seek different learning environments; and (d) use certain learning tools.

Learning preference combinations. Learning preference combinations are combinations of two learning preferences that explains the interaction on learning and test taking. The learning preference combinations by orientation of energy and perception (IS, IN, ES, and EN), perception and attitude (SP, SJ, NP, and NJ), and mental process i.e. perception and judgment (ST, SF, NF, and NT) are determined through the MBTI® assessment tool (Lawrence, 2009).

Extraversion preference (E). (defined with relevance to learning, test taking, and multiple choice test performance) The attitude (orientation) that identifies the direction and flow of energy to the outer world (Myers, et al., 2003). This preference is one of the extremes of the Extraversion (E) – Introversion (I) dichotomy that identifies the source of energy for learning, thinking, and test taking that comes from external sources (Lawrence, 2009; Paul, 2014; Pelly & Dalley, 1997). An Extraversion (E) type is an individual who has a preference for the extraverted attitude over the introverted attitude.

Introversion preference (I). (defined with relevance to learning, test taking, and multiple choice test performance) The attitude (orientation) that identifies the direction and flow of energy to the inner world (Myers, et al., 2003). This preference is one of the extremes of the Extraversion (E) – Introversion (I) dichotomy that identifies the source of energy for learning, thinking, and test taking that comes from within (Lawrence, 2009; Paul, 2014; Pelly & Dalley, 1997). An Introversion (I) type is an individual who has preference for introverted attitude over the extraverted attitude.

Sensing preference (S). (defined with relevance to learning, test taking, and multiple choice test performance) The perceiving mental function that is concerned with experiences available to senses (Myers, et al., 2003). This preference is one of the extremes of the Sensing (S) – Intuition (N) dichotomy that deals with how students process information which is an important attribute for a multiple-choice examination (Lawrence, 2009; Paul, 2014; Pelly & Dalley, 1997). They are also referred as linear learners. A Sensing (S) type is an individual who has a preference for sensing over intuition as a way of perceiving.

Intuition preference (N). (defined with relevance to learning, test taking, and multiple choice test performance) The perceiving mental function that is concerned with meaning, relationships, patterns, and possibilities (Myers, et al., 2003). This preference is one of the extremes of the Sensing (S) – Intuition (N) dichotomy that deals with how students process information which is an important attribute for a multiple-choice examination (Lawrence, 2009; Paul, 2014; Pelly & Dalley, 1997). They are also referred to as integrative learners. An Intuitive (N) type is an individual who has a preference for intuition over sensing as a way of perceiving.

Thinking preference (T). (defined with relevance to learning, test taking, and multiple-choice test performance) The judging mental function that is concerned with making decision

and reaction to information and situations (Myers, et al., 2003). The decisions are made by ordering choices in terms of logical cause-effect and objective analysis of relevant information. This preference is one of the extremes of the Thinking (T) – Feeling (F) dichotomy that deals with how students react to new information or situations (Lawrence, 2009; Paul, 2014; Pelly & Dalley, 1997). A Thinking (T) type is an individual who has a preference for Thinking over Feeling as a way of making judgments.

Feeling preference (F). (defined with relevance to learning, test taking, and multiple choice test performance) The judging mental function that is concerned with making decisions and reaction to information and situations (Myers, et al., 2003). The decisions are made by ordering choices in terms of personal values. This preference is one of the extremes of the Thinking (T) – Feeling (F) dichotomy that deals with how students react to new information or situations (Lawrence, 2009; Paul, 2014; Pelly & Dalley, 1997). A Feeling (F) type is an individual who has a preference for feeling over thinking as a way of making judgments.

Judging preference (J). (defined with relevance to learning, test taking, and multiple-choice test performance) The mental attitude (orientation) that indicates either thinking or feeling is the preferred way of dealing with the outer world (Myers, et al., 2003). The preference is one of the extremes of the Judging (J) – Perceiving (P) dichotomy that deals with how individuals structure their lives which is the important attribute for a multiple-choice examination or achievement (Lawrence, 2009; Paul, 2014; Pelly & Dalley, 1997). A Judging (J) type is an individual who has a judging attitude, i.e., prefers to use judging functions (Thinking or Feeling) over perceiving functions (Sensing or Intuition) when dealing with learning, thinking, or test taking.

Perceiving preference (P). (defined with relevance to learning, test taking, and multiple choice test performance) The mental attitude (orientation) that indicates that either sensing or intuition is the preferred way of dealing with the outer world (Myers, et al., 2003). The preference is one of the extremes of Judging (J) – Perceiving (P) dichotomy that deals with how individuals structure their lives which is an important attribute for a multiple choice examination or achievement (Lawrence, 2009; Paul, 2014; Pelly & Dalley, 1997). A Perceiving type is an individual who has a perceiving attitude, who prefers to use perceiving function (Sensing or Intuition) over the judging function (Thinking or Feeling) when dealing with learning, thinking, or test taking.

IS, IN, ES, and EN. The learning preference combinations by orientation of energy and perception which were clearly associated with learning and achievement and reported in previous research (Lawrence, 2009). There are measured by the MBTI®.

SP, SJ, NP, and NJ. The learning preference combinations by perception and attitude which were clearly associated with learning and achievement and reported in previous research (Lawrence, 2009). They are measured by the MBTI®.

ST, SF, NF, and NT. The learning preference combinations by mental process combinations (i.e., perception and making decisions) which were clearly associated with learning and achievement and reported in previous research (Lawrence, 2009). They are measured by the MBTI®.

CHAPTER II

LITERATURE REVIEW

Introduction

The research purpose is to investigate (conduct a quantitative inquiry) whether learning preferences, learning preference combinations, and personality types are related to standardized achievement examination performance or academic achievement, i.e., overall test performance and test performance based on specific duty areas (i.e., communicating information, performing basic nursing skills, performing personal care, performing basic restorative skills, providing mental health-services, and providing for resident's rights) of nurse aide students on a multiple choice Illinois Nurse Aide Competency Examination (INACE). A search related to the literature was conducted covering the years from 1975 to 2017. The search was conducted at Southern Illinois University's Morris Library and Carbondale Public Library utilizing EBSCOhost, American Medicine & Surgery, Dentistry Periodicals, CINAHL Plus with Full Text, ERIC, Health and Psychological Instruments, Health Sources – Nursing Academic Edition, Medline, PyschARTICLES, PsychCRITIQUES, PyschINFO, ProQuest, Google Scholar, and OPENSIUC databases and topic relevant books.

The primary descriptors used in the literature search included these: Myers-Briggs Type Indicator®, Personality Types, Psychological Types, Type Theory, Academic Achievement, Standardized MCQ Tests, Standardized Tests, Cognitive Attributes, Academic Success, Academic Aptitude, Achievement Tests, and Learning Styles. The parts of this chapter include a theoretical and conceptual framework and a review of type, learning styles, and academic achievement literature. The literature and research on the relationship between a standardized achievement exam (academic achievement), learning styles, and the psychological types of the

nurse aide population is sparse. However, an attempt was made to include all relevant literature published in the last 15 years. Citations will include studies more than five years old in order to more thoroughly cover the topics under study.

Theoretical and Conceptual Framework

The research purpose is to investigate whether learning preferences, learning preference combinations, and personality types are related to standardized achievement examination performance or academic achievement, i.e., overall test performance and test performance based on specific duty areas (i.e., communicating information, performing basic nursing skills, performing personal care, performing basic restorative skills, providing mental health-services, and providing for resident's rights) of nurse aide students on a multiple choice Illinois Nurse Aide Competency Examination (INACE). In order to attain the purpose, it is important to understand the theoretical and conceptual framework of the research study. A *theory* is formulated to explain, predict, and understand a phenomena and, in some cases, to challenge and extend existing knowledge within the limits of critical bounding assumptions while a *theoretical framework* introduces and describes the theory that explains why the research problem under the study exists (Swanson, 2013).

The purpose relies on three different entities: psychological types (personality), learning styles, and standardized achievement examination performance (academic achievement) with typology theory being the gross indicator. The following discussions will clearly describe and position the theoretical framework, concepts, models, or theories that form the conceptual basis for understanding, analyzing, and designing ways to investigate the relationships within the research identity (i.e., understanding learning, thinking, and test taking while performing on the exam).

Student development is the central task of education when learning is broadly construed as a potential of lifelong growth (Arnold & King, 1997). Student development encompasses a sequential growth, adaptation, and transformation and helps to understand differences in students served in education while typological modes of student development can be used to understand the differences of psychological type and how these differences affect student success (Sanborn, 2013). There are different student development theories, the research and application of which were synthesized into four broad schools of theories: (a) Psychological theories; (b) Cognitive development theories; (c) Typology theories; and (d) Contextual theories (Arnold & King, 1997; Evans, Forney & Guido-DiBrito, 1998; Love & Guthrie, 1999; Pascarella & Terenzini, 1997).

Psychological theories examine students' personal and interpersonal lives by defining it as a series of developmental tasks or stages that are confronted by adults when their biology and psychology converge and qualitatively change their thinking, feeling, behaving, valuing, and relating to others and self (Chickering & Reisser, 1993; Erikson, 1959; Evans et al., 1998). Erikson's eight development crises, Sanford's stages development, Marcia's model of ego identity status, etc., are some examples of psychological theory (Provost & Anchors, 2012).

Cognitive development theories examine the development of how students grow cognitively and intellectually, including how they interpret the world around them and they examine the way people think but not what they think (Evans et al., 1998). Perry's scheme of intellectual and ethical development, Loevinger's theory of ego development, Baxter Magolda's epistemological reflection model, etc., are some examples of cognitive development theory (Provost & Anchors, 2012).

Typology theories examine individual differences in how students view and relate to the world (Evans et al., 1998). Jung and Myers-Briggs typological theory, Keisey and Bates'

temperament differences, Kolb's theory of experiential learning, Holland's theory of vocational choice, the Big Five theory, and K. P. Cross's work on socioeconomic characteristics are some proponents of typological theory (Provost & Anchors, 2012).

Contextual theories examine how the students' environment influences students' behavior through interaction and characteristics of the students (Sandeen, 1991). Bronfenbrenner', Banning, Kaiser's theory, etc., are some examples of typological theory (Provost & Anchors, 2012).

According to Evans et al. (1998), typology theories reflect individual stylistic differences in how students approach their world. This means they are different than psychological and cognitive theories which consist of stages that students' progress through. The typological models are more often used to measure students' personal attributes and learning styles while other models gauge choice of major, comfort level around decision making, peers, and predicaments (Walker, 2008). As the intent of this study is to understand nursing aide or assistant students' personality types or psychological types and learning styles in relation to competency exam performance, typological theory is more pertinent to form the theoretical base or concept of this study.

Typology Theories

There are many examples of typology theories like the Holland's theory of vocational choice, the Kolb's theory of experiential learning, the Big Five theory, and Jung and Myers-Briggs typological theory. Holland's theory of vocational choice seeks (Holland, 1997) to explain vocational behavior and suggests that our culture allows individuals to be characterized by personality type. Kolb's theory of experiential learning (1981) arranges individuals according to a learning style model based on how they learn and develop. The Big Five Theory is a five-

dimensional model of personality based on experience as opposed to theory (Center for Applied Cognitive Studies [CACS], 2004). According to CACS (2004), the model was identified by searching for the smallest number of synonym clusters that could account for the largest variation in individual differences in personality.

Jung and Myers-Briggs typology theory provides a way of examining some important personality differences. Apart from visible and invisible differences among students (as the other theories stated above help us to understand), there are cognitive and affective differences that influence learning and development (which is the basic premise of Jung and Myers-Briggs typological model) (Provost & Anchors, 2012). For example, why do some students from advantaged backgrounds succumb or barely survive while others from apparently disadvantaged backgrounds excel? Knowing about such differences will help researchers understand students and provide rationale for predicting such behaviors. This theory helps to comprehend variation in random student behavior (Jung, 1971; McCaulley, 1999; Myers, 1998) which is not because of chance but is a result of a few observable differences in personality.

But, which typological theory fits the requirement of this research study? As discussed earlier, there are many examples to typology theory: Holland's theory of vocational choice, Kolb's theory of experiential learning, the Big Five theory, and the Jung and Myers-Briggs typological theory. The basic premise of the Jung and Myers-Briggs typology theory is that individuals can have different motivations and processes for getting through the day, but they follow certain polar configurations. These preference pairs include the source of energy (Extraversion – Introversion; important attribute for achievement), how the information is processed (Sensing – Intuitive; important attribute for multiple choice exams), reaction towards new information and situations (Thinking – Feeling), as well as structuring lives and decision

making (Judging – Perceiving; important attribute for achievement) (Lawrence, 2009; Paul, 2014). Individuals use each aspect of these personality pairs daily, but have a preference for one that is more comfortable to use.

Determining if students with specific type preferences have more difficulty in their path to student success is important for addressing the issues related to nurse aide or assistant workforce demands and requirements for such a skilled nurse aide or assistant workforce. The *Jung and Myers-Briggs typology theory* is a better option when compared to other typological models or theories because it serves to explore the basic premise of the research study, i.e., compare and describe personality types and learning styles with reference to performance on the multiple choice certified nursing aide or assistant (CNA) competency exam. The next section presents a discussion about the theory.

Jung and Myers-Briggs Typology Theory

Jung and Myers-Briggs typology, a theory about how students take-in information and make decisions, has been a subject of research for over 10 decades (Kise, 2007). Type differences are real and analyzing data through the lens of type reveals invisible biases in how we measure intelligence, creativity, learning, and academic achievement (Hammer, 1996; Kise, 2007). The Jung and Myers-Briggs theory is a theoretical framework that supports effective teaching and learning (Kise, 2007; Lawrence, 2009). Every student is different and is a product of his or her own heredity and environment and, therefore, is different from everyone else (Myers & Myers, 1995). The merits of this theory enable us to understand specific personality differences, in particular student's personality differences and to cope with students and the differences in a constructive way (Lawrence, 1984; 2009; McCaulley, 1990; Myers et al., 2003).

Jung and Myers-Briggs typology theory was developed based on Carl Gustav Jung's (1923, 1971, 1990) psychological type theory. He was one of the first developmental psychologists. He believed that student development is a lifelong process and all human beings have an innate psychic energy toward growth (Provost & Anchors, 2012). According to Myers (1998), Jung observed that when people's minds are active, they are involved in two mental activities – taking in information or *perceiving* and organizing information and coming to conclusions or *judging*. The two opposite ways that people perceive, he called s*ensation* (called *sensing* by Myers and Briggs) and *intuition,* and the two opposite ways that people judge, he called *thinking* and *feeling*. He referred to these as "orienting functions – a particular form of psychic activity that remains the same under varying condition" (p. 436). In addition, Jung explained that individuals tend to focus their energy and be energized more by the external world of people, experiences, and activities or more by the internal world of ideas, memories, or emotions – *extraversion* or *introversion*. People tend to operate in a variety of ways depending on circumstances and develop comfortable patterns, which dictate behavior in certain predictable ways (Jung, 1923, 1971, 1990).

Jung (1971) combined the two different orientations of the world or attitudes – Extraversion (E) and Introversion (I) with four mental processes – Sensing (S) – Intuition (N) and Thinking (T) – Feeling (F). The attitude pair and the two mental processes pairs were referred to as dichotomies. The first pair of opposite preferences describes the extent to which behavior is determined by attitudes toward the world. The next pair of preferences describes the ways of perceiving or taking in information and processing. The latter pair of preferences describes the two methods of decision making or reaching conclusions.

Isabel Briggs Myers and her mother, Katherine Cook Briggs were convinced that Jung's theories had an application for increasing human understanding (Myers & Myers, 1980). "Within his [Jung's] model, psychological type is viewed as a compass directing this growth, suggesting the probable course for each type" (Myers & Kirby, 1994, p. 21). In addition to Jung's dichotomies, Myers and Briggs elaborated Jung's idea of psychological type and added a fourth dichotomy – Judging attitude and Perceiving attitude (Bastable, 2014; Lawrence, 2009; Myers et al, 2003). These attitudes are the means by which an individual comes to a conclusion about or becomes aware of something.

Jung (1923, 1971, 1990) explained that people are innately different and they have a natural preference for one within a dichotomy over the other. Therefore, each person has a preference for one way of looking at the world. These differences in mental function and mental attitude lead to fundamental differences between people. According to Myers et al. (2003), psychological types are dynamic and not static. Jung (1923, 1971) described the interaction of the four letter type using different functions and in the order of preference: the *dominant function*, most used mental process; *auxiliary function*, the second in preference; the *tertiary function* or third; and the *inferior*, the fourth or least preferred.

Individuals are predisposed to prefer one of the four, Sensing (S) or Intuition (N) and Thinking (T) or Feeling (F), as their dominant function. The failure of a dominant function to develop results in an undifferentiated personality and the complete development of one process offers unity and enables the person to be effective (Myers, 1998). The role of the auxiliary function is important in support of the dominant function (Myers et al., 2003). For people to be balanced, there should be sufficient development of the second process, not as a "rival" but as a "partner" because each function provides direction and continuity (Myers & Myers, 1995). The

third and the fourth function play a part in the dynamics of psychological type. The less

developed functions are always a problem however, learning to manage them is worth the effort.

As Myers (1998) eloquently put it,

type describes 16 dynamic energy systems, rather than defining static boxes. The four-letter type is much more than simple addition of four preferences: it is the interaction of the preferences with each other …. Everyone uses each of the preferences to some extent. Our type consists of those we prefer. (p. 42)

In simple terms, personality is structured with the combination of the four preferences (a

dominant preference from each of the dichotomies or bi-polar scales) and individuals create their

type by choosing one from each, leading to 16 recognizable types. The 16 psychological or

personality types as identified by Myers (1998) and represented by Quenk (2009) are in Table

2.1.

Table 2.1

16 Psychological or Personality Types

Type	Dynamic Name - *Dominant and Auxiliary*	*Tertiary*	*Inferior*
ISTJ	Introverted Sensing with Extraverted Thinking	*Feeling*	*Extraverted Intuition*
ISFJ	Introverted Sensing with Extraverted Feeling	*Thinking*	*Extraverted Intuition*
ESTP	Extraverted Sensing with Introverted Thinking	*Feeling*	*Introverted Intuition*
ESFP	Extraverted Sensing with Introverted Feeling	*Thinking*	*Introverted Intuition*
INTJ	Introverted Intuition with Extraverted Thinking	*Feeling*	*Extraverted Sensing*
INFJ	Introverted Intuition with Extraverted Feeling	*Thinking*	*Extraverted Sensing*
ENTP	Extraverted Intuition with Introverted Thinking	*Feeling*	*Introverted Sensing*
ENFP	Extraverted Intuition with Introverted Feeling	*Thinking*	*Introverted Sensing*
ISTP	Introverted Thinking with Extraverted Sensing	*Intuition*	*Extraverted Feeling*
INTP	Introverted Thinking with Extraverted Intuition	*Sensing*	*Extraverted Feeling*
ESTJ	Extraverted Thinking with Introverted Sensing	*Intuition*	*Introverted Feeling*
ENTJ	Extraverted Thinking with Introverted Intuition	*Sensing*	*Introverted Feeling*
ISFP	Introverted Feeling with Extraverted Sensing	*Intuition*	*Extraverted Thinking*
INFP	Introverted Feeling with Extraverted Intuition	*Sensing*	*Extraverted Thinking*
ESFJ	Extraverted Feeling with Introverted Sensing	*Intuition*	*Introverted Thinking*
ENFJ	Extraverted Feeling with Introverted Intuition	*Sensing*	*Introverted Thinking*

Note. Adapted from *Essentials of Myers-Briggs Type Indicator*® *assessment* (p. 20), by N. L. Quenk, 2000, New York, NY: John Wiley & Sons, Inc. Copyright 2000 by John Wiley & Sons, Inc.

According to Myers and Myers (1995), there are three ways to identify the dominant function from the four letters of psychological or personality type (see Table 2.2). The dominant function should either be the preferred perceptive process – P (as shown by the second letter) or the preferred judging process – J (as shown by the third). The J and P in the type is the auxiliary function which is used to supplement the dominant function or process. The dominant process is used in the preferred attitude or world (E or I) while the auxiliary is used in the opposite attitude or world (E or I). If the extravert's type ends in P, the dominant process is a perceptive process, either S or N and if the extravert's type ends in J, the dominant process is a judging process, either T or F. It is opposite in case of Introversion. If an introvert's type ends in J, the dominant process is either S or N and if the introvert's type ends in P, the dominant process is either T or F.

Table 2.2

Dominant Functions of 16 Personality Types

	ST	SF	NF	NT	*Extrovert*	*Introvert*
I -- -- J	ISTJ	ISFJ	INFJ	INTJ	The JP preference shows how a person prefers to deal with the *outer* world.	The JP preference shows how a person prefers to deal with the *outer* world.
I -- -- P	ISTP	ISFP	INFP	INTP	The dominant process shows up on the JP preference.	The dominant process shows up on the JP preference.
E -- -- P	ESTP	ESFP	ENFP	ENTP	The dominant process is used in the *outer* world.	The dominant process is used in the *inner* world.
E-- -- J	ESTJ	ESFJ	ENFJ	ENTJ	The auxiliary process is used in the *inner* world.	The auxiliary process is used in the *outer* world.

Note. Adapted from *Gift differing: Understanding personality types* (p. 15), by I. B. Myers and P. B. Myers, 1995, Mountain View, CA: Davies-Black Publishing. Copyright 1995 by David-Black Publishing.

As Myers and Myers (1995) so expressively conveyed,

Balance does not refer to equality of two processes or attitudes; instead, it means superior skill in one, supplemented by a helpful but not competitive skills in the other. The need for such supplementing is obvious. Perception without Judgment is spineless; Judgement with no Perception is blind. Introversion lacking any Extraversion is impractical; Extraversion with no Introversion is superficial. (p. 182)

Many personality assessment tools were devised based on the theory of Jung and Myers Briggs typology and one among them was the Myers-Briggs Type Indicator® (MBTI®). The next section presents a discussion about the development, construct, preference, and clarity estimates of the MBTI® instrument.

Myers-Briggs Type Indicator® (MBTI®)

      Development of Myers-Briggs Type Indicator®. Based on Jung and Myers-Briggs typological theory, Katherine Briggs and Isabel Myers developed the Myers-Briggs Type Indicator instrument®, which is designed to make Jung and Myers-Briggs typological theory understandable and useful in everyday life (Myers, 1998). It is the most widely used personality instrument and has more than 100 years of utilization in research and development for understanding personality differences (Lawrence, 2009; Myers, 1998; Myers, et al., 2003). It has been used for a wide variety of purposes: self-understanding and development, career development and exploration, organizational development, team building, management and leadership training, problem solving, relationship counseling, education and curriculum development, academic counseling, diversity, multicultural training, etc. (Myers, 1998). It is used internationally and is available in 30 different languages. This study utilized the Myers-Briggs Type Indicator® (MBTI®) Form M instrument in North American English.

      Quenk (2009) presented a chronological listing of significant events in the history of MBTI® development (see Table 2.3).

Table 2.3

Background and Development of the MBTI®

Year	Details
1917	Katherine Briggs developed a way of describing individual differences in ways of achieving excellence based on her study of biographies of accomplished individuals.
1923	Jung's *Psychological Types* theory was translated into English from the original German, first published in 1921.

1923 – 1941	Briggs and Myers studied Jung's typology and observed its expression in the behavior of individuals.
1941	World War II motivated Myers to work on developing an instrument that will give people access to their Jungian type – to capitalize on natural preferences to help the war effort.
1942 – 1944	Myers wrote and tested items using a small criterion group whose preferences were clear to her. Forms A and B were created.
1942 – 1956	MBTI data was collected on various samples, including medical and nursing students.
1956	Educational Testing Service published the MBTI as a research instrument. It was available only to the researchers.
1956 – 1962	Research continued, yielded MBTI Form C through E.
1962	The first MBTI manual and MBTI Form F were published by Educational Testing Service. It continued to be classified as a research instrument.
1962 – 1974	Researchers at several universities used the MBTI for various research purposes. Mary H. McCaulley, a clinical psychology faculty member at the University of Florida, collaborated with Myers and further tested the MBTI assessment, and created a data bank for the storage of MBTI data.
1975	Consulting Psychologist Press, Inc. became the publisher of the MBTI Form F, and made it available to all professionals qualified to purchase Level B instruments.
1978	Form G (126 items) replaced Form F (166 items) as the standard form of the MBTI, based on a standardization of the scales.
1980	Isabel Briggs Myers died.
1985	The second edition of the MBTI manual was published, co-authored by Myers and McCaulley.
1987, 1989	Extended forms of the indicator, Form J and K were published.
1998	Form M (93 items) replaced Form G as the standard form. It is preceded by extensive exploration of alternative item selection and scoring methods and was standardized on a stratified national sample of the U.S. population. The third edition of the MBTI manual was published.
2001	Form Q (144 items) was published replacing Form K as the standard form for the MBTI Step II assessment. The Step II Manual was also published. Form J was retained as a research form.
2008	MBTI® Complete, an online interactive administration and interpretation of the MBTI instrument was published and was made available to the general public and professional users.
2009	MBTI Step III form and manual were published, completing Myers' extensive theoretical and research work on type development.

Note. Adapted from *Essentials of Myers-Briggs Type Indicator® assessment* (p. 3 – 4), by N. L. Quenk, 2000, New York, NY: John Wiley & Sons, Inc. Copyright 2000 by John Wiley & Sons, Inc.

The Constructs of the MBTI® Instrument. The constructs of MBTI® are based on eight preferences based on Jung and Myers-Briggs typology theory: Extraversion, Introversion, Sensing, Intuition, Thinking, Feeling, Judging, and Perceiving (Myers & Myers, 1995). The eight preferences are available to and used by everyone, but one natural preference over the other in a particular dichotomy leads individuals to direct energy toward it and develop habits and behavior leading to a four-letter type (like (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENFP, ENTP, ESTJ, ESFJ, ENFJ, and ENTJ, see *Figure 2.1*) (Myers, 1998). Jung used the word *type* to identify these styles of personalities (hence the theory is also referred to as Jung's theory of psychological types, which is not a psychological theory but is a typological theory).

Dichotomy		
Preference		*Preference*
Extraversion	←——————→	Introversion
Sensing	←——————→	Intuition
Thinking	←——————→	Feeling
Judging	←——————→	Perceiving

	S	S	N	N	
I	ISTJ	ISFJ	INFJ	INTJ	J
I	ISTP	ISFP	INFP	INTP	P
E	ESTP	ESFP	ENFP	ENTP	P
E	ESTJ	ESFJ	ENFJ	ENTJ	J
	T	F	F	T	

Figure 2.1. Top: Four preferences out of the four dichotomous pairs are scored to arrive at a personality type. Bottom: The 16 personality types identified using the Myers-Briggs Type Indicator instrument.

The MBTI® preferences indicate the differences in people that result from the following: (a) where they prefer to focus their attention and get energy (Extraversion and Introversion), (b) the way they prefer to take in information (Sensing and Intuition), (c) the way they prefer to make decisions (Thinking and Feeling), and (d) how they orient themselves to the external world (Judging and Perceiving) (Myers & Myers, 1995). The descriptions of preferences mentioned above are general; however, the specific descriptions will be made relating to academic

achievement and learning styles in the next sections. Each preference identifies normal and valuable human behavior (Lawrence, 2009). MBTI® Form M self-scorable is made up of 93 items (phrase questions with two or more responses and word pairs) and there is no right or wrong answer. The intent of the MBTI® is to not measure traits, but rather to sort people into equally valuable groups of type (Myers et al., 2003).

      Preference and Clarity Estimates. The MBTI® reports preferences based on four dichotomies with opposite poles. According to Myers and Myers (1995) and Myers et al. (2003), we can sign our name with the hand which we normally use and also with the other; however, the experience is very different. Signing with the hand which we normally use will make us feel natural and competent; it does not make us think; it is effortless and easy; and it looks neat, legible and adult.   Using the other hand makes us concentrate, feel unnatural, feel awkward and clumsy, and look childlike. The use of one hand over the other illustrates the theory of preferences in the MBTI® instrument. In a similar context, everyone has a natural preference for one of the two opposites on the each of the four dichotomies. The two poles are used at different times; however, not both at once, and not with equal confidence. This theory should be incorporated while administering the MBTI® instrument because it impacts the validity of this research study.

      According to Quenk (2009), while devising Form M of the MBTI® assessment, much care was taken to discourage the researchers from assuming that the numbers associated with MBTI® preferences were interpretable as amount of, degrees of competence with, levels of maturity of use, or relative ease of access to these preferences. In order to avoid such confusion, the interdependent concept of preference clarity index and preference clarity category was devised. The preference clarity index ranges from 1 to 30 where an index of 30 indicates that the

respondent has consistently answered items on the dichotomy in favor of the preferred pole

(Hammer, 1996; Myers, 1998; Myers et al., 1998; 2003; Quenk, 2009). Preference clarity

category scores are reported as "very clear", "clear", "moderate", and "slight" (see Table 2.4)

Table 2.4

Converting Raw Points into Preference Clarity Category

Dichotomy	Greatest Raw Points	Preference Clarity Category
E – I	11 – 13	Slight
	14 – 16	Moderate
	17 – 19	Clear
	20 – 21	Very Clear
S – N	13 – 15	Slight
	16 – 20	Moderate
	21 – 24	Clear
	25 – 26	Very Clear
T – F	12 – 14	Slight
	15 – 18	Moderate
	19 – 22	Clear
	23 – 24	Very Clear
J – P	11 – 13	Slight
	14 – 16	Moderate
	17 – 20	Clear
	21 – 22	Very Clear

Note. Adapted from *MBTI® manual: A guide to the development and use of the Myers-Briggs Type Indicator® (*p. 112), by I. B. Myers, M. H. McCaulley, N. L. Quenk, and A. L. Hammer, 2003, Mountain View, CA: Consulting Psychologist Press, Inc. Copyright 2003 by Consulting Psychologist Press, Inc.
[a]Equal points on E – I is classified as *I*; equal points on S – N is classified as *N*; equal points on T – F is classified as *F*; and equal points on J – P is classified as *P*.

The preference clarity index and category describes how consistently an individual prefers one

pole of the dichotomy over its opposite and identifies preferences and not abilities, maturity, or

development (Myers et al., 2003). It is important to understand one of the general cautions of the

psychological types: none of the preferences within the dichotomies of MBTI® are good or bad.

Type, Learning Styles, and Standardized Achievement Examination Performance

The review of literature pertinent to the relationship between learning preferences,

learning preference combinations, psychological or personality types or learning approaches and

standardized achievement exam performance or academic achievement is presented in the

following pattern. Initially the literature relevant to a relationship between personality or

psychological type, learning styles, and academic achievement was reviewed and discussed.

Additionally, the relationship was explored based on theoretical conceptualization of Jung and

Myers Briggs typology theory and the cognitive motor progression of a learner considering

multiple choice standardized achievement examination performance. Furthermore, literature

relevant to the learning preferences, the learning preference combinations, and the 16 types or

approaches to learning was reviewed and discussed in relevance with the theoretical

conceptualization. Finally, the relevant research articles were reviewed to identify similar work

done within this area and to have a thorough understanding of the topic under study. The review

began with the original research and preparation of the first MBTI® manual and covered the next

four decades of research related to type, learning, and academic achievement of nursing students.

Relationship between personality type, learning styles, and academic achievement

The discussion in this section will review the literature around the relationship between

learning styles, personality types, and academic achievement (i.e. multiple choice standardized

achievement examination performance) in relation to the Myers-Briggs Type Indicator®

(MBTI®). Students have individual differences like learning styles and personality types that

influence academic achievement (Snyder, 2000). *Learning* involves the integrated functioning

of the total organism – thinking, feeling, perceiving, and behaving (Kolb, 1984) while

personality presents a clear understanding of preferred method of taking in information,

processing it, and developing an opinion or judgement (Lawrence, 2009). The relationship

between learning and personality is apparent because personality differences are expressed in

learning styles, and learning styles are reflected in learning strategies, and these learning

strategies are manifested in learning tactics which in turn produce a likely outcome of academic achievement (Schmeck, 1998). The ways students learn efficiently and effectively have been a major concern of education for a long time and there is extensive research of learning styles and personality differences that were theorized to affect academic achievement (Aragon, Johnson, & Shaik, 2002; Eysenck & Eysenck, 1985; Lawrence, 2009; Myers et al., 1998, 2003; Ross, Drysdale, & Schulz, 2001).

How is the concept of learning style relevant to this study? "Learning style is a multi-dimensional concept and students' learning styles are composed of unique reactions to their environments, emotionality, social preferences, physiological traits, and cognitive-psychological inclinations." (Dunn, Gemake, Jalali, Zenhausern, Quinn, & Spiridakis, 1990, p. 69). For this research study, learning style refers to an individual's mode of perceiving, processing, and using the information (Dollar, 2001) to perform on a multiple choice standardized achievement examination. The three areas or core personality structures that provide a useful approach for understanding and describing learning styles are cognitive, affective, and physiological components (Cornett, 1983; Guild & Garner, 1985; Keefe & Ferrell, 1990). On a similar approach Keefe (1991) defined,

> *Learning styles* as characteristics of cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment. *Cognitive styles* are "information processing habits representing the learner's typical mode of perceiving, thinking, problem solving, and remembering. *Affective styles* refer to those motivational processes viewed as learner's typical mode of arousing, directing, and sustaining behavior. *Physiological styles* are biologically-based modes of response that are founded on sex-related differences, personal nutrition and health, and accustomed reactions to physical environment. (pp. 4, 8, 11, & 15)

There is predominantly extensive research related to learning styles exploring personality variables associated with various learning preferences (Lawrence, 2009; Myers, et al., 2003). According to Keefe and Ferrell (1990), "learning styles are intimately interwoven with the

affective, temperamental, and motivational structures of the total human personality" (p. 57).

The cognitive learning styles are information processing habits of an individual that describe the mode of thinking, perceiving, and remembering, or problem solving through personality dimensions (Keefe, 1982). The cognitive personality preferences are the most stable and an example of this stability is the use of Myers-Briggs Type Indicator®. It is a widely used psychological test or measurement tool that adds to the value of understanding personality types, learning preferences, and academic achievement (Myers & Myers, 1980).

The study of learning styles is full of prototypes and since 1960; approximately 30 instruments of learning styles have emerged (Keefe, 1982). One among them is the Myers-Briggs Type Indicator®(MBTI®) based on Jung and Myers typology theory. It is an instrument or assessment which (a) is better normed than most of its kind, (b) is more sophisticated and complex than most learning style assessments, (c) can identify four learning preferences and sixteen types or sixteen approaches to learning, (d) can account of most traits identified by widely used instruments except for visual, auditory, and kinesthetic channels of perception and communication, (e) is designed to assess personality types which helps to make predictions about how the student learns best, (f) is designed to assess cognitive functions rather than behavioral patterns, and (g) allows one to penetrate through the veil of behavior to underlying cognitive functions (Grindler & Bandler, 1976; Lawrence, 1984; 2009; Lowen, 1982; Myers, et al., 2003; Provost & Anchors, 2003). The MBTI® assessment explains the different learning styles that reflect different academic strengths, weakness, skills, and differences (i.e., academic achievement) through the lens of personality or psychological types (Lawrence, 2009).

Lawrence (1984; 2009) described learning styles in accordance with the MBTI® instrument to describe the psychological make-up of learning styles:

(a) cognitive style in the sense of preferred or habitual patterns of mental attitudes of mental functioning: information processing, and formation of ideas or judgments,

(b) patterns of attitudes and interests that influence what a person will attend to in a learning situation,

(c) a disposition to seek out learning environments compatible with one's cognitive style, attitudes, and interests, and to avoid environments that are not congenial, and

(d) a disposition to use certain learning tools and avoid others. (p. 38)

The definitions of learning style by Keefe (1991) and Lawrence (1984; 2009) share several common themes; but Lawrence's definition provides better guidance to this research study and helps in conceptualizing psychological types or personality types with cognitive motor progression of the learner considering multiple choice standardized achievement exam performance.

Academic achievement is an important outcome of education for students, educators, and industry which can be measured using a standardized achievement exam's test score or Grade Point Average (GPA) (Malloy, 2007). An achievement measure or examination is an assessment of competence in an area in which a summary of a grade or test score is received to obtain an educational degree or certification, such as the grade point average (GPA) or scores on tests that assess the degree to which the respondent has learned a particular skill or body of information (Myers, et al., 2003).

A standardized examination is any form of exam that does the following: (a) requires all test takers to answer the same questions or selection of questions from a common bank of questions, in the same way, and that (b) is scored in a "standard" or consistent manner, which makes it possible to compare the relative performance of individual students or groups of students (Standardized Test, n.d.). Relative to both of the definitions, the Illinois Nurse Aide Competency Examination is a standardized achievement examination. The INACE is an 85-item multiple choice standardized achievement exam that assesses the competence of nurse aide

students in six broad duty areas: communicating information, performing nursing skills, performing personal care skills, performing basic restorative skills, providing mental health and social service needs, and providing for residents' rights. The questions are written at the application level of Bloom's taxonomy (INAT, 2016).

Type as measured with the MBTI® assessment can predict preferred or habitual patterns or dispositions which can be used to predict behaviors, instruction tools, and environments that facilitates or hinder learning for students (Provost & Anchors, 2003). Type can make a natural and predictable difference between learning styles and student responses to teaching methods (Myers & Myers, 1995). Type can explain why students do well with and enjoy a particular teaching method while others are frustrated by it (Myers & Myers, 1980). Type is extensively used and applied in higher education. One more important aspect of learning differences and teaching differences is academic achievement and the MBTI® assessment helps in identifying students who are likely to experience academic difficulty and help facilitate a good fit between the learner and the instructor or teacher (Provost & Anchors, 2012). There are voluminous studies that indicated low achievers can achieve high scores on a standardized achievement exam when they are taught within the realm of learning styles (Dunn, Beaudry, & Kalvas, 1989).

The reviewed literature explains thoroughly that (a) psychological attributes or types result from individual differences, determine particular strategies a student chooses in learning, i.e., learning styles, (b) learning styles can either hamper or increase academic achievement, and (c) the MBTI® assessment will help to determine the differences in terms of information processing during learning and performance, formation of ideas or judgments during learning and performance, attitudes that influence learning situations, determinine a learning environment

compatible with one's cognitive style, attitudes, and interests, and use of certain learning tools so as to better understand and improve achievement.

Cognitive motor progression of learner and its relationship with personality types and multiple-choice standardized achievement examination

The aim of this study is to understand learning styles and academic achievement (i.e., multiple choice standardized achievement exam performance) with personality types as the gross indicator. The relevant literature presented in the previous section clearly explained the relationship and now, continuing in the review, the cognitive motor progression is theoretically conceptualized with Jung and Myers-Briggs typology theory to better comprehend the learner's progression towards achievement with the help of type preferences. *Figure 2.2* represents the theoretical conceptualization which was designed based on Elanore Gibson's (1969) practical understanding of classroom and brain, Edelman's (1978) selection theory, and with the growing evidence that type is hard-wired into the brain (Shiflett, 1989; Taggart, Kroeck, & Escoffier, 1991; Wilson & Languis, 1989).
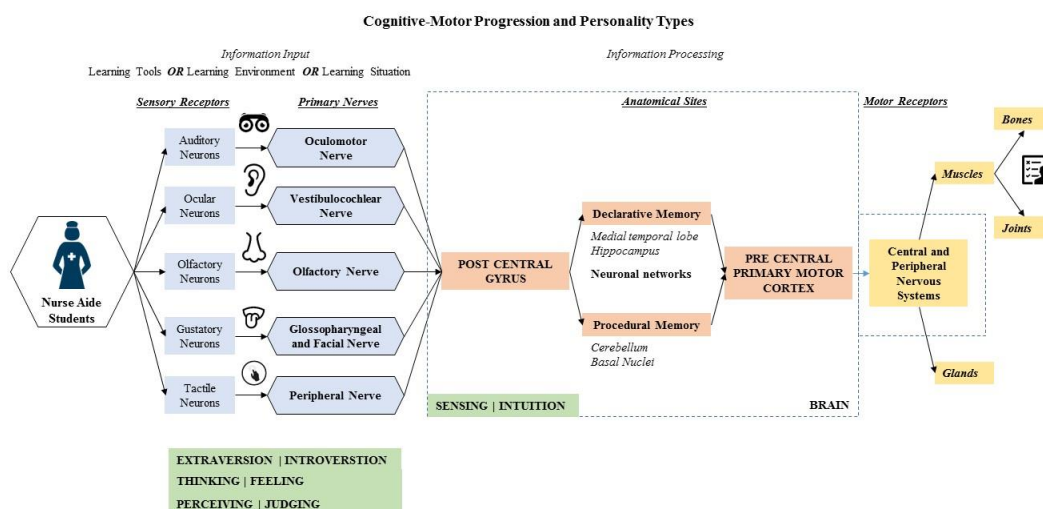
Figure 2.2. Theoretical conceptualization of Jung and Myers-Briggs typology theory and cognitive motor progression of the learner. Adapted from *A learner's guide to individualizing learning*, by R. F. Bortz, 2014, Carbondale, IL: Southern Illinois University. Copyright 2014 by Richard F. Bortz.

There are many studies that focus on the function of brain in a variety of disciplines (like neurology, neurobiology, anatomy, physiology, cognitive science, education, etc.) and there seems to be a relatively stable agreement among various scientists that information processing starts with our sensory systems (seeing, hearing, touching and smelling), and reach our brain through the central nervous system (Morgan, 1997). According to the definition of Keefe (1991), "learning styles are characteristics of cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment" (p. 4). Bortz (2014a; 2014b) elaborated on this definition and explained the characteristics, i.e., cognitive behavior, motor behavior, affective behavior and physiological behavior through his work.

According to him and a study conducted at the Laboratory of Advanced Studies in Neurocognition at the University of West Florida by Bruce R, Dunn, Marlin L. Languis, Denise A. Dunn, and D. B. Andrews (Morgan, 1997), learning and forgetting is one of the definitive functions of human behavior (i.e., brain) and that the human behavior is responsible for processing and assimilation of knowledge into the thought process of the individual. Human behavior is classified into two categories – cognitive and motor. The *cognitive behavior* deals with the recall or recognition of knowledge and the development of intellectual abilities and skills while motor behavior is the contraction and relaxation of muscles and the subsequent movement of bones and joints of the body, which in simple term means performance (Bloom, 1956; Bortz, 2014a; Bortz, 2014 b; Carraher, Carraher, & Schlemann, 1995; Greeno & Jensen, 1966; Lave, 1988).

The *physiological behavior* is the synapse, the transmission of nerve impulses (i.e., knowledge) to display motor behavior (i.e., performance). Contraction and relaxation of muscle

tissues leads to the subsequent movement of the bones and joints of the body. The *affective behavior* is the adaptation of the cognitive behavior involving analysis, synthesis, and evaluation, i.e., achieving different levels of performance. *Figure 2.3* explains the cognitive motor behavior of a nurse aide student in relation to learning and test taking. The learning process begins with the simulation of somatosensory receptors and ends with motor performance. The figure explains two main functions that the nurse aide student will have to undergo – one is "*Learning*" (Cognitive) and the other is "*Performance*" (Motor). The learning activity (which involves learning tools, learning environment, learning situation, etc.) happens while undergoing the Illinois approved Basic Nurse Aide Training Program and performance relates to the 21-mandated skills assessment and the multiple-choice Illinois Nurse Aide Competency Examination.

From biological perspective as explained by Bloom (1956), Bortz (2014a), Chomsky (2012), Edelman (1978; 1987), Marieb and Hoehn (2013), and Vygotsky (1962), it is important to understand the two aspects, i.e., learning and performance of nurse aide student (in other words – cognitive motor progression of the learner). During the learning process, which involves the brain, the nurse aide student will transmit all the learning information through the five senses - that is ocular or visual, auditory, olfactory or smell, gustatory or taste or facial senses, and tactile or touch (Morgan, 1997). These environmental stimuli are received and converted into nerve or electrical impulses by somatosensory neurons. A neuron is a central factor in an individual that has the capacity to transmit information (Edelman, 1987). The electrical impulses (synapse) are then transmitted to the post-central gyrus, and subsequently, create or assimilated into existing neuronal networks in the anatomical sites of the brain (i.e.,

declarative and procedural anatomical memory sites, see Figure 2.3). At this very point, information is converted into knowledge.
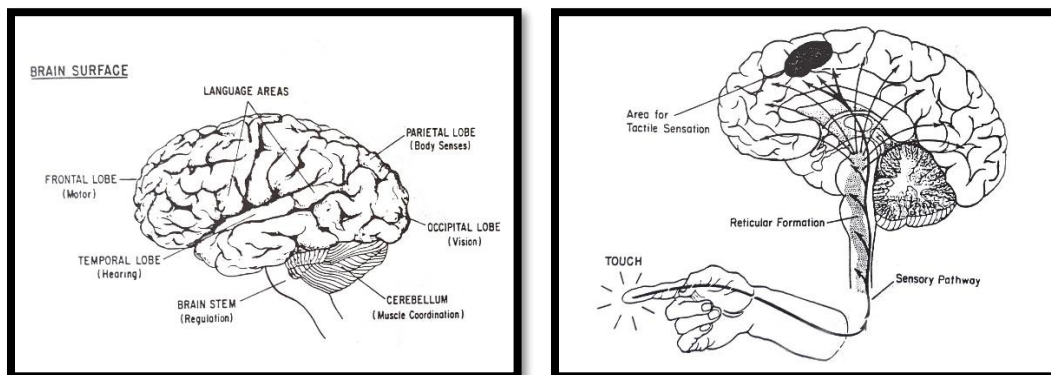
Figure 2.3. Right: The flow of environmental stimuli or sensory information to the parts of the brain through the spinal cord. Left: The cognitive and motor behavior (psychomotor) activity. Adapted from *Cognitive styles and classroom learning (*p. 46, 47), by H. Morgan, 1997, Westport, CT: Praeger Publishers. Copyright 1997 by Praeger Publishers.

The declarative memory is the part of the human memory that stores facts and events (i.e., memories that can be consciously declared) which includes standard textbook learning and knowledge. It provides a knowledge base from which nurse aide students make decisions and form judgments regarding motor performance (i.e., perform on the multiple-choice INACE or during the 21-mandated skills assessment). The procedural memory (i.e., long term) is another part of the human memory that deals with skills and procedures or "*how to*" knowledge. It is not easily verbalized, but can be applied without conscious thought. The declarative anatomical sites are the medial temporal lobe and hippocampus while the procedural anatomical sites are the cerebellum and basal nuclei.

During performance on the multiple-choice INACE, neural pathways are created between the neuronal networks of the anatomical sites of the brain (i.e., declarative and procedural anatomical memory sites) and the motor receptors, (i.e., the muscles, bones and joints). In biological terminology, the nerve electrical impulses are transmitted from the neuronal networks

to the pre-central gyrus and primary motor cortex of the brain to the muscles and glands through central peripheral nervous system. The muscles contract and relax and move the bones and joints. The performance on the test establishes a superior and subordinate relationship between cognitive (declarative and procedural knowledge) and motor behavior in the student. In this relationship, knowledge directs, influences, and controls motor performance which forms the basis of the concept of "psychomotor" (Bortz, 2014a).

During a personal interview with G. Paul, a renowned MBTI® consultant and practitioner helping students to matriculate into medical and dental school through the Medical/Dental Education Preparatory Program at Southern Illinois University School of Medicine, the concept of cognitive motor progression of the learner was conceptualized with Jung and Myers-Briggs typology theory (G. Paul, personal communication, May 17, 2015). The four learning preferences, based on Jung and Myers-Briggs typology theory and determined through the MBTI® instrument or assessment were observed within the cognitive motor progression of the learner to understand learning and academic achievement through the lens of type theory.

The first preference pair – Extraversion (E) and Introversion (I) concerns *energy for learning* and is more relevant with the learning process of the student (Kise, 2007). This pair is an important attribute for academic achievement and aptitude (Provost & Anchors, 2012). The second preference pair – Sensing (S) and Intuition (N) concerns *gathering and processing information* and is more relevant with the cognitive and motor behavior (i.e., learning process and performance) of the student (Lawrence, 2009; Myers & Myers, 1995; Pelly & Dalley, 1997; Provost & Anchors, 2012). This pair is the most important attibute for high achievement on multiple choice exams.

The third preference pair – Thinking (T) and Feeling (F) concerns *how students react to information* or *make decisions* and is more relevant with the learning process (Kise, 2007; Pelly & Dalley, 1997). The fourth preference pair – Judging (J) and Perceiving (P) concerns approach to work, school, and life in general or how students structure their lifestyle and is more relevant with the learning process (Kise, 2007; Pelly & Dalley, 1997). This pair is an important attribute for achievement specifically during the learning process. The learning process here refers to the patterns of attitudes and interests that influence student's learning situation, learning environments compatible with one's cognitive style, attitudes and interests, and the use of certain learning tools (Lawrence, 2009). In the following section, a description of all these learning preferences relative to learning styles, personality types, and academic achievement is presented based on numerous studies that were conducted in the past.

Characteristics of Learners

According to Myers et al. (2003), "of all the applications of the Myers-Briggs Type Indicator® personality inventory, perhaps none holds greater promise than education for assisting our efforts to deal with social change in an increasingly pluralistic world" (p.253). Myers and Myers (1980, 1985) saw type theory as not only as the means for human understanding but also a catalyst of understanding human potential. The area in which voluminous application of MBTI® research took place is education (Myers et al., 2003). The research encapsulates (a) the 16 types in education with the interaction of MBTI® dichotomies within the student; (b) characteristics of learners, dealing especially with learning styles, cognitive styles, brain patterns, and with attention to the four MBTI® dichotomies one at a time; (c) academic aptitude, performance, and comparison with standardized test (Myers et al., 2003). Lawrence (1984) and DiTiberio (1996) conducted comprehensive reviews of studies by comparing each of the MBTI® dichotomy pairs

with aspects of learning styles, cognitive styles, brain patterns, and information processing. This section presents some consistent research findings by different authors on MBTI® dichotomies, combinations, and approaches related to the characteristics of learners.

Learning Preferences by Source of Energy (inner/outer world) (EI). Extraversion (E) and Introversion (I) preferences concern how students are energized, what is the degree of students' reliance on activity in leaning process, where do the interests of students lie, and how students become involved in an activity (Kise, 2007; Pelly & Dalley, 2008; Provost & Anchors, 2012). Jung created the preference pair from Latin components – Extraverts as *Epimetheans* (Greek word for "after-thinkers") because they tend to think best while acting or after acting and Introverts as *Prometheans* (Greek word for "fore-thinkers") because they tend to think before they act (Lawrence, 2009; Provost & Anchors 2012). Extraverts gain their source of energy through action and interaction, i.e., from the outside world or external sources (Kise, 2007) and therefore, they are sociable and people oriented (Pelly & Dalley, 1997). Introverts gain their source of energy through reflection, contemplation, and solitude, i.e. from the inner world (Kise, 2007); therefore, they are reserved and quiet (Pelly & Dalley, 1997).

The E and I preference also refer to how the dominant processes – Sensing (S), Intuition (N), Thinking (T), and Feeling (F) are used (Lawrence, 2009; Myers et al., 2003). For example, when a student's preference is Extraversion (E) then the student most often uses the dominant mental process outwardly, where it is visible to people; and when the student's preference is Introversion (I) then the student most often uses the dominant mental process inwardly, privately. This is an important attribute for achievement on a multiple choice standardized achievement examination because this preference pair explains how the dominant process is used. In the following paragraphs, a description of the connection between E and I is drawn

from Kise (2007); Lawrence (1982, 1984, 2009); McCaulley and Natter (1974); Myers and

Myers (1995); Myers (1980); Myers, et al. (1998, 2003); Paul (2014); Pelly and Dalley (2008);

and Provost and Anchors (2012).

A student with the Extraversion preference (a) learns best with others in situations filled

with variety, movement, action, talk, and discussion; (b) learns through interactions (verbal or

non-verbal), initiation, thinking out loud, talking out loud, activities, and physically engaging the

environment and experience; (c) forms thoughts through discussion; (d) has shorter attention

span; (e) studies through trial and error of what works and what does not followed by

contemplation so as to learn and complete projects; (f) studies from doing to considering and

then back to doing i.e., activity before reflection; (g) concentrates fully in classrooms that allow

for group discussions (h) puts learning into action before the idea gets stale; (i) communicates

learning best through demonstration; and (j) answers questions immediately, thinking of what to

say as the student speaks.

A student with the Introversion preference (a) learns best when alone or with individual

attention filled with reading, verbal discussion, thinking things through, concentration and quiet

reflection; (b) reflects on facts and concepts (c) likes quiet, private, and individual ways for study

without interruption of concentration; (d) waits to share until thoughts are formed; (e) has a

longer attention span; (f) anticipates problems and develops solutions before plunging in too

quickly in a task or activity; (g) studies from considering to doing and then back to considering

i.e., reflection before activity; (h) pauses to understand clearly before putting learning into

action; (i) communicates learning by describing; and (j) answers questions by thinking about

their answer, rehearses it, and only then delivers it to the audience. Table 2.5 summarizes the

learner's characteristics associated with Extraversion and Introversion by Myers (1998).

Table 2.5

Learner's Characteristics Associated with Extraversion and Introversion

Extraversion	*Introversion*
▪ Attuned to external environment	▪ Drawn to their inner world
▪ Prefer to communicate by talking	▪ Prefer to communicate in writing
▪ Work out ideas by talking then through	▪ Work out ideas by reflecting on them
▪ Learns best through doing and discussing	▪ Learn best by reflection and mental practice
▪ Have broad interests	▪ Focus in depth on their interests
▪ Sociable and expressive	▪ Private and contained
▪ Readily take initiative in work and relationships	▪ Take initiative when situation or issue is very important

Note. Adapted from *Introduction to Type*® (p. 9), by I. B. Myers, 1998, Mountain View, CA: Consulting Psychologist Press, Inc. Copyright 1998 by Consulting Psychologist Press, Inc.

Learning Preferences by mode of Perception (SN). Sensing (S) and Intuition (N) preferences describe two normal processes for gathering information, how students prefer to perceive new information, and to which aspect of new information does a student give greater attention (Kise, 2007; Pelly & Dalley, 2008; Provost & Anchors, 2012). *Sensing students* first pay attention to *what is*, i.e., to the information they can gather through their five senses (the facts) while *Intuitive students* first pay attention to *what could be*, i.e., to hunches, connections, or imagination – a sixth sense. Sensing students are more comfortable thinking in the "here-and-now", i.e., present while Intuitive students are more comfortable thinking "what-if", i.e., future. In the following paragraphs, a description of the connection between S and N is drawn from Kise (2007); Lawrence (1982, 1984, 2009); McCaulley and Natter (1974); Myers and Myers (1995); Myers (1980); Myers, et al. (1998, 2003); Paul (2014); Pelly and Dalley (2008); and Provost and Anchors (2012).

Sensing students prefer (a) accuracy and being observant at the expense of imagination; (b) using experience as a guide; (c) following a proper set of instructions (orderly directions and information); (d) routine and detailed material; and (e) paying attention to reality and working with proven methods and curriculum. They are practical and realistic, detailed and concise in

their own communications, and like to learn a skill or procedure, and then practice it without much variation. Sensing students like assignments where (a) facts and details are valued, (b) expectations are clear, (c) motivation comes from safety in specificity, (d) set materials are covered, (e) handouts and other aids give a visible structure to the lecture, and (f) connections are made to real life. They tend to write down all of the information in a lecture and it is generally organized exactly the way it was presented and they are dismayed if the instructor wanders off the main path with examples or anecdotes, attempting to clarify or explain a concept. They rarely risk errors of facts. They are annoyed when a part of communication is left to the imagination.

Intuitive students prefer (a) insights and using imagination as a guide at the expense of observation; (b) learning concepts and abstract theories; (c) plunging-in (using hunches to fill in missing information); (d) paying attention to possibilities via abstract and complex material; (e) working with innovative methods and ideas; and (f) instructors who frequently repeat instructions of the lecture. They seek the opportunity to let their instincts work and tend to prefer open-ended assignments. Intuitive students like assignments where (a) general concepts launch opportunities for imaginative or critical thinking, (b) motivation comes with room for individuality, (c) themes are tapped and opened, and (d) knowledge is interesting even of it is not useful. During a lecture they tend to miss some of the lecture because everything new and interesting takes their attention away to the world of associations and possibilities and they get bored with handouts and lists of facts and are attentive when the instructor wanders off from the main point with examples or anecdotes that clarify or explain a concept. They consider errors of facts natural to learning. They are bored when communication is too explicit.

While performing on a multiple-choice examination, students look for association between facts and concepts. A Sensing student is a *linear learner* because they connect concepts with their associated facts in sequence and do not look for association between concepts unless they are also presented as a concept. An Intuitive student is an *integrative learner* because they spontaneously look for connections between concepts and for facts where they apply more than one concept. A Sensing student attempts to master the facts and details of the learning environment while an Intuitive student tends to master the theories and concepts. These learning preferences are an important attribute for achievement on a multiple-choice examination. A Sensing student scores lower than an Intuitive student on a multiple-choice examination; however, they tend to equal Intuitive students when tested on actual performance in real life situations. A Sensing student re-examines answers to test questions to be certain while an Intuitive student trusts hunches about answers to the test questions. A Sensing student likes the chance to be precise on untimed test while an Intuitive student likes the challenge of timed tests. Table 2.6 summarizes the learner's characteristics associated with Sensing and Intuition learning preferences by Myers (1998).

Table 2.6

Learner's Characteristics Associated with Sensing and Intuition

Sensing	**Intuition**
▪ Oriented to present realities	▪ Oriented to future possibilities
▪ Factual and concrete	▪ Imaginative and verbally creative
▪ Focus on what is real and actual	▪ Focus on patterns and meaning in data
▪ Observe and remember specifics	▪ Remember specifics when they relate to a pattern
▪ Build carefully and thoroughly toward conclusions	▪ Move quickly to conclusions, follow hunches
▪ Understand ideas and theories through practical application	▪ Want to clarify ideas and theories before putting them into practice
▪ Trust experience	▪ Trust inspiration

Note. Adapted from *Introduction to Type®* (p. 9), by I. B. Myers, 1998, Mountain View, CA: Consulting Psychologist Press, Inc. Copyright 1998 by Consulting Psychologist Press, Inc.

Learning Preferences by mode of Judgment (TF). Thinking (T) and Feeling (F) preferences describe two normal and rational approaches to making decisions and these preferences are most useful for providing insights into the affective domain (emotion/feeling) of learning styles (Kise, 2007; Pelly & Dalley, 2008; Provost & Anchors, 2012). Thinking students make decisions through objective and logical principles while Feeling students make decisions by considering the impact of each alternative on the people involved. In the following paragraph, a description of connection between T and F is drawn from Kise (2007); Lawrence (1982, 1984, 2009); McCaulley and Natter (1974); Myers and Myers (1995); Myers (1980); Myers, et al. (1998, 2003); Paul (2014); Pelly and Dalley (2008); and Provost and Anchors (2012).

Thinking types prefer (a) objectivity and logic; (b) clear and relevant study objectives; (c) studying material that needs to be learned; (d) giving and receiving critical analysis; (e) a clearly presented set of performance criteria; (f) first seeing what is wrong, striving for competency; (g) analyzing; (h) a lecturer who will answer the question they asked; (i) studying first that which should be learned, and (j) sticking to rules.

Feeling types prefer (a) subjectivity and values; (b) personal encouragement; (c) studying the material that they personally value; (d) taking criticism personally; (e) studying first that which is more valued personally; (f) first seeing what is right; (g) striving for harmony; (h) sympathizing; and (i) a lecturer who thanks them for asking such a helpful question and making room for exceptions.

These preferences can be observed when a nurse aide student assists a sick patient. If the student focuses first on the disease and then how it is affecting the patient, the student uses Thinking preference. If the student focuses first on how the disease is affecting the patient and

then turns their attention to the disease, the student uses a Feeling preference. Among the four

dichotomies, this dichotomy is least important in determining success or achievement; however,

it plays a dominant role in learning. Table 2.7 summarizes the learner's characteristics

associated with Thinking and Feeling learning preferences by Myers (1998).

Table 2.7

Learner's Characteristics Associated with Thinking and Feeling

Thinking	*Feeling*
- Analytical - Use cause-and-effect reasoning - Solve problem with logic - Strive for an objective standard of truth - Reasonable - Can be "tough-minded" - Fair – want everyone treated equally	- Empathetic - Guided by personal values - Assess impacts of decisions on people - Strive for harmony and positive interactions - Compassionate - May appear "tenderhearted" - Fair – wants everyone treated as individual

Note. Adapted from *Introduction to Type*® (p. 10), by I. B. Myers, 1998, Mountain View, CA: Consulting Psychologist Press, Inc. Copyright 1998 by Consulting Psychologist Press, Inc.

Learning Preferences by manner of lifestyle or learning style (JP). Judging (J) and

Perceiving (P) preferences describe a student's natural approach to life or how much discipline

students prefer in their lifestyle. (Kise, 2007; Pelly & Dalley, 2008; Provost & Anchors, 2012).

These preferences determine whether or not students prefer structured learning environments

(Provost & Anchors, 2012). Judging student prefers planning their work and working their plan

while a Perceiving student prefers for staying open to the moment. In the following paragraph, a

description of connection between T and F is drawn from Kise (2007); Lawrence (1982, 1984,

2009); McCaulley and Natter (1974); Myers and Myers (1995); Myers (1980); Myers, et al.

(1998, 2003); Paul (2014); Pelly and Dalley (2008); and Provost and Anchors (2012).

These learning preferences are important attribute for achievement on a multiple-choice

examination. Judging students prefer (a) decisiveness that comes with the judging process; (b)

thinking or feeling judgment in the way they structure their learning; (c) orderly and planned

lifestyle and learning; (d) work before they play; (e) completing assignments as soon as possible; (f) a schedule to follow; and (g) knowing what will be happening. They tend to gauge their academic progress by their accomplishments and prefer the kind of structured learning environment in which goals and deadlines are set. They tend to be overachievers and, meet deadlines by keeping commitments

Perceiving students prefer (a) openness that comes from the perception process; (b) a spontaneous and adaptive lifestyle; (c) decisiveness to meet deadlines and to set up goals with schedules so as to ensure they meet those goals; (d) to delay completion of assignments until everything is taken into account; (e) enjoy starting; (f) to let work and play coexist; (g) to search for more information; and (h) experiencing surprises and variety. They take pleasure in accomplishing tasks, writing papers, reading books, or making oral presentations. They tend to view learning as a freewheeling, flexible, and thorough quest that may never end. They feel imprisoned and restricted in a highly structured classroom.

Judging students prefer clear deadlines and goals (no surprises because they start working right away), a clear workload that allows for steady effort, clear expectations so they know when they are done, can produce product quickly (perhaps rushing the process) and knowing what is coming so they can plan ahead. Perceiving students prefer flexibility and surprises (they process longer before moving to production), a workload with high and low activity levels, flexible timelines so they can stick with something that interests them, enjoy the process, forgetting to move on to producing something, and concentrating on what they need to do now. Table 2.8 summarizes the learner's characteristics associated with Thinking and Feeling learning preferences by Myers (1998).

Table 2.8

Learner's Characteristics Associated with Judging and Perceiving

Judging	*Perceiving*
▪ Scheduled	▪ Spontaneous
▪ Organize their lives	▪ Flexible
▪ Systematic	▪ Casual
▪ Methodical	▪ Open-ended
▪ Make short-and-long term plans	▪ Adapt, change course
▪ Like to have things decided	▪ Like things loose and open to change
▪ Try to avoid last minute stresses	▪ Feel energized by last-minute pressures

Note. Adapted from *Introduction to Type*® (p. 10), by I. B. Myers, 1998, Mountain View, CA: Consulting Psychologist Press, Inc. Copyright 1998 by Consulting Psychologist Press, Inc.

Learning Preference Combinations by Orientation of Energy and Perception. IS, IN, ES, and EN are learning preference combinations by orientation of energy (Extraversion and Introversion) and perception process (Sensing and Intuition) (Lawrence, 1982; 1984; 2009). According to Kalsbeek (1989), IN is a preference for becoming aware through Intuition (N) with an Introverted (I) focus; EN is a preference for becoming aware through Intuition (N) with an Extroverted (E) focus; IS is a preference for becoming aware through the senses (S) with an Introverted (I) focus; and ES is a preference for becoming aware through the senses (S) with an Extroverted (E) focus.

McCaulley and Natter (1980) explained these preference combinations on the basis of learning:

1. IN type of learner tends to be introspective and scholarly, interested primarily in ideas, theories, and depth of understanding;

2. EN type of learner tends to see possibilities as challenges to make things happen; has wide-ranging interests; and likes to explore new patterns and relationships;

3. IS type of learner tends to carefully test ideas to see whether they are supported by facts; prefers to deal with what is real and factual in a careful unhurried way; and

4. ES type of learner tends to be active and realistic and learns best when useful applications are obvious.

This is an important attribute for achievement on a multiple choice standardized achievement examination (Provost & Anchors, 2012). According to Kise and Russell (2008): IS types prefer demonstrations, laboratory work, computer-assisted instruction, films, and audiovisual aids ; IN types prefer serious reading, tutorials, independent study, and systematically organized courses; ES types prefer to report to class on topics selected by students, to schedule their own time, to have a schedule and stick to it, and work orderly on goals set in advance; and EN types prefer reading, self-instruction, courses that put them in their own initiative, working on group projects; meeting a lot of people; and opportunities to be creative and original.

Learning Preference Combinations by Perception and Attitude. SP, SJ, NP, and NJ are learning preference combinations by perception process (Sensing and Intuition) and mental attitude (Judging and Perceiving) (Lawrence, 1982; 1984; 2009). SP types are structured, exploratory, observational, and prefer hands on instruction; SJ types are structured, didactic, well-organized, and prefer sensory-rich instruction; NP types are low structured and prefer inductive instruction; NJ types are moderate to highly structured and prefer serious instruction (Myers, et al., 2003).

Learning Preference Combinations by Mental Process (Perception and Judgment). ST, SF, NF, and NT are learning preference combinations by perception process (Sensing and Intuition) and judging process (Thinking and Feeling) (Lawrence, 1982; 1984; 2009). Myers (1998) explained learning and styles associated with these MBTI® functions:

1. students with ST preference are interested in facts about real things – useful, practical information about everyday activities; learn best by doing hands-on activities; need precise, step-by-step instructions, logical practical reasons for doing something; and want teachers to treat them fairly;

2. students with SF preference are interested in useful, practical information about people, and a friendly environment; learn best by doing hands-on activities with others; need precise, step-by-step instructions, frequent, friendly interaction and approval; and want teachers to sympathize and support individual recognition;

3. students with NF preference are interested in new ideas about how to understand people as well as symbolic and metaphorical activities; learn best by imagining, creating with others, and writing; need general direction, with freedom to do it their own creative way, and frequent positive feedback; and want teachers' warmth, enthusiasm, humor, and individual recognition; and

4. students with NT preference are interested in theories and global explanations about why the world works the way it does; learn best by categorizing, analyzing, and applying logic; need to be given a problem to solve, an intellectual challenge, and then to be allowed to work it out; and want teachers to treat them with respect and competence.

ST types prefer demonstrations, laboratory work, television, having a plan and sticking to it, and having a study schedule; SF types prefer student-led demonstrations or presentations, instruction with personal involvement, television, films, and audio visuals; NF types prefer to learn through personal relationships, faculty feedback, opportunities to be creative and original, and dislike impersonal, didactic instruction; and NT types prefer organized teacher lectures, self-instruction, reading, researching, and systematically organized discourses (Lawrence, 1982; 1984; 2009).

Psychological or personality types or learning approaches. According to Lawrence (2009) and Murphy (1992), there are many ways of applying type theory to the practice of

learning and performance and one of the starting points is for the teacher to consider the effects of student's type and teacher's type.

Relevant research related to learning styles, psychological types, and academic achievement

It has been more than two decades since the applications of type in the field of education (Provost & Anchors, 2012). Extensive and comprehensive research has been conducted and reported by Myers and McCaulley (1985) pertaining to the relationship between type and standardized achievement examination performance. Previous research by Kalsbeek (1987) suggested that there is a relationship between three of the four dichotomous scales (Extraversion – Introversion, Sensing – Intuition, and Judging and Perceiving) and academic achievement. The individuals with stronger preference for I, J, and N tend to have higher test scores. Charlton (1980) and McCaulley (1977) suggested that there is a relationship between the learning preferences Extraversion (E) – Introversion (I) and Sensing (S) and Intuition (N) and academic achievement. Provost and Anchors (2012) summarized the work of Jensen (1986) and Jensen and DiTiberio (1983; 1984) that explained the relationship between the S – N dimension and test taking:

> When S's read test questions, they often have hunches as to the correct answer, but they rarely trust their hunches… frequently, they begin to reread the questions repeatedly, looking for a concrete clue (a fact, underlined, something that related to their experience, etc.)… they often reread a question until they misread it… they may also answer theoretical questions with lived experience, fail to grasp the big picture or system behind the question, and generally lose points by changing answers. (p. 151)

> Intuitive types tend to read questions quickly, at times carelessly, trust their hunch and then move on to the next question… because they trust their hunches, they are often better test takers than S's, but they can often pick up points by checking for careless errors… their misreading of questions is usually due to a faulty inference, a line of thought that begins with "What if…?" A single inference is usually appropriate, but N's often make inferences from inferences and stray too far from the core of the question. (p. 151)

There are numerous studies that support type theory pertaining to the relationship between the MBTI® learning preferences and academic achievement (Myers et al., 2003). Myers and McCaulley (1985) conducted meta-analyses of studies looking at mean grade point averages. The studies revealed that students with an Introversion learning preference score higher than Extraversion learning preference; students with an Intuition learning preference score higher than Sensing learning preference; students with Thinking and Feeling learning preferences had no consistent pattern; and students with a Judging learning preference receive higher grades than those with a Perceiving learning preference.

In Chickering and Reisser's (1993) vectors and some implications for type, it was reported that more college professors are Intuitive types than Sensing types and they tend to write exams that most frequently fit their own type. In addition, in the tests where students are required to memorize facts and recall them, students who are Sensing (S) and Judging (J) may have more opportunity to excel than in the later courses. Educational exams are often the determining factors in students' sense of competence and it is generally acknowledged that there is relationship between type preferences and performance on standardized examination (Provost & Anchors, 2012). In addition, there is an argument that Sensing intelligence cannot be measured by paper-pencil instruments and that Sensing students (especially Extraverted Sensors) are at a disadvantage on many timed examinations that focus on the ability to quickly manipulate symbols, see patterns, and relationships between words and concepts.

Kalsbeek (1987) presented a paper at the Association for Institutional Research forum in Orlando that reported that TRAILS (Tracking Retention and Academic Integration by Learning Styles) data clearly supported these patterns on both the ACT and the SAT. There exists relationships between three of the four dichotomies (E – I, S – N, and J – P) and academic

achievement and the Introversion and Intuitive (IN) types scored the highest, followed by the EN, IS, and ES types. In addition to this, the data included strength of preference scores. In order to do that, each preference score was converted to a continuous score and correlated. Only the Sensing – Intuition dimension had a single score that reflects both strength and direction of preference. Moreover, the Sensing – Intuition (S – N) scale had the strongest relationship with ACT/SAT test performance and the analysis suggested that the stronger the preference for Intuition, the higher the ACT/SAT score. The other preferences (Extraversion – Introversion, Thinking – Feeling, and Judging – Perceiving dimensions) were not related to test scores at any statistically significant degree.

According to type theory, Introversion (I) and Intuition (N) have their main province within the definition of academic achievement; Introversion with the capacity to deal with concepts and ideas and Intuition with the capacity to work with abstraction, symbols, and theory (Myers, et al., 2003; Provost & Anchors, 2012). Myers, McCaully, Quenk, and Hammer (1998) found that individuals who prefer Introversion and Intuition (IN) tend to show greater aptitude than individuals who favor Extraversion and Sensing (ES) because their gift lies in the practical world of action. Studies of type and academic achievement suggest that Judging and Perceiving learning preferences are related to grades and academic achievement (Myers, et al., 2003). The pattern seems to be same with high school students (Casey, 1986; Kyle, 1985), college freshmen (Kalsbeek, 1986; Pollard, 1989; Provost, 1985), undergraduate students (Anchors, Robins, & Greshman, 1989; Schurr & Ruble, 1986; Woodruff & Clarke, 1993), and medical students (Neral, 1989; Tharp, 1992).

According to type theory, Intuitive types consistently score higher than Sensing types, with Sensing – Intuition differences being greater than Extraversion – Introversion differences

(Myers, et al., 1998). Individuals who preferred Introversion and Intuition showed greater academic aptitude than those who preferred Extraversion and Sensing (Sak, 2004). Type theory also predicts that the Thinking and Feeling (T – F) function seems to have much less of an effect on academic aptitude than Sensing and Intuition (S – N) and Introversion and Intuition (IN) (Malloy, 2007; Provost & Anchors, 2012). The preference of Judging – Perceiving (J – P) is predicted to show the difference between aptitude and achievement (Myers, et al., 2003). The Perceiving attitude of the J – P preference favors where there is a large amount of information in many areas may result in higher aptitude scores; conversely, the Judging attitude that carries the ability to be focused and organized may lead to higher grades (Malloy, 2007; Myers et al., 2003; Provost & Anchors, 2012). In a study by Schurr and Ruble (1986) of 2,713 undergraduate students, the students with a Judging learning preference outscored those with a Perceiving learning preference in GPA. The grades were higher for ES, IS, or EN with T and for IN with P. Pollard (1989), Provost and Anchors (1985), and Anchors, Robins, and Gershman (1989) reported stronger academic performance of students with the Judging preference.

McCaulley, et al. (2003) reported a comparative study of the relationship between aptitude (IQ), achievement (GPA), and sixteen psychological types or learning approaches of 3,505 male high school students. The report concluded that INTJ's scored highest, while INFJ's, ENFJ's, ENTJ's, and INTP's scored lower. INFP's and ENTP's were high on IQ and, they were below the regression line on grades. All ES types, except for ESTJ's, were below the regression line. ESFP's were low on both IQ and grades. The students with a Judging preference had higher grades and IQs while students with a Perceiving preference had lower grades when compared to their IQs. The students with an Intuition preference had higher IQs on the average than Sensing preference.

Kelly (1998) conducted a study to describe the personality attributes found in Student Registered Nurse Practitioners (SRNPs) and Student Family Nurse Practitioners (SFNPs) before they started their graduate program. All of the research questions described the personality traits of the nurses. The majority of the nurses were Extroverted Sensing Thinking Judging (ESTJ) composite prototype, who according to their type were; (a) best to well structured, (b) their academic ability was successful; and (c) they were frustrated by intuitive-perceiving professors whose lectures do not follow stated outlines and whose material is not limited to factual and concrete. These nurses generally fell into the nursing and military prototypes that added value to the validity of the MBTI® instrument. The author suggested that once types of students are known, faculty can initiate programs to help the students better understand the methods of teaching, test taking, and communicating and the valuable information can be integrated into the educational curriculum.

Li (2003) conducted a study to assess learning styles of students in a two year and five-year associate degree of nursing program, and two-year associate degree of nursing program in Taiwan with a sample of 331 nursing students (94 students in a two-year associate degree of nursing program, 189 students in a five year associate degree for nursing (AND) program, and 48 in two-year baccalaureate degree of nursing). The analyses of the data revealed that the most common learning styles were Introverted Sensing Thinking Judging (ISTJ) and Introverted Sensing Feeling Judging (ISFJ). As SJ is the popular preference in nursing, the study had 43.0% of SJs. There was significant relationship between academic achievement and learning styles (p = .001, df = 15). The findings suggested that nursing students with Introvert, Sensing, Thinking, and Judging preferences had better grades than those with Extravert, Intuitive, Feeling, and Perceiving preferences. A large sample was suggested for further research.

Malloy (2007) conducted a research study to explore the relationship between learning style, academic achievement, and psychological type of baccalaureate nursing students with a sample of 62 undergraduate nursing students from a private university. The participants completed the MBTI® instrument and a learning style questionnaire designed by the researcher. The data analysis revealed that significant correlations existed between the 14 learning style subscales and the MBTI®: (a) Extraversion and highly structured cognitive style (Gagne) and Interactive approach to learning; (b) Introversion and Independent approach to learning and Independent teaching-learning methods; (c) Intuition and meaningful cognitive style and academic comfort; (d) Thinking and objective approach to learning; (e) Feeling and spontaneous approach to learning; and (f) Judging and structured approach to learning. Feeling was correlated with course grade in Maternal-Child nursing. The subscales that correlated with course grade were: meaningful cognitive style, academic comfort, independent approach to learning, and independent teaching learning methods. There were number of significant correlations (weak and moderate) between learning styles behaviors, MBTI® dimensions, and academic achievement that agree with previous MBTI® research.

Li, et al. (2014) conducted an exploratory study of the relationship between learning styles and academic performance of nursing students in a 5-year associate degree of nursing (ADN) program and 2-year bachelor of science in nursing (BSN) program in Taiwan with a sample of 285 nursing students (96 in 2-year BSN program and 189 in 5-year ADN program). The data analyses revealed that academic performance was significantly related to learning styles.

Kim and Han (2014) investigated the relationship between the Myers-Briggs Type Indicator® personality profiling, academic performance, and student satisfaction of 109 college

students in Daejeon, Korea. The data analyses revealed that Judging types scored higher in academic performance than Perceiving types. Extrovert types scored higher in student satisfaction than Introvert types. The student academic achievement levels and student satisfaction were different according to their MBTI® personality types in nursing students.

Summary

"The Myers-Briggs Type Indicator is not a panacea for the ills of education but it certainly is a very powerful and useful instrument" (Provost & Anchors, 2012; p. 150). The indicator helps students to understand how they can learn best, how teachers can understand why some students are underperforming, and how to create a connection between student and teacher. Unlike other learning styles instrument, the Myers-Briggs type indicator moves past behaviors to the cognitive process to better understand the thought process of students. The findings from the review of literature are as follows: (a) a relationship exists between learning styles and personality types; (b) the concept of learning styles is relevant to this study; (c) the MBTI® and the Jung and Myers typology theory on which its construct is based will be appropriate in studying learning styles because it is most sophisticated and stable; (d) learning styles discovered by the MBTI® cover a psychological makeup of cognitive style, patterns of attitudes, patterns of mental functioning, disposition of learning environment, and disposition of learning tools; (e) student's personality traits can be considered a precursor of academic achievement because it deals with cognitive, affective, and behavioral processes; (f) a relationship exists between learning styles assessed by the personality make-up and academic achievement; (g) the cognitive motor progression of the learner can be theoretically conceptualized with Jung and Myers typology theory; (h) the progression of learning by the learner can be viewed through the lens of type theory and the dynamics of MBTI® can be explored (through characteristics of learners);

and (i) there exists a relationship between learning preferences, learning preference combinations, psychological types or learning approaches and standardized achievement examination performance. However, the impact varies by test performance, learning environment, and learning tools.

While these findings are conducive with different populations (e.g., nursing students seeking education to become a licensed practical nurse or licensed vocational nurse; nursing students seeking bachelor's degree or graduate degree; K-12 students, medical students, engineering students, etc.) it has never been explored within the academic settings of nurse aides or assistants (which is a vocational program). This is the identified potential gap from the review of literature as related to the themes. Finally, the investigation of these gaps will help in planning better instruction while alternatively dealing with a learning/teaching style mismatch along with providing guidance for students to better prepare for the INACE. Additionally, it could provide a better approach in preparing the questions for the certification examination.

CHAPTER III

METHODS AND PROCEDURE

Introduction

The research questions and hypotheses, variables (independent and dependent), research design, instrumentation, research validity (i.e., measurement reliability of each variable, measurement validity of each variable, overall measurement reliability and statistics for the whole study, overall measurement validity of the constructs for the whole study, internal validity of the study – assumptions and limitations, and external validity of the study), procedure, statistical design, and data analysis are outlined in this chapter.

Research Approach and Design

Lincoln and Guba (1985) suggested that the choice of the paradigm or approach sets down the intent, motivation and expectations for the research. There are different approaches or paradigms (like post-positivist or quantitative, constructivist or qualitative, pragmatic or mixed methods) within the realm of social sciences to describe the general framework of a research study (Gliner, Morgan, & Leech, 2009; Morgan, Gliner & Harmon, 2006; Tashakkori & Teddlie, 2002). This study used the post-positivist or quantitative approach.

In the view of the post-positivist or quantitative approach, the general purpose of the research was to explore relationships between variables. The general approach was non-experimental because attribute independent variables (learning preferences, learning preference combinations, and psychological or personality types are the attributes of the subjects) were studied. The specific approach was to compare groups and summarize data. Based on this specific approach, differential and descriptive research questions and hypotheses were framed.

The statistics used for the analysis of data were difference inferential statistics and descriptive

statistics. Table 3.1 summarizes the research design of this study.

Table 3.1

Research Design

Research Paradigm	Post-positivist or Quantitative
General Purpose	Explore relationships between variables and describe
General Approach	Non-Experimental Quantitative (Attribute Independent Variable)
Specific Approach	Compare groups and summarize data
Research Questions or Hypotheses	Difference (to compare groups) Descriptive
General type of statistic or method	Difference Inferential Statistics Descriptive Statistics

Note. Adapted from "Research Methods in Applied Settings: An Integrated Approach to Design and Analysis" by J. A. Gliner, G. A. Morgan, and N. L. Leech, 2009, p.46. Copyright 2009 by Routledge.
The table shows how general type of statistic or method and research questions and hypotheses used in this study corresponds to the purpose and approach or paradigm henceforth setting the intent, motivation and expectation of this research study.

Research Questions and Hypotheses

The researcher investigated whether a relationship exists between learning styles and

psychological types or personality types or learning approaches, and standardized achievement

examination performance (i.e. test score and test score based on duty areas on a multiple-choice

Illinois Nurse Aide or Assistant Competency Examination – INACE) of nurse aide or assistant

students. To accomplish this, the following comparative questions and hypotheses were posited:

1. What are the differences between the four dichotomous pairs or levels of learning

   preferences determined by the Myers-Briggs Type Indicator® [3]*Extraversion (E) -*

   [3]*Introversion (I),* [2]*Sensing (S) -* [2]*Intuition (N), Thinking (T) - Feeling (F), and* [2]*Judging*

   (J) - [2]*Perceiving (P)* with reference to the mean of *overall test performance* and means of

overall test performance based on specific duty areas[1] on the multiple choice certified

nursing aide competency examination (CNA) of nurse aide students?

H[O1]: There are no significant differences between the four dichotomous pairs or levels

of learning preferences E – I, S – N, T – F, and J - P with reference to the mean of

overall test performance and means of overall test performance based on specific

duty areas[1].

H[a1]: There are significant differences between the four dichotomous pairs or levels

of learning preferences E – I, S – N, T – F, and J - P with reference to the mean of

overall test performance and means of overall test performance based on specific

duty areas[1].

2. What are the differences between the four levels of learning preference combinations by

orientation of energy and perception determined by the Myers-Briggs Type Indicator®

[2,3]*IS,* [2,3]*IN,* [2,3]*ES, and* [2,3]*EN* with reference to the mean of *overall test performance* and

means of *overall test performance based on specific duty areas[1]* on the multiple-choice

certified nursing aide competency examination of nurse aide students?

H[O2]: There are no significant differences between the four levels of learning preference

combinations IS, IN, ES, and EN with reference to the mean of overall test

performance and means of overall test performance based on specific duty areas[1].

H[a2]: There are significant differences between the four levels of learning preference

combinations IS, IN, ES, and EN with reference to the mean of overall test

performance and means of overall test performance based on specific duty areas[1].

3. What are the differences between the four levels of learning preference combinations by

perception and attitude [2]*SP,* [2]*SJ,* [2]*NP, and* [2]*NJ* determined by the Myers-Briggs Type

Indicator[®] with reference to the mean of *overall test score* and means of *overall test*

scores based on specific duty areas[1] on the multiple-choice certified nursing aide

competency examination of nurse aide students?

H$_{O3}$: There are no significant differences between the four levels of learning preference

combinations SP, SJ, NP, and NJ with reference to the means of overall test

performance and means of overall test performance based on specific duty areas[1].

H$_{a3}$: There are significant differences between the four levels of learning preference

combinations SP, SJ, NP, and NJ with reference to the mean of overall test

performance and means of overall test performance based on specific duty areas[1].

4. What are the differences between the four level of learning preference combinations by

mental process (perception and judgment) [2]*ST,* [2]*SF,* [2]*NF, and* [2]*NT* determined by the

Myers-Briggs Type Indicator[®] with reference to the mean of *overall test performance* and

means *overall test performance based on specific duty areas[1]* on the multiple-choice

certified nursing aide competency examination of nurse aide students?

H$_{O4}$: There are no significant differences between the four levels of learning preference

combinations by mental processes ST, SF, NF, and NT with reference to the mean

of overall test performance and means of overall test performance based on

specific duty areas[1].

H$_{a4}$: There are significant differences between the four levels of learning preference

combinations by mental processes ST, SF, NF, and NT with reference to the mean

of overall test performance and means overall test performance based on specific

duty areas[1].

5. What are the differences between the 16 levels of psychological types or learning approaches *ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ* determined by the Myers-Briggs Type Indicator® with reference to the mean of *overall test performance* and means of *overall test performance based on specific duty areas[1]* on the multiple-choice certified nursing aide competency examination of nurse aide students?

$H_{O}5$: There are no significant differences between the 16 levels of psychological types or learning approaches ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ with reference to the mean of overall test performance and means of overall test performance based on specific duty areas[1].

$H_{a}5$: There are significant differences between the 16 levels of psychological types or learning approaches ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ with reference to the mean of overall test performance and means of overall test performance based on specific duty areas[1]

---

[1] specific duty areas include communicating information, performing basic nursing skills, performing personal skills, performing basic restorative skills, providing mental health and social service needs, and providing for residents' rights (INAT, 2016).
[2] It is the single most important attribute for achievement on multiple choice standardized achievement exam performance pertaining to information processing (Lawrence, 1982; 1984; 2009; Myers & Myers, 1995, Myers, et al., 1998, 2003; Paul, 2014; Pelly & Dalley, 2008; Provost & Anchors, 2003).
[3] It is an important attribute for achievement on a multiple choice standardized exam performance pertaining to source of learning or structure learning (Lawrence, 1982; 1984; 2009; Myers & Myers, 1995, Myers, et al., 1998, 2003; Paul, 2014; Pelly & Dalley, 2008; Provost & Anchors, 2003).

Variables and their Measurement Levels

      Dependent Variables. A dependent variable is a "variable assumed to measure or assess the effect of the independent variable; thought of as the presumed outcome or criterion of the independent variable; also referred to as the outcome variable" (Gliner, George, & Nancy, 2009, p. 429). There were seven dependent variables in this research study (see Table 3.2). They were measured through a multiple-choice Illinois Nurse Aide or Assistant Competency Examination (INACE) held in January 2017. The first dependent variable was the overall test score. The other six dependent variables were test score based on duty areas: communicating information (Duty Area 1), performing basic nursing skills (Duty Area 2), performing personal skills (Duty Area 3), performing basic restorative skills (Duty Area 4), providing mental health and social service needs (Duty Area 5), and providing for residents' right (Duty Area 6). All the dependent variables had ratio, continuous (ordered) level of measurement, and were approximately normally distributed.

      Independent Variables. An independent variable is "a variable that is presumed to affect or predict the values of another variable, may be active or attribute; also called as predictor variable" Gliner et al., 2009, p. 431). There were eight key independent or antecedent or predictor variables (see Table 3.2) in this research study. Seven out of the eight independent variables were learning preferences. One out of the eight independent variables was psychological or personality types or learning approach. All the independent variables were attribute independent variables because they were measured characteristics of nurse aide or assistant students (participants) that could not be manipulated.

    The independent variables, their number of levels or categories, and level of measurement are as follows:

1. Learning preference pair by source of energy has two dichotomous, unordered, categorical levels: *Extraversion (E) and Introversion (I)*,

2. Learning preference pair by perception had two dichotomous, unordered, categorical levels: *Sensing (S) and Intuition (N)*,

3. Learning preference pair by reaction to information or making decisions has two dichotomous, unordered categorical levels: *Thinking (T) and Feeling (F)*,

4. Learning preference pair by preference to lifestyle has two dichotomous, unordered categorical levels: *Judging (J) and Perceiving (P)*,

5. Learning preference combination by orientation of energy and perception has four nominal, unordered categorical levels: *IS, IN, ES, and EN*,

6. Learning preference combination by perception and attitude has four nominal, unordered categorical levels: *SP, SJ, NP, and NJ*,

7. Learning preference combination by mental process (i.e. perception and judgment) has four nominal, unordered categorical levels: *ST, SF, NF, and NT*, and

8. Psychological or personality types or learning approaches has sixteen nominal, unordered categorical levels: *ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ*.

All the independent variables were categorical because they had either unordered nominal or dichotomous levels or categories. All the independent variables were measured using the Myers-Briggs Type Indicator® inventory in North American English.

Population and Sample

Participants are the people, objects, or events that are of interest in a particular study (Gliner, Morgan, & Leech, 2009). Students seeking nurse aide or assistant certification were the

participants or subjects of this study. The theoretical or target population includes participants of theoretical interest to the research (Gliner, et al., 2009). The theoretical or target population which is of interest in this study was all the students seeking nurse aide or assistant certification in the state of Illinois during January 2017.

Nurse aide, sometimes called nurse assistant, is a profession within the heath care team, which provides basic patient care for patients under the direction of the nursing staff (Bureau of Labor Statistics, 2015; O*Net, 2016). They perform duties such as feeding, bathing, dressing, grooming, moving patients, changing linens, turning, repositioning or transferring patients, listening to and recording patients' health concerns, reporting information to nurses, measuring patient's vital signs, serving patients with meals, transporting patients, etc. (Bureau of Labor Statistics, 2015).

According to the Illinois Department of Public Health [IDPH] (2016), in order to join the workforce as a nurse aide or assistant in licensed or certified nursing facilities, intermediate care facilitates, and home health agencies, it is mandatory that they should meet the following criteria: (a) undergo a criminal background check, (b) successfully complete an Illinois approved CNA training program, (c) pass a competency test covering 21 mandated manual skills, and (d) pass a written competency test (Illinois Nurse Aide or Assistant Competency Examination – INACE. The information provided here is in chronological order, which is important because each entity enlisted becomes a pre-requisite for the next entity). The CNA training is provided by different types of programs (see Table 3.3) such as community colleges, vocational schools, secondary schools, hospitals, home health facilities, facilities, and others (INAT, 2016). The 21 mandated manual skills are assessed by the training program. The INACE is administered by Illinois Nurse Aide Testing Project.

Table 3.3

Certified Nurse Aide Competency Exam Participants by Program Type

Year	2015		2014		2013		2012	
Program	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Community College	6097	40.65	7374	42.16	8042	43.02	9037	44.30
Vocational	4935	32.91	5844	33.41	6331	33.87	6941	34.03
Secondary	1945	12.97	1939	11.09	1847	9.88	1582	7.76
Other	1605	10.70	1522	8.70	1246	6.67	1344	6.59
Hospital	12	0.08	24	0.14	40	0.21	92	0.45
Home Health	185	1.23	579	3.31	536	2.87	656	3.22
Facility	218	1.45	210	1.20	274	1.47	313	1.53
Private					377	2.02	434	2.13
Total	14997	100	17492	100	18693	100	20399	100

Note. Adapted from "CNA Competency Exam Results by Type of Training Program," by Illinois Nurse Aide Testing Program at Southern Illinois University, Carbondale.

The accessible population, sometimes called the survey population or sampling frame is the group of participants that are accessible to the researcher (Gliner, et al., 2009; Morgan, et al., 2006). The accessible population to the researcher was all nurse aide students seeking certification at test sites (students from different training programs will take their competency test at the test site) that administered the Illinois Nurse Aide or Assistant Competency Examination (INACE) in January 2017. The accessible population, i.e., the nurse aide students taking the INACE at various test sites, were stratified into northern, central, and southern Illinois. The INACE is offered by Illinois Nurse Aide Testing Project at Southern Illinois University Carbondale (SIUC) in partnership with the Illinois Department of Public Health (IDPH) (IDPH, 2016). Since INACE was administered by SIUC, the population was accessible to the researcher. There were 38 test sites that administered INACE in January 2017; 19 test sites were from northern Illinois, 8 test sites were from central Illinois, and 11 test sites were from southern Illinois. 985 nurse aide students from various training programs took the competency examination in northern Illinois, 304 nurse aide students from various training programs took the

competency examination in central Illinois, and 207 nurse aide students from various training

programs took the competency examination in southern Illinois in January 2017.

The selected sample is the smaller group of subjects or participants that is drawn from the

larger accessible population by the researcher through a sampling technique (Gliner et al., 2009;

Morgan, et al., 2006). The selected sample was drawn from the accessible population using a

stratified random sampling technique. From the stratified test sites, 19 test sites were randomly

selected (3 from northern Illinois, 5 from central Illinois, and 10 from southern Illinois). A total

sample of 558 participants were selected for the study.

Specifications	Details
Target or theoretical population	All students seeking nursing aide or assistant certification in the state of Illinois.
Accessible population	38 test sites where students from different training programs took their Illinois Nurse Aide or Assistant Competency Examination (INACE) in January 2017. (19 were from Northern Illinois, 8 test sites were from Central Illinois, and 11 were from Southern Illinois)
Selected Sample	From stratified test sites, 19 (3 from northern Illinois, 5 from central Illinois, and 10 from southern Illinois) test sites randomly selected. A total of 558 participants were selected.
Sampling Technique	Stratified Random Sampling (with unequal proportions)
Actual Sample	558 (184 from northern Illinois, 187 from central Illinois, and 187 from southern Illinois)

Figure 3.1. Schematic diagram of the sampling process.

Therefore, the participants in the selected sample were representative of the accessible

population because the stratified random sampling technique was used. The accessible

population was representative of the theoretical population because each test site had students

from different training programs taking the Illinois Nurse Aide or Assistant Competency

Examination (INACE).

Research Validity

Research validity is the merit of the whole study which is evaluated using the following

entities: (a) measurement reliability of each variable; (b) measurement validity of each variable;

(c) overall measurement reliability and statistics of the whole study; (d) overall measurement

validity of the constructs of the whole study; (e) internal validity; and (f) external Validity

(Campbell & Kenny, 1999; Campbell & Stanley, 1996; Gliner, et al., 2009; Morgan, et al., 2006,

See Figure 3.2).
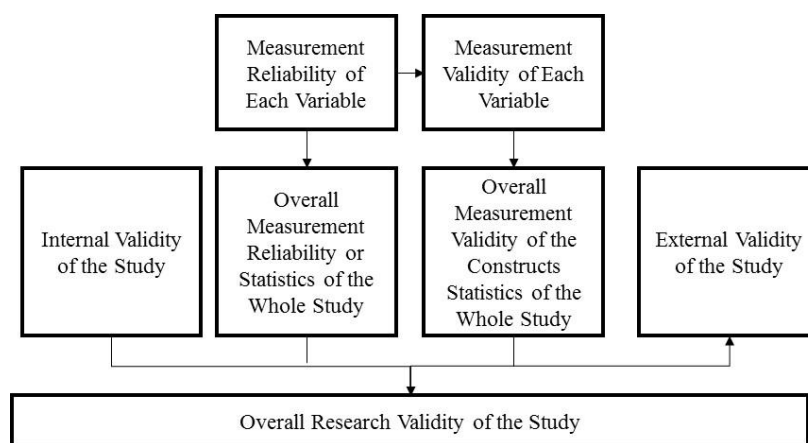
Figure 3.2. Schematic diagram showing the presentation overall research validity of this research study. Adapted from "Research Methods in Applied Settings: An Integrated Approach to Design and Analysis" by J. A. Gliner, G. A. Morgan, N. L. Leech, 2009, p.343. Copyright 2009 by Routledge.

Analysis of Design and Methods. As discussed earlier, there were eight key

independent or predictor variables: four had two dichotomous, unordered, categorical levels;

three had four nominal, unordered categorical levels; and one had sixteen nominal, unordered

categorical levels. All these independent variables were attribute independent variables. They

were all measured using the Myers-Briggs Type Indicator® (MBTI®). Additionally, there were

seven key dependent or outcome variables with ratio, continuous, ordered levels of

measurement. They were measured against the Illinois Nurse Aide Competency Examination

(INACE). All the research questions or hypotheses were difference and descriptive research

questions or hypotheses because the aim was to compare groups and summarize data. Moreover, each question and hypothesis was assessed using difference inferential statistics. The research study used a comparative and descriptive non-experimental approach with a between-group design (because each participant in the research was in one and only one group) (see Table 3.2).

Instrumentation, Reliability, and Validity. The independent variables in the study were learning styles or learning preferences: Extraversion (E) and Introversion (I), Sensing (S) and Intuition (N), Thinking (T) and Feeling (F), and Judging (J) and Perceiving (P); learning preferences by combination of: orientation of energy and perception (i.e. IS, IN, ES, and EN), perception and attitude (SP, SJ, NP, and NJ), mental processes (ST, SF, NF, and NT); and psychological or personality types or learning approaches (i.e., ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ). All these independent variables were measured against the results of the 93-item Myers-Briggs Type Indicator inventory. The test scores and the test scores based on duty areas were measured against the results of the Illinois approved Certified Nurse Aide Competency Evaluation Exam which was a paper based multiple-choice exam.

The Myers-Briggs Type Indicator® (MBTI®) inventory, developed by Isabel Briggs Myers and her mother, Katherine Cook Briggs, is one of the most widely used inventories in the world which is based on the psychological theories of Carl Gustav Jung (Myers & McCaulley, 1985; Myers, McCaulley, Quenk, & Hammer, 1998; Naomi, 2009; Schaubhut, Herk, & Thompson, 2009). The assessment combines the four preferences into one preference from each dichotomy – yielding one four letter personality type (i.e., ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ) of the 16 possible personality types (Schaubhut et al., 2009). The MBTI® assessments are available in different

forms and different languages. This study utilized the self-scorable 93-item MBTI® Form M in North American English.

Reliability. Reliability is of utmost importance to any research study because if an outcome cannot provide reliable data, then one cannot accurately measure the results of the study (Gliner, Morgan, & Leech, 2009). Cronbach (1990) said that reliability refers to consistency of the series of measurements. According to Thompson (2003), it is a property of scores and it is not immutable across all conceivable uses of a given measure. Measurement reliability refers to stability or consistency which means that the participants' scores should be the same or very similar from one testing time to another. Although the Myers-Briggs Type Indicator® (MBTI®) is a psychological instrument, it meets and exceeds the standards for psychological instruments in terms of its reliability (Myers, et al., 2009). MBTI® Form M is a standard form that was first published in 1998 and uses item response theory (IRT) based scoring and item selection to identify an individual's four letter type.

The evidence of reliability can be stated in two different ways: (a) participants' responses and (b) observers' responses (Cronbach, 1960; 1990; Gliner, et al., 2009). The evidence of reliability based on participant's responses can be gathered through *test re-test reliability* (which confirms stability over time), *parallel forms of reliability* (which confirms consistency across presumably equivalent versions of the instruments), and *internal consistency* (which confirms whether items that are to be combined are related to each other). The evidence of reliability based on observer's response can be gathered through *inter-rater reliability* (which confirms that different observers or raters give similar scores).

Schaubhut, Herk, and Thompson (2009) estimated the test retest validity by correlating two continuous scores that ranged from less than one year to more than four years for a sample

that consisted of 49% women, 49% men, and 2% did not report the gender. The correlation of MBTI® dichotomies ranged from .57 to .81, indicating good reliability for each preference over long periods of time. The correlation of men ranged from .53 to .93 while correlation for women, it ranged from .56 to .92. Additionally, internal consistency was computed for the samples of adults who completed the MBTI Form M assessments from June 2008 to May 2009. The reliabilities of five employment status categories (employed full time, employed part time, full time student, retired, and not working), ranged from .86 to .92. The internal consistency reliability based on ethnicity (African American, American Indian/Alaskan Native, Asian, Caucasian, Indian, Latino(a)/Hispanic, Middle Easterner, Pacific Islander/Native Hawaiian, and Multiethnic) ranged from .80 to .92.

The internal consistency reliability based on age (under 20, 20-29, 30-39, 40-49, 50-59, over 60) ranged from .86 to .91. The internal consistency reliability based on an international sample (Africa, Asia, Australia, New Zealand, Europe, Latin America, Middle East and North Africa) ranged from .81 to .91. Moreover, the MBTI® Form M instrument was compared with well-known personality assessments (parallel form of reliability) and the internal consistency and test re-test reliabilities were good or superior to those reported for the other personality assessments (Myers et al., 2003; Schaubhut, et al., 2009). Finally, the MBTI® Form M reliability according to participants' responses has been evaluated through test-retest reliability, parallel forms of reliability and internal consistency and the evidence is presented in this section and the evidence is acceptable (Myers et al., 2003; Schaubhut, et al., 2009).

Validity. Measurement validity is about establishing evidence for the use of a particular measure or instrument in a particular setting, with a particular population for a specific purpose and it explains the accuracy and correctness of a research study (Ghiselli, Campbell, & Zedeck,

1981; Gliner, et al., 2009; Murphy & Davidshofer, 2005). In simple terms, it means whether the score accurately reflects or measures what the instrument is designed or intended to (Morgan, et al., 2006). There are four types of validity: content related evidence, construct related evidence (response process, internal structure, and relations to other variables), criterion related evidence, and consequences related evidence (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999). There have been many studies from over the years that have proven the validity of the MBTI® instrument in three categories: (a) the validity of the four separate preference scales; (b) the validity of the four preference pairs as dichotomies; and (c) the validity of 16 types or particular combinations of preferences (Myers, et al., 2003).

Schaubhut, et al. (2009) stated that

the validity of personality assessments is often established through *construct validity* by showing that results of assessment relate in a predictable manner to the results of other similar measures they should be related to (known as *convergent validity*) and are not related to the results of measures they should not be related to (known as *divergent validity*). (p. 9)

They reported convergent validity and divergent validity of the MBTI® assessment by correlating the scales of several other assessments with the MBTI®. The correlations indicated expected relationships with other instruments. In addition, they reported the MBTI® validity through 'best fit' or verified, type through many studies conducted in the past that revealed the agreement between reported type and best-fit type ranging from 62% to 85%. The results indicated high rates of agreement between reported and best fit types and inconsistency occurring more frequently for preference clarity index. Finally, they also reported MBTI® validity through confirmatory and exploratory factor analysis of a national sample of 10,000 participants to establish construct validity. The results indicated that the four-factor structure of the MBTI® Form M items measured what they were intended to measure. Curry (1987) tested validity

(predictive and construct) of the MBTI® scores of 5,355 medical students over a span of 12 years. The psychometric ratings were strong for validity. As a result, the MBTI® is a useful instrument for this research study.

Evaluation of the four key dimensions of research validity. This is established by evaluating the overall measurement reliability and statistics of the whole study, internal validity, overall measurement validity of the constructs, and external validity (Gliner, et al., 2009). The following section describes the evaluation of the four key dimensions.

Overall measurement reliability and statistics of the whole study. The first dimension of research validity emphasizes the importance of the overall measurement reliability as well as the interpretation of inferential statistics (Gliner, et al., 2009). There are five aspects to identify the overall measurement reliability and statistics of the whole study by answering the following questions: (a) whether the overall ratings of measurement reliability of the variables acceptable; (b) whether the power was adequate or appropriate; (d) whether the choice or use of statistics was appropriate; and (e) whether statistical results were appropriately interpreted (see Table 3.4, Morgan, et al., 2006).

The MBTI® inventory was used to measure all the independent variables. The overall measurement reliability was acceptable because the MBTI® inventory is one of the most reliable and valid instruments based on the fact it meets and exceeds the standards of psychological instruments (Myers, et al., 2003; Schaubhut, et al., 2009). In terms of reliability in administration of the instrument, all the administration guidelines were carefully followed while administering the MBTI® inventory to nurse aide students to obtain accurate results. The observed power was not adequate because of high attrition rate (42%, see Table 3.9) of participants in the research study. The choice and use of statistics was appropriate because all the

basic assumptions of the statistic (both one-way ANOVA and one-way MANOVA) were met before conducting the analysis. The sample was selected using stratified random sampling technique. The level of measurement of variables was categorical for independent variables and continuous or scale for dependent variables. There was linearity and multivariate normality within the dependent variables.   There was multivariate homogeneity of variance and co-variance between groups. The statistical results had small to medium effect size (see Table 4.3 and 4.4). The statistical results were properly interpreted; however, the power was not appropriate because of the high attrition rate of 42% (see Table 3.9).

Internal validity. It is the extent to which we can infer that an independent variable caused the dependent variable (i.e., the relationship is causal) (Gliner, et al., 2009; Morgan, et al., 2006). There are three criteria to infer a causal relationship: (a) the independent variable must precede the dependent variable; (b) the independent variable must be related to the dependent variable; and (c) there must be no other variables that could explain why the independent variable is related to the dependent variable (see Table 3.9 and 3.10), Gliner, et al., 2009). The two main dimensions that were used to evaluate the internal validity in this study were as follows: (a) equivalence of the groups on participant characteristics and (b) control of extraneous experience and environmental variables.

There were no random assignments to groups; however, the participants were matched demographically and based on participant characteristics and attributes. All the groups had nurse aide students who went through an Illinois approved Basic Nurse Aide Training program, completed the 21-mandated skills assessment, and were taking the Illinois Nurse Aide Competency Examination in January of 2017. Additionally, the groups were formed based on

the results of the Myers Briggs Type Indicator®, which was administered to the randomly selected nurse aide students at various test sites in the state of Illinois.

One extraneous factor, instrumentation was identified within this research design and attempts were made to reduce this factor. The Myers-Briggs Type Instrument is not a test and there are no right or wrong answers. It has 93 questions with options and word pairs. The participants while answering might feel both the options of a particular question or word pairs are correct when only one option should be selected on the basis of their natural self or they might select an option that is more unnatural (learned self /acquired skill) which is not natural. This will have a major impact on the MBTI® results. To reduce this extraneous cue, an instructions sheet (see Appendix D) was asked to be completed before attempting the instrument. The activity and instructions undoubtedly guide the participants on how to complete the instrument. This was also explained in the limitation and assumption statements.

Assumptions. The following were the assumptions of this study:

1. The researcher did realize that the true preferences of the respondents (i.e., subjects of the study) are only identified by themselves, and Myers-Briggs Type Indicator (MBTI) Inventory reports the first step, but not a final step in identifying these because the MBTI personality indicator is a direct self-report inventory.

2. The researcher assumed that the respondents (i.e. subjects of the study) may have answered questions according to their psychological type which they believed was more favorable.

3. The researcher assumed that the subjects of the study or respondents completed the study honestly and provided accurate information to the best knowledge of their own preferences.

4. The researcher also assumed that the MBTI® instrument is valid and reliable as it has been represented in the literature.

5. The researcher assumed that the participants of the study were competent in literacy to at least the high school level.

6. Creation of this database also required that certain students be delimited or excluded from the study if they were not 18 years of age or any information was missing from the dataset.

Limitations. The following were the limitations of this study.

1. The results of this study were limited to the population of nursing aide or assistant students enrolled in the Illinois approved Nurse Aide Training program provided by community colleges, vocational schools, secondary schools, hospitals, home health agencies, and private organizations.

2. The study results cannot be representative of the entire population of nursing aides or assistants from other states within the United States and other countries.

3. The survey was taken only by the nursing aide or assistant students who completed the Illinois Basic Nurse Assistant Training program and have passed the test covering the 21 mandated manual skills.

4. Enrollment and the corresponding demographics change within this program change every year and results applied to other time periods may not be the same.

5. Personality testing is not an exact science. Measurement error and lack of precision are inevitable in all personality instruments.

6. Psychological type does not explain all behavior.

7. All respondents (i.e., subjects) of the same type are not alike. The theory describes preferences, but not at the level of type development.

8. Motivation of subjects of this study influences the answers. Test results can be invalidated by random responses, by deliberate faking, by failure to understand questions, or by inability to report true preferences through lack of self – understanding

9. A number of the 16 types are found in small percentages in the general population; therefore, it was difficult to obtain sufficient numbers of all the 16 types in this study.

Overall Measurement Validity of the Constructs of the Whole Study. This dimension helps make an overall judgment of the validity of the operational definitions of several key variables in the study (Gliner, et al., 2009, see Table 3.11). There are three aspects to identify the overall measurement validity of the constructs of the whole study: (a) use of measures with similar participants; (b) evidence for the validity of the outcomes based on existing empirical or theoretical research presented; and (c) adequate evidence for the validity of the attribute independent variables presented (Morgan, et al., 2006). The attribute independent variables were measured using the MBTI® inventory and dependent variables were measured on the Illinois Nurse Aide Competency Examination conducted in January 2017. They were measured validly and appropriately as defined under the concept of investigation. The measure was used in the earlier studies that involved nursing students as participants; however, this is the first time the measure was used with nurse aide students. There was adequate evidence of validity of the outcomes based on a national sample presented by Schaubhut, et al. (2009) related to the MBTI®.

External Validity. External validity is about generalizability: "to what populations, settings, treatment variables, and measurement variables can this effect be generalized?"

(Campbell & Stanley, 1963; 1966, p.5). There are three aspects of external validity: population external validity, ecological external validity, and testing of sub-groups (Gliner, et al., 2009). The first two examine the representativeness of the population and setting of the target or theoretical population and of the procedures and settings and the third evaluates whether the results are likely to generalize.

     Population External Validity. Population external validity is based on the following: (a) representativeness of accessible population with target population; (b) adequacy of sampling method from accessible population; and (c) adequacy of response rate (Gliner et al., 2009, see Table 3.12). The participants in the accessible population were representative of the target or theoretical population because nurse aide students taking the Illinois Nurse Aide Competency Examination in January 2017 were from different training programs that imparted the Illinois approved basic nurse aide training which is mandatory for nurse aides to seek certification. The selected sample was representative of the accessible population because the sample was selected from the accessible population through random stratified sampling technique. According to Gliner et al., (2009), "random selection of participants is useful to produce high population external validity whereas random assignment to groups is important for high internal validity" (p. 131). The actual sample was not representative of the selected sample because the response rate was 58.42%; 114 nurse aide students represented northern Illinois, 111 students represented central Illinois, and 101 represented southern Illinois. The drop out did not affect all the groups except for learning preference (Thinking, $n = 56$ and Feeling, $n = 270$) and psychological types (not all 16 types were adequately represented). The aim of the study was to only focus on the nurse aides in the state of Illinois and not any other states within the U.S. or any other country. Hence, this study is not representative of nurse aides from any other state within the U.S. or

country. Though the external validity of the study was moderate, attempts should be made in future studies to have adequate sample size (especially group size) when considering a study of psychological or personality to establish significance.

Ecological External Validity. Ecological external validity is about the conditions/settings, testers, procedures or tasks, and time in history (Gliner, et al., 2009, see Table 3.13). These five aspects establish ecological external validity in terms of how representative they are of the target or intended settings: naturalness of the setting, adequacy of rapport with testers and observers, naturalness of procedures/tasks, appropriateness of timing of length of intervention or treatment (if active independent variable), and extent to which results are not restricted to specific time in history. The data was obtained during the CNA competency examination held in January 2017 at various test sites (field setting), i.e., community colleges (northern, central, and southern regions). Therefore, the ecological validity based on naturalness of the setting was high.

The data pertaining to learning preferences, learning preference combinations, and psychological type were collected using a self-report MBTI® Form M inventory. Therefore, the ecological validity based on naturalness of the procedures was somewhat artificial because the instrument was not a direct measure of the participant's actual behavior in a typical environment. The rapport and quality of the relationship between participants and researcher was established through the Illinois Nurse Aide Testing Project at Southern Illinois University Carbondale, which is an individual body that administers the written portion of the competency exam at various sites throughout the state of Illinois, thereby, providing a strong bond to build rapport and reason for such research initiatives that was for the betterment of the nursing students as a quality improvement initiative.

The aspect of length of intervention or treatment was not applicable because this study was a non-experimental comparative and descriptive study. Enrollment and the corresponding demographics within this program change every year and results applied to other time periods may not be the same. Overall ecological external validity of this research study was moderate.

Procedure

The data related to the independent or predictor variables, namely learning preferences (Extraversion and Introversion, Sensing and Intuition, Thinking and Feeling, and Judging and Perceiving), learning preference combinations (IS, IN, ES, and EN; SP, SJ, NP, and NJ; and ST, SF, NF and NT), and psychological types or personality types (like ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ types) were measured against the 93 –item Myers-Briggs Type Indicator (MBTI®) instrument in North American English . The data related to dependent or outcome variables, i.e., test scores and test scores based on duty areas, were measured against the multiple-choice Illinois Nurse Aide Competency Examination (INACE). The data was obtained during the INACE conducted in January 2017.

The researcher requested permission to seek participation of students from the Project Coordinator, Illinois Nurse Aide Testing Project (see Appendix A). The SIUC Human Subjects Committee approval was approved on December 9, 2016 to conduct this study with the selected sample using the above stated measure. A set of the following documents were arranged for each participant: a cover letter, an MBTI® activity and instruction sheet, a demographic sheet, and a MBTI® Form M paper-pencil inventory or questionnaire (see Appendix B, D, and E). Each set was inserted into the test booklet of the Illinois Nurse Aide Competency Examination (INACE) before they were sent to the test sites (selected through stratified random sampling) in

the first week of January 2017. Additionally, an email and a hard copy of instructions on how to instruct students to compete the MBTI® inventory was sent to the proctors (see Appendix C) along with a sample completed activity and demographic sheet.

The cover letter (see Appendix B) explained the purpose, expectations, and request for participation in the study. The demographic sheet asked basic student information such as age, gender, ethnicity/race, education, ESL, truncated SSN, test site code, and email address (see Appendix D). The truncated SSN (last four digits) and test site code was obtained to match participant's MBTI® results with test scores of INACE. The email address was obtained to contact interested participants with their MBTI personality type and description related to their type through a certified MBTI consultant as an incentive for participation in the research study. The activity and instructions sheet (see Appendix D) had basic instructions to complete the survey and an activity to complete so that the nurse aide students would select their best-fit type based on their perception of their personality type.

The participants were instructed to complete the Illinois Nurse Aide Competency Examination (INACE) and then participate in the survey by the proctors. They were also informed that the instrument was not part of their competency exam and their participation was voluntary and answering the instrument would not impact their competency exam score. No minors were involved in the study so participants at least 18 years of age or above were invited to participate. After they completed INACE, the proctors instructed the participants to go through the cover letter, read the instructions, complete the activity, and complete the MBTI® inventory. While all these activities were being conducted, the researcher and a certified MBTI® consultant were available to answer any question(s) via email and phone.

Upon completion, the participants returned the activity and instructions sheet, demographics sheet, and the MBTI® inventory along with the INACE test booklet and INACE answer sheet to the proctor. The proctor later mailed all of the items to the Illinois Nurse Aide Testing Program at Southern Illinois University in a sealed envelope. Each MBTI® inventory was scored using templates in the MBTI® booklet provided by the Center for Applications of Psychological Type. The results (the MBTI® type and description related to it) were emailed to the students who provided their email address as an incentive for participation. Finally, the categorical data were coded and readied for statistical data analysis (see Exhibit I).

Statistical Design

The selection of statistical design may seem a daunting task, considering the large number of possible choices; however, the task becomes easier with the knowledge of factors involved in choosing the statistical design (Campbell & Kenny, 1999; Gliner, et al., 2009; Morgan et al., 2006): research questions, independent variables, dependent variables, number of levels, level or scale of measurement, research approaches, and design classification.

There were five comparative research questions in this research study. The first question had four attribute independent variables (see Table 3.2) with dichotomous, unordered categorical levels leading to two groups for each independent variable and continuous related dependent variables. The second, third, and fourth questions had one attribute independent variable (see Table 3.2) with four nominal, unordered categorical levels leading to four groups and continuous related dependent variables. The fifth question had one attribute independent variable (see Table 3.2) with sixteen nominal, unordered categorical levels leading to sixteen groups and continuous related dependent variables. The independent variables were measured against the MBTI® Form M inventory. The dependent variables were the overall test performance and test performance

based on the specific duty areas on the standardized multiple-choice Illinois Nurse Aide

Competency Examination (INACE), which were approximately normally distributed. The

groups of independent variables were compared between-groups against the means of dependent

variables. In addition, there were descriptive questions to summarize data of the research study

and assumptions to be tested.

Based on the analysis of the elements of the research questions relationships (see Figure

3.3); the general purpose of this research study was to explore relationship between variables

(i.e., between learning styles, psychological types, and standardized examination performance)

and describe numerical facts of the research study. The research approach was non-

experimental, comparative and descriptive. All the questions were either difference (comparing

between-groups) or descriptive. All the questions and hypotheses were analyzed using

descriptive statistics and difference inferential statistics. The statistical design was represented

using a schematic diagram shown in Figure 3.3.

General Research Design	Specific Research Design	
General Purpose	Explore Relationship between variables	Description
	⬇	
General Approach	Non-Experimental	
	⬇	⬇
Specific Approach	Comparative	Descriptive
	⬇	⬇
Specific Purpose	Compare Between Groups	Summarize Data
	⬇	⬇
Type of Questions and/or Hypotheses	Difference (To compare groups)	Descriptive
	⬇	⬇
General Type of Statistic	Difference Inferential Statistic (*t* – test, ANOVA, and MANOVA)	Descriptive Statistic Mean, Standard Deviation, Percentages, Histograms, etc.

Figure 3.3. Schematic diagram showing the statistical design corresponding the research purpose.

Data Analysis

Data analysis is a section that tells how a researcher plans to analyze the collected data based on research procedures and research design (Koran, 2015). Every statistical test is determined based on various factors (some of them have been discussed in the earlier section) such as the research question, independent variables and their levels, dependent variables and their scale of measurement, research design classification (between-groups, within-groups or repeated measures, or mixed), and statistical assumptions (the assumption of normality, the assumption of homogeneity of variance, and the assumption of independence) (Gliner, et al., 2009; Tabachnick & Fidell, 2012). The following paragraphs present information on these various factors.

The first question had four categorical independent variables (learning preferences) with two groups and seven continuous or scale dependent variables. The second, third, and fourth questions had one categorical independent variable (learning preference combination) with four groups and seven continuous or scale dependent variables. The last question had one categorical independent variable with sixteen groups and seven continuous or scale dependent variables. The overall test performance on INACE and test performance based on specific duty areas were separately considered for data analysis to avoid disagreement of the assumption of independence of dependent variables (i.e. the scores in one group should not influence the probability of score in another group) (Gliner, et al., 2009) because the six specific duty areas were derivatives or subsets of overall test performance.

The research questions with categorical independent variables (learning preferences, learning preference combinations, psychological type or personality type) with two or four or sixteen groups and continuous or scale dependent variable (overall test performance on INACE)

were analyzed using one-way analysis of variance (ANOVA) between groups. The following assumptions were tested before conducting the one-way ANOVA: (a) level of measurement of variables – one categorical independent variable with two or more groups and one continuous or scale dependent variables measurement; (b) the sample should be randomly selected; (c) the group sample size (*n*) should be roughly equal; (d) there should be no extreme outliers; (e) the dependent variables should be independent; (f) normality of groups – *kurtosis and skewness*; and (g) homogeneity of variance between groups – Levene's *F* test.

The research questions with categorical independent variables (learning preferences, learning preference combinations, psychological type or personality type) with two or four or sixteen groups and six continuous or scale dependent variable (test performance on specific duty areas on INACE – communicating information, performing basic nursing skills, performing personal skills, performing basic restorative skills, providing mental health and social service needs, and providing for residents' rights) were analyzed using one-way multivariate analysis of variance (MANOVA) between groups. The following assumptions were tested before conducting the one-way MANOVA: (a) the sample should be randomly selected; (b) level of measurement of variables – one categorical independent variable with two or more groups and two or more continuous or scale dependent variables; (c) linearity of the dependent variables – Pearson *r*; (d) multivariate normality – *kurtosis* and *skewness*; (e) multivariate homogeneity of variance between groups – Levene's *F* test; and (g) multivariate homogeneity of covariance between groups – Box's M test.

If significance was found, post hoc analysis (for four and sixteen groups independent variables) was conducted and a separate analysis of variance was analyzed between different dependent variables. The effect size and power were evaluated. All these data analyses were

performed using the Statistical Package of Social Sciences (SPSS 23.0). The descriptive

questions were also analyzed using descriptive statistics.

Summary

A 93-item MBTI® inventory Form M in North American English was used to study the

learning preferences, learning preference combinations, and psychological or personality types.

The MBTI® instrument is considered highly reliable and valid. The participants were selected

using stratified random sampling technique. They were nurse aide students taking the Illinois

Nurse Aide Competency Examination (INACE) in January 2017. They completed the

demographic sheet, read the instructions, completed an activity, and then completed the MBTI®

Form M. The relationship between learning preferences, learning preference combinations,

psychological or personality types, and Illinois Nurse Aide Competency Examination (INACE)

was explored using five research questions and hypotheses using a non-experimental

comparative and descriptive approach. The data was analyzed using one-way analysis of

variance and one-way multivariate analysis of variance between groups. The results and

discussion of these findings are presented in Chapter IV and Chapter V.

CHAPTER IV

RESULTS

Introduction

This study addressed five research questions and hypotheses to examine whether learning preferences, learning preference combinations (with typology being the gross indicator), and psychological types or learning approaches can be the predictors of Illinois Nurse Aide Competency Examination (INACE) performance (standardized achievement examination) of nurse aide students. These questions were important because research shows that personal attributes such as learning styles, psychological types, etc., play an important role in student learning and performance.

The research questions and hypotheses had eight independent variables: learning preferences (Extraversion – E, Introversion – I, Sensing – S, Intuition – N, Thinking – T, Feeling – F, Judging – J, and Perceiving – P), learning preference combinations (IS, IN, ES, and EN; SP, SJ, NP, and NJ; and ST, SF, NF, and NT), and psychological types or learning approaches (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ). The independent variables were determined by the Myers-Briggs Type Indicator® (MBTI®) Form M inventory in North American English. In addition, there were seven dependent variables: INACE test performance and INACE test performance based on duty areas (communicating information, performing basic nursing skills, performing personal skills, performing basic restorative skills, providing mental health and social service needs, and providing for residents' rights). Raw scores were converted to questionnaire scores and questionnaire scores were then converted into continuous scores enabling them to be used

statistically in this research study. Directions for these conversions were provided by the Center for Applications of Psychological Types MBTI® Manual.

Initially, descriptive statistics (mean, frequencies, percentages) were used to describe the demographic data. The learning preferences, learning preference combinations, and psychological or personality types were expressed in frequencies and percentages. Furthermore, descriptive statistics (means and standard deviations) were used to describe learning preferences, learning preference combinations, and psychological or personality types on overall test performance (INACE) and test performance based on duty areas (INACE). Moreover, the basic assumptions were established for the comparative inferential statistics that were used to evaluate the research questions. The tested assumptions included confirmation of independent random sampling, levels of measurement (categorical for independent variable and continuous or scale for dependent variable), linearity of dependent variables (through Pearson *r*), multivariate normality of dependent variables (through Kurtosis and Skewness), multivariate homogeneity of variance between groups (through Levene's *F* test), and multivariate homogeneity of covariance between groups (through Box's M test).

Finally, the research questions and hypotheses were analyzed using *one-way between groups univariate analysis of variance* (ANOVA) and *one-way between group multivariate analysis of variance* (MANOVA). The Statistical Package for Social Services (SPSS®), Version 23, was used to analyze the data. If any of these findings were conducive then the study could help to plan better instruction while alternatively dealing with learning/teaching styles mismatch, provide guidance to nurse aide students to better prepare for the INACE examination, and provide a better approach in preparing the INACE examination questions for nurse aide students.

Description of Sample

The profiles in this section describe the participants i.e. nurse aide students taking the

Illinois Nurse Aide or Assistant Competency Examination in the state of Illinois. This section

presents the descriptive information of the participants such as participants' demographic

information and descriptive statistics of independent and dependent variables.

Participants' Demographic Information

Students seeking nurse aide or assistant certification were the participants of the study. A total

of 326 randomly selected nurse aide students participated in the study; 114 from northern

Illinois, 111 from central Illinois, and 101 from southern Illinois. Forty participants were males

and 286 participants were females. Table 4.1 reflects the demographic information of the sample.

Table 4.1

*Demographic Characteristics of Participants (*N *= 326)*

Characteristic	*n*	*%*
Gender		
Male	40	12
Female	286	88
Age (years)		
18-25	234	71
26-30	35	11
31-35	13	4
36-40	14	4
41-25	14	4
46-50	7	2
51-55	8	3
66+	1	<1
Ethnicity/Race		
African American/Black	43	13
Asian or Pacific Islander	22	7
Hispanic, Latino	25	8
White	232	71
Native American or Alaskan Native or American Indian	2	<1
Other	2	<1
Highest education level completed		
Some high school, no diploma	47	14
High school graduate, diploma or equivalent (for e.g., GED)	71	22
Some college credit, no degree	159	49

Characteristic	n	%
Trade/technical/vocational training	10	3
Associate Degree	23	7
Bachelor's Degree	14	4
Master's Degree	2	<1
English as First Language		
English as First Language	292	90
English as Second Language	34	10

Note. Totals of percentages are not 100 for every characteristic because of rounding.

Participant Characteristics based on Independent Variables

Participants profiles based on independent variables (learning preferences, learning preference

combinations, and psychological types) are represented in Table 4.2.

Table 4.2

*Participant Characteristics Based on Independent Variables (*N = 326*)*

Characteristic	*n*	*%*
Learning preference pair by source of energy		
Extraversion (E)	179	55
Introversion (I)	147	45
Learning preference pair by perception		
Sensing (S)	179	55
Intuition (N)	147	45
Learning preference pair by reaction to information or making decisions		
Thinking (T)	56	17
Feeling (F)	270	83
Learning preference pair by preference to lifestyle		
Judging (J)	119	37
Perceiving (P)	207	63
Learning preference combination by orientation of energy and perception		
IS	76	23
IN	68	21
ES	104	32
EN	78	24
Learning preference combination by perception and attitude		
SP	42	12
SJ	141	43
NP	76	23
NJ	67	21
Learning preference combination by mental process		
ST	45	14
SF	135	41
NF	135	41
NT	11	3

Note. Totals of percentages are not 100 for every characteristic because of rounding.

Table 4.2 (continued)

Participant characteristics based on independent variables (N = *341*)

Characteristic	*n*	*%*
Psychological or personality types or learning approaches		
ISTJ	20	6
ISFJ	45	14
INFJ	26	8
INTJ	3	<1
ISTP	4	1
ISFP	10	3
INFP	37	11
INTP	2	<1
ESTP	5	2
ESFP	22	7
ENFP	34	10
ENTP	5	2
ESTJ	16	5
ESFJ	58	18
ENFJ	38	12
ENTJ	1	<1

Note. Totals of percentages are not 100 for every characteristic because of rounding.

The frequency distribution of participants by learning preference, learning preference combinations, and psychological or personality type is represented in Table 4.2. Based on learning preference by source of energy, perception, reaction to information or making decision, and preference to lifestyle described by MBTI®, the greatest number of respondents were classified as preferring Extraversion (55%), Sensing (55%), Feeling (83%), and Perceiving (63%) respectively. Furthermore, based on learning preference combination by orientation of energy and perception, perception and attitude, and mental process (perception and judgment), the greatest number of respondents were classified as Extraversion-Sensing-Intuition (56%), Sensing-Perceiving-Judging (55%), and Sensing-Thinking-Feeling (56%) respectively. Finally, based on psychological or personality types, the greatest number of respondents (18%) were classified as extrovert-sensing-feeling-judging (ESFJ) types. The second largest number of respondents (14%) were introvert-sensing-feeling-judging (ISFJ) types. All the sixteen types were represented in the study.

Results of the Study

All the research questions and hypotheses were analyzed using comparative inferential statistics. One-way analysis of variance (ANOVA) was used to assess differences between two or four group means of a categorical independent variable when there was one continuous dependent variable, and one-way multivariate analysis of variance (MANOVA) was used to assess the differences between two or four group means of a categorical independent variable where there were six continuous dependent variables. Before conducting the analysis, the descriptive statistics were established and assumptions were tested.

Research Question and Hypothesis 1

What are the differences between the four dichotomous pairs or levels of learning preferences determined by the Myers-Briggs Type Indicator® *Extraversion (E) - Introversion (I), Sensing (S) - Intuition (N), Thinking (T) - Feeling (F), and Judging (J) -Perceiving (P)* with reference to the mean of *overall test performance* and means of *overall test performance based on specific duty areas* of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination (INACE)?

H_{O1}: There are no significant differences between the four dichotomous pairs or levels of learning preferences E – I, S – N, T – F, and J - P with reference to the mean of overall test performance and means of overall test performance based on specific duty areas.

H_{a1}: There are significant differences between the four dichotomous pairs or levels of learning preferences E – I, S – N, T – F, and J - P with reference to the mean of overall test performance and means of overall test performance based on specific duty areas.

With the aim of analyzing this research question, initially a separate one-way between group analysis of variance (ANOVA) was conducted for each of the four categorical independent variables to evaluate the relationship between learning preferences and overall test performance of nurse aide students on the Illinois Nurse Aide Competency Examination (INACE). Prior to conducting the ANOVA, the assumption of normality was evaluated and determined to be satisfied as the distributions of dependent variables were associated with skewness and kurtosis less than |2.0| and |9.0|, respectively (Schmider, Ziegler, Danay, Beyer, and Buhner, 2010) (see Table 4.4). The following were the findings for the relationship between each learning preference and overall test performance.

1. It was observed that students with *Extraversion (E)* learning preference ($M = 80.61$, $SD = 7.722$, $n = 179$) had numerically the smallest mean and students with *Introversion (I)* learning preference ($M = 81.47$, $SD = 7.7513$, $n = 147$) had numerically the highest mean on overall test performance (see Table 4.4 and Table 4.5). The assumption of homogeneity of variances was satisfied based on Levene's F test, $F(1, 324) = .674$, $p = .412$. There was no statistically significant ($p < .05$) difference between the mean score of nurse aide students with Extraversion (E) learning preference and the mean score of nurse aide students with Introversion (I) learning preference on overall test performance, $F(1, 324) = 1.02$, $p = .31$, $\eta^2 = .003$. The effect size based on Cohen's (1988) convention is small (i.e., Small = .20, Medium = .50, and Large = .80) and the observed power was .172.

2. It was observed that students with *Sensing (S)* learning preference ($M = 81.85$, $SD = 7.551$, $n = 179$) had numerically the highest mean level and students with *Intuition (N)* learning preference ($M = 79.96$, $SD = 7.669$, $n = 147$) had numerically the smallest mean

level on overall test performance (see Table 4.4 and Table 4.5). The assumption of homogeneity of variances was satisfied based on Levene's F test, $F(1, 324) = .206$, $p = .650$. There was a statistically significant ($p < .05$) difference between the mean score of students with the Sensing (S) learning preference and the mean score of students with the Intuition (N) learning preference on overall test performance of nurse aide students on INACE, $F(1, 324) = 4.98$, $p = .02$, $\eta^2 = 0.015$. Thus, the students with the Sensing learning preference were associated with the statistically significantly larger mean than students with the Intuition learning preference. Cohen's d was estimated at 0.248, which is a small effect size based on Cohen's (1988) guidelines (i.e., Small $= .20$, Medium $= .50$, and Large $= .80$). The observed power was at .605.

3. It was observed that students with the *Thinking (T)* learning preference ($M = 81.60$, $SD = 6.834$, $n = 56$) had the numerically highest mean and students with the *Feeling (F)* learning preference ($M = 80.87$, $SD = 7.789$, $n = 270$) had numerically the smallest mean on overall test performance (see Table 4.4 and Table 4.5). The assumption of homogeneity of variances was satisfied based on Levene's F test, $F(1, 324) = 2.59$, $p = .108$. There was no statistically significant ($p < .05$) difference between the mean score of nurse aide students with the Thinking (T) learning preference and the mean score of nurse aide students with the Feeling (F) learning preference on overall test performance, $F(1, 324) = .414$, $p = .521$, $\eta^2 = .001$. The effect size based on Cohen's (1988) convention is small (i.e., Small $= .20$, Medium $= .50$, and Large $= .80$) and the observed power was .098.

4. It was observed that students with the *Judging (J)* learning preference ($M = 80.47$, $SD = 7.091$, $n = 119$) had the numerically smallest mean and students with the *Perceiving (P)*

learning preference ($M = 81.30$, $SD = 7.922$, $n = 207$) had the numerically highest mean

on overall test performance (see Table 4.4 and Table 4.5). The assumption of

homogeneity of variances was satisfied based on Levene's F test, $F(1, 324) = 1.06$, $p =$

.304. There was no statistically significant ($p < .05$) difference between the mean score

of nurse aide students with the Judging (J) learning preference and the mean score of

nurse aide students with the Perceiving (P) learning preference on overall test

performance, $F(1, 324) = .895$, $p = .345$, $\eta^2 = .003$. The effect size based on Cohen's

(1988) convention is small (i.e., Small = .20, Medium = .50, and Large = .80) and the

observed power was .157.

In addition, to further analyze this research question, a between-group multivariate

analysis of variance (MANOVA) was conducted for each of the four categorical independent

variables with two groups to evaluate the relationship between learning preferences and test

performance based on specific duty areas of nurse aide students on the Illinois Nurse Aide

Competency Examination (INACE). Prior to conducting the MANOVA, a series of Pearson

correlations were performed between all the dependent variables to test the MANOVA

assumption that the dependent variables were correlated with each other in the moderate range

(Hancock & Mueller, 2010). As can be seen in Table 4.6, a meaningful pattern of correlations

was observed amongst all the dependent variables, suggesting appropriateness of MANOVA.

Furthermore, the homogeneity of variance assumption was tested for all six duty areas. Based on

the series of Levene's F tests, the homogeneity assumption was considered satisfied ($p > .05$)

(see Table 4.8). Moreover, the assumption of multivariate normality was evaluated and

determined to be satisfied as the dependent variables' distributions were associated with

skewness and kurtosis less than |2.0| and |9.0|, respectively (Schmider, et al., 2010) (see Table 4.3). The Box M test was conducted for each independent variable.

The following were the findings for the relationship between each learning preference and overall test performance based on duty areas (INACE).

1. For learning preference pair by source of energy (Extraversion and Introversion), the Box M value of 16.47 was associated with a p value of .762, which was interpreted as non-significant based on Tinsley and Brown's (2000) guideline (i.e., $p < .005$). Thus, the covariance matrices between the groups were assumed to be equal, suggesting appropriateness of MANOVA. A one-way multivariate analysis of variance (MANOVA) was conducted to test the hypotheses that there would be mean differences between learning preference levels (Extraversion and Introversion) and test performance based on specific duty areas of nurse aide students on the INACE (see Table 4.7, 4.8, and 4.9). There was no statistically significant difference ($p < .05$) between nurse aide students with Extraversion learning preference and nurse aide students with the Introversion learning preference on test performance based on specific duty areas, Wilks' $\lambda = .985$, $F(6, 326) = .817$, $p = .557$, $\eta^2 = .015$. The effect size based on Cohen's (1988) convention is small and the observed power was .323.

2. For the learning preference pair of perception (Sensing and Intuition), the Box M value of 27.39 was associated with $p = .179$, which was interpreted as non-significant based on Tinsley and Brown's (2000) guideline (i.e., $p < .005$, see Table 4.8). Thus, the covariance matrices between the groups were assumed to be equal, suggesting appropriateness of MANOVA. A one-way MANOVA was conducted to test the hypotheses that there would be mean differences between learning preference levels

(Sensing and Intuition) and test performance based on specific duty areas of nurse aide students on INACE (see Table 4.7, 4.8, and 4.9). There was a statistically significant ($p <$ .05) difference between nurse aide students with the Sensing learning preference and nurse aide students with the Intuition learning preference on test performance based on specific duty areas, Wilks' $\lambda = .961$, $F(6, 319) = 2.156$, $p = .04$, $\eta^2 = .039$. The effect size based on Cohen's (1988) convention is small and the observed power was .766. A separate ANOVA was conducted for each dependent variable, with each ANOVA (see Table 4.9) evaluated at 0.025 and following are the results:

A. There was a statistically significant ($p < .05$) difference between *Sensing (S)* and *Intuition (N)* (learning preference by perception) on test performance based on the duty area, performing personal skills with $F(1, 324) = 6.11$, $p = .014$, partial $\eta^2 = .019$. The students with the *Sensing* preference ($M = 81.91$) scored higher than the students with the *Intuition* preference ($M = 78.70$) on test performance based on the duty area, performing personal skills. The effect size based on Cohen's (1988) convention is small (i.e., Small = .20, Medium = .50, and Large = .80) and the observed power was .693.

B. There was a statistically significant ($p < .05$) difference between *Sensing* (S) and *Intuition* (N) (learning preference by perception) on test performance based on the duty area, performing basic restorative skills with $F(1, 324) = 6.91$, $p = .009$, partial $\eta^2 = .021$. The students with the *Sensing* preference ($M = 84.60$) scored higher than students with the *Intuition* preference ($M = 81.46$) on test performance based on the duty area, performing basic restorative skills. The effect size based on Cohen's (1988) convention is small and the observed power was .745.

C. There was no statistically significant ($p < .05$) difference between the *Sensing* (S) and the *Intuition* (N) learning preference by perception, on test performance based on the duty area, communicating information with, $F(1, 324) = 0.16$, $p = .90$, partial η^2 =.000. The effect size based on Cohen's (1988) convention is small and the observed power was .052.

D. There was no statistically significant ($p < .05$) difference between the *Sensing* (S) and the *Intuition* (N), learning preference by perception, on test performance based on the duty area, performing basic nursing skills with, $F(1, 324) = 0.497$, $p = .48$, partial η^2 = .002. The effect size based on Cohen's (1988) convention is small and the observed power was .108.

E. There was no statistically significant ($p < .05$) difference between the *Sensing* (S) and the *Intuition* (N) learning preference by perception, on test performance based on the duty area, providing mental health and social service needs with, $F(1, 324) = 3.631$, $p = .058$, partial $\eta^2 = .011$. The effect size based on Cohen's (1988) convention is small and the observed power was .476.

F. There was no statistically significant ($p < .05$) difference between the *Sensing* (S) and the *Intuition* (N) learning preference by perception, on test performance based on the duty area, providing residents' rights with, $F(1, 324) = .003$, $p = .957$, partial $\eta^2 = .000$. The effect size based on Cohen's (1988) convention is small and the observed power was .050.

3. For learning preference pair by reaction to information or making decisions (Thinking and Feeling), the Box M value of 23.99 was associated with p value of .343, which was interpreted as non-significant based on Tinsley and Brown's (2000) guideline (i.e., $p <$

.005, see Table 4.8). Thus, the covariance matrices between the groups were assumed to be equal, suggesting appropriateness of MANOVA. A one-way multivariate analysis of variance (MANOVA) was conducted to test the hypotheses that there would be mean differences between learning preference levels (Thinking and Feeling) and test performance based on specific duty areas of nurse aide students on INACE (see Table 4.7, 4.8, and 4.9). There was no statistically significant difference ($p < .05$) between nurse aide students with the Thinking learning preference and nurse aide students with the Feeling learning preference on test performance based on specific duty areas, Wilks' $\lambda = .987$, $F(6, 319) = .724$, $p = .631$, $\eta^2 = .013$. The effect size based on Cohen's (1988) convention is small and the observed power was .287.

4. For learning preference pair by preference to lifestyle (Judging and Perceiving), the Box M value of 23.59 was associated with p value of .339, which was interpreted as non-significant based on Tinsley and Brown's (2000) guideline (i.e., $p < .005$, see Table 4.8). Thus, the covariance matrices between the groups were assumed to be equal, suggesting appropriateness of MANOVA. A one-way multivariate analysis of variance (MANOVA) was conducted to test the hypotheses that there would be mean differences between learning preference levels (Judging and Perceiving) and test performance based on specific duty areas of nursing students on INACE (see Table 4.7, 4.8, and 4.9). There was no statistically significant difference ($p < .05$) between nurse aide students with the Judging learning preference and nurse aide students with the Perceiving learning preference on test performance based on specific duty areas (INACE), Wilks' $\lambda = .987$, $F(6, 319) = .1.357$, $p = .232$, $\eta^2 = .025$. The effect size based on Cohen's (1988) convention is small and the observed power was .530.

Table 4.3

Means, Standard Deviations, Skewness, and Kurtosis of Dependent Variables (Overall Test Performance and Test Performance based on Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

	Test Performance	Duty Area 1	Duty Area 2	Duty Area 3	Duty Area 4	Duty Area 5	Duty Area 6
N	326	326	326	326	326	326	326
M	81.00	80.42	80.20	80.46	83.19	79.98	81.41
SD	7.63	11.82	10.54	11.78	10.83	22.45	15.19
Skewness	-.254	-.535	-.216	-.386	-.417	-.840	-.713
Kurtosis	-.644	-.095	-.760	-.398	-.363	-.267	1.006
Maximum	61	50	55	50	56	25	20
Minimum	97	100	100	100	100	100	100

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights.

Table 4.4

Means, Standard Deviations, Skewness, and Kurtosis of Independent Variables (Learning Preferences) and Dependent Variable (Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

Variable	Overall Test Performance			
	M	*SD*	Skewness	Kurtosis
Learning preference pair by source of energy				
Extraversion (E)	80.61	7.72	-.757	-.757
Introversion (I)	81.47	7.51	-.349	-.443
Learning preference pair by perception				
Sensing (S)	81.85	7.51	-.396	-.510
Intuition (N)	79.96	7.67	-.088	.200
Learning preference pair by reaction to information or making decisions				

Thinking (T)	81.60	6.83	-.247	-.438
Feeling (F)	80.87	7.78	-.243	-.690
Learning preference pair by preference to lifestyle				
Judging (J)	80.47	7.09	.152	-.848
Perceiving (P)	81.30	7.92	-.444	-.513

Note. Acceptable skewness < |2.0|. Acceptable kurtosis < |9.0|.

Table 4.5

Levene's test and One-Way Analysis of Variance of Independent Variables (Learning Preferences) and Dependent Variable (Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

Variable	Test Performance				
	Levene's F Test		ANOVA		
	$F(1, 324)$	p	$F(1, 324)$	p	η^2
Learning preference pair by source of energy					
Extraversion (E)	.674	.412	1.02	.313	.003
Introversion (I)					
Learning preference pair by perception					
Sensing (S)	.206	.650	4.98	.026*	.015
Intuition (N)					
Learning preference pair by reaction to information or making decisions					
Thinking (T)	2.594	.108	.414	.521	.001
Feeling (F)					
Learning preference pair by preference to lifestyle					
Judging (J)	1.058	.304	.895	.345	.003
Perceiving (P)					

Note. η^2 = Partial eta square. *Statistically significant difference: $p < 0.05$.

Table 4.6

Means, Standard Deviations, and Intercorrelations for Illinois Nurse Aide Competency Examination (INACE) performance or test performance based on specific duty areas

Measure	*M*	*SD*	1	2	3	4	5	6
1. Duty Area 1	80.42	11.82	1.0					
2. Duty Area 2	80.20	10.54	.36	1.0				
3. Duty Area 3	80.46	11.78	.25	.41	1.0			
4. Duty Area 4	83.19	10.83	.20	.36	.34	1.0		
5. Duty Area 5	79.98	22.49	.13	.20	.18	.12	1.0	
6. Duty Area 6	81.41	15.19	.19	.15	.20	.06	.05	1.0

Note. $N = 326$. All correlation coefficients greater than .10 are statistically significant ($p < .01$). Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights.

Table 4.7

Means and Standard Deviations of Learning Preferences and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).

Variable	DA1		DA2		DA3		DA4		DA5		DA6	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Extraversion (E)	80.26	12.29	79.79	10.62	80.52	11.91	82.16	10.68	80.03	23.01	80.89	15.98
Introversion (I)	80.61	11.25	80.71	10.44	80.40	11.65	84.44	10.90	79.93	21.83	79.93	14.18
Sensing (S)	80.49	12.33	80.57	10.76	81.91	11.63	84.60	9.69	82.12	21.23	81.45	15.58
Intuition (N)	80.33	11.24	79.75	10.27	78.70	11.74	81.46	11.87	77.38	23.65	81.36	14.74
Thinking (T)	81.70	13.24	79.63	10.86	80.92	9.78	84.82	10.38	82.59	19.61	81.07	12.88
Feeling (F)	80.15	11.51	80.32	10.48	80.37	12.16	82.85	10.90	79.44	22.98	81.48	15.64
Judging (J)	80.53	10.81	80.29	10.77	79.36	11.63	82.14	10.80	76.68	24.07	82.35	14.53
Perceiving (P)	80.35	12.39	80.15	10.45	81.10	11.83	83.79	10.82	81.88	21.28	80.87	15.55

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights.

Table 4.8

Box's Test of Equality of Variances and Levene's Test of Equality of Error Variances for Learning Preferences and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE)

| Variable | Box's Test | | Levene's Test | | | | | | | | | | | |
| | | | DA1 | | DA2 | | DA3 | | DA4 | | DA5 | | DA6 | |
	Box's M	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*
Extraversion (E) Introversion (I)	16.47	.762	.028	.868	.117	.732	.020	.888	.151	.698	.433	.511	1.18	.278
Sensing (S) Intuition (N)	27.39	.176	1.648	.200	.174	.677	.206	.650	7.70	.006	1.06	.303	.011	.917
Thinking (T) Feeling (F)	23.99	.343	1.446	.230	.20	.888	4.32	.038	.723	.396	1.792	.182	2.17	.141
Judging (J) Perceiving (P)	23.59	.339	2.831	.093	.143	.706	.009	.924	.065	.799	.498	.481	.180	.671

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. Levene's test *df* = 1, 324.

Table 4.9

Multivariate and Univariate Analyses of Variance F *Rations for Learning Preferences and Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).*

Variable	MANOVA	Duty Area 1 ANOVA	Duty Area 2 ANOVA	Duty Area 3 ANOVA

	F^a	p	η^2	F^b	p	η^2	F^b	p	η^2	F^b	p	η^2
Extraversion (E)	.817	.557	.015	.071	.790	<1	.612	.435	.002	.008	.929	<1
Introversion (I)												
Sensing (S)	2.156	.047*	.039	.16	.901	<1	.497	.481	.002	6.108	.014*	.019
Intuition (N)												
Thinking (T)	.724	.631	.013	.789	.375	.002	.200	.655	001	.099	.753	<1
Feeling (F)												
Judging (J)	.975	.232	.025	.017	.896	<1	.013	.908	<1	1.652	.200	.005
Perceiving (P)												

Note. F ratios are Wilk's approximation of F. ANOVA = univariate analysis of variance; MANOVA = multi-variate analysis of variance. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills. *Statistically significant difference: $p < 0.05$. η^2 = Partial eta square. [a]Multivariate $df = 6, 319$. [b]Univariate $df = 1, 324$.

Table 4.9 (Continued)

Multivariate and Univariate Analyses of Variance F *Rations for Learning Preferences and Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).*

Variable	MANOVA			Duty Area 4 ANOVA			Duty Area 5 ANOVA			Duty Area 6 ANOVA		
	F^a	p	η^2	F^b	p	η^2	F^b	p	η^2	F^b	p	η^2
Extraversion (E)	.817	.557	.015	3.610	.058	.011	.001	.969	<1	.460	.498	.001
Introversion (I)												
Sensing (S)	2.156	.047*	.039	6.907	.009*	.021	3.631	.058	.011	.003	.975	<1
Intuition (N)												
Thinking (T)	.724	.631	.013	1.544	.215	.005	.910	.341	.003	.034	.854	<1
Feeling (F)												
Judging (J)	.975	.232	.025	1.744	.188	.005	4.099	.044	.012	.720	.397	.002
Perceiving (P)												

Note. F ratios are Wilk's approximation of F. ANOVA = univariate analysis of variance; MANOVA = multi-variate analysis of variance. Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. η^2 = Partial eta square. *Statistically significant difference: $p < 0.05$. [a]Multivariate $df = 6, 319$. [b]Univariate $df = 1, 324$.

Research Question and Hypothesis 2

What are the differences between the four levels of learning preference combinations by orientation of energy and perception determined by the Myers-Briggs Type Indicator® *IS, IN, ES, and EN* with reference to the mean of *overall test performance* and means of *overall test performance based on specific duty areas* of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination (INACE)?

       H_{O2}:   There are no significant differences between the four levels of learning preference combinations IS, IN, ES, and EN with reference to the mean of overall test performance and means of overall test performance based on specific duty areas.

       H_{a2}:   There are significant differences between the four levels of learning preference combinations IS, IN, ES, and EN with reference to the mean of overall test performance and means of overall test performance based on specific duty areas.

To analyze this research question, initially, a one-way analysis of variance (ANOVA) was conducted to test the hypotheses whether there were one or more mean differences between learning preference combination levels by orientation of energy and perception (IS, IN, ES, and EN) and overall test performance of nurse aide students on the INACE (see Table 4.10 and 4.11). Prior to conducting ANOVA, the assumption of normality was evaluated and determined to be satisfied as the distributions of dependent variables were associated with skewness and kurtosis less than |2.0| and |9.0|, respectively (Schmider, et al., 2010, see Table 4.10).

It was observed that students with *IS* learning preference combination ($M = 82.04$, $SD = 7.43$, $n = 76$) had the numerically highest mean and students with *ES* learning preference combination ($M = 81.74$, $SD = 7.57$, $n = 104$) had a numerically higher mean on overall test performance. The students with *IN* learning preference ($M = 80.80$, $SD = 7.71$, $n = 68$) had a

numerically smaller mean and students with *EN* learning preference ($M = 79.16$, $SD = 7.62$, $n = 78$) had the numerically smallest mean on overall test performance. The assumption of homogeneity of variances was satisfied based on Levene's *F* test, $F(3, 322) = .168$, $p = .918$. There was no statistically significant ($p < .05$) difference between the means of nurse aide students with IS learning preference combination, nurse aide students with IN learning preference combination, nurse aide students with ES learning preference combination, and nurse aide students with EN learning preference combination on overall test performance, $F(3, 322) = 2.348$, $p = .073$, $\eta^2 = .021$. The effect size based on Cohen's (1988) convention is small and the observed power was .0587.

In addition, to further analyze this research question, a between-group multivariate analysis of variance (MANOVA) was conducted for the categorical independent variable with four groups (IS, IN, ES, and EN) to evaluate the relationship between learning preference combinations by orientation of energy and perception and test performance on specific duty areas by nurse aide students on the INACE. Prior to conducting MANOVA, a series of Pearson correlations were performed between all the dependent variables to test the MANOVA assumption that the dependent variables were correlated with each other in the moderate range (Hancock & Mueller, 2010). As can be seen in Table 4.6, a meaningful pattern of correlations was observed amongst all the dependent variables, suggesting appropriateness of a MANOVA. Furthermore, the homogeneity of variance assumption was tested for all six duty areas. Based on a series of Levene's *F* tests, the homogeneity assumption was considered satisfied ($p > .05$, see Table 4.13). Moreover, the assumption of multivariate normality of dependent variables was evaluated and determined to be satisfied as the dependent variables' distributions were associated

with skewness and kurtosis less than |2.0| and |9.0|, respectively (Schmider, et al., 2010) (see

Table 4.3).

The Box M value of 69.57 was associated with a p value of .335, which was interpreted

as non-significant based on Tinsley and Brown's (2000) guideline (i.e., $p < .005$, see Table 4.13).

Thus, the covariance matrices between the groups were assumed to be equal, suggesting

appropriateness of a MANOVA. A one-way multivariate analysis of variance (MANOVA) was

conducted to test the hypotheses that there would be one or more mean differences between

learning preference combinations by orientation of energy and perception (IS, IN, ES, and EN)

and test performance based on specific duty areas (see Table 4.12, 4.13, and 4.14). There were

no statistically significant ($p < .05$) differences between the means of nurse aide students with IS

learning preference combination, nurse aide students with IN learning preference combination,

nurse aide students with ES learning preference combination, and nurse aide students with EN

learning preference combination on test performance based on specific duty areas, $F(18, 897) =$

1.177, $p = .273$, $\eta^2 = .022$. The effect size based on Cohen's (1988) convention is small and the

observed power was .787.

Table 4.10

Means, Standard Deviations, Skewness, and Kurtosis of Independent Variables (Learning Preference Combinations by Orientation of Energy and Perception) and Dependent Variable (Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

Variable	Overall Test Performance			
	M	*SD*	Skewness	Kurtosis
Learning preference combinations by orientation of energy and perception				
IS	82.04	7.43	-.487	-.381
IN	80.80	7.71	-.200	-.430
ES	81.74	7.57	-.351	-.536

EN	79.16	7.62	.025	-.779

Note. Acceptable skewness < |2.0|. Acceptable kurtosis < |9.0|.

Table 4.11

Levene's test and One-Way Analysis of Variance of Independent Variable (Learning Preference Combinations) and Dependent Variable (Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

Variable	Test Performance				
	Levene's F Test		ANOVA		
	F^a	p	F^b	p	η^2
Learning preference combinations by orientation of energy and perception					
IS					
IN					
ES	.168	.918	2.348	.073	.021
EN					

Note. η^2 = Partial eta square. [a]Levene's test df = 3, 322. [b]Univariate df = 3, 322.

Table 4.12

Means and Standard Deviations of Learning Preference Combinations by Orientation of Energy and Perception and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE)

Variable	DA1		DA2		DA3		DA4		DA5		DA6	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
IS	79.93	12.33	80.89	10.49	81.99	10.85	85.03	10.16	81.91	21.05	82.37	15.65
IN	81.25	10.11	80.55	10.65	78.58	12.42	83.55	11.78	77.57	22.91	81.76	12.81
ES	81.01	12.37	80.24	10.95	81.85	12.18	84.31	9.34	82.45	21.44	80.96	15.61
EN	79.38	12.06	79.08	12.07	78.77	11.27	79.57	11.78	76.92	24.43	80.77	16.26

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights.

Table 4.13

Box's Test of Equality of Variances and Levene's Test of Equality of Error Variances for Learning Preference Combination by Orientation of Energy and Perception and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE)

Variable	Box's Test		Levene's Test											
			DA1		DA2		DA3		DA4		DA5		DA6	
	Box's M	p	F	p	F	p	F	p	F	p	F	p	F	p
IS														
IN														
ES	69.57	.335	.605	.612	.081	.971	.270	.847	3.29	.021	.558	.643	.827	.480
EN														

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. Levene's *df* = 3, 322.

Table 4.14

Multivariate and Univariate Analyses of Variance F *Rations for Learning Preference Combinations by Orientation of Energy and Perception and Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).*

Variable	MANOVA			Duty Area 1 ANOVA			Duty Area 2 ANOVA			Duty Area 3 ANOVA		
	F^a	p	η^2	F^b	P	η^2	F^b	p	η^2	F^b	p	η^2
IS, IN, ES, EN	1.178	.273	.022	.439	.725	.004	.456	.713	.004	2.04	.108	.019

Note. F ratios are Wilk's approximation of F. ANOVA = univariate analysis of variance; MANOVA = multi-variate analysis of variance. Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. η^2 = Partial eta square.
[a]Multivariate *df* = 18, 897. [b]Univariate *df* = 3, 322.

Table 4.14 (Continued)

Multivariate and Univariate Analyses of Variance F *Rations for Learning Preference Combinations by Orientation of Energy and Perception and Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).*

Variable	MANOVA			Duty Area 4 ANOVA			Duty Area 5 ANOVA			Duty Area 6 ANOVA		
	F^a	p	η^2	F^b	P	η^2	F^b	p	η^2	F^b	p	η^2
IS												
IN												
ES	1.178	.273	.022	4.16	.007	.037	1.35	.257	.012	.188	.904	.002
EN												

Note. F ratios are Wilk's approximation of F. ANOVA = univariate analysis of variance; MANOVA = multi-variate analysis of variance. Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. η^2= Partial eta square.
[a]Multivariate *df* = 18, 897. [b]Univariate *df* = 3, 322.

Research Question and Hypothesis 3

What are the differences between the four levels of learning preference combinations by

perception and attitude *SP, SJ, NP, and NJ* determined by the Myers-Briggs Type Indicator[®]

with reference to the mean of *overall test score* and means of *overall test scores based on*

specific duty areas of nurse aide students on the multiple-choice Illinois Nurse Aide Competency

Examination (INACE)?

H_{O3}:   There are no significant differences between the four levels of learning preference

combinations SP, SJ, NP, and NJ with reference to the means of overall test

performance and means of overall test performance based on specific duty areas.

H_{a3}:   There are significant differences between the four levels of learning preference

combinations SP, SJ, NP, and NJ with reference to the mean of overall test

performance and means of overall test performance based on specific duty areas.

To analyze this research question, initially, a one-way analysis of variance (ANOVA)

was conducted to test the hypotheses whether there were one or more mean differences between

learning preference combinations levels by perception and attitude (SP, SJ, NP, and NJ) and overall test performance of nurse aide students on the INACE (see Table 4.15 and 4.16). Prior to conducting an ANOVA, the assumption of normality was evaluated and determined to be satisfied as the distributions of dependent variables were associated with skewness and kurtosis less than |2.0| and |9.0|, respectively (Schmider, et al., 2010, see Table 4.15).

It was observed that students with the *SJ* learning preference combination ($M = 82.11$, *SD* $= 7.64$, *n* $= 141$) had the numerically highest mean and students with the *SP* learning preference combination ($M = 80.98$, *SD* $= 7.16$, *n* $= 42$) had a numerically higher mean on overall test performance. The students with the *NP* learning preference ($M = 80.12$, *SD* $= 7.11$, *n* $= 76$) had a numerically smaller mean and students with the *NJ* learning preference ($M = 79.66$, *SD* $= 8.26$, *n* $= 67$) had the numerically smallest mean on overall test performance. The assumption of homogeneity of variances was satisfied based on Levene's *F* test, $F(3, 322) = .628$, $p = .598$. There was no statistically significant ($p < .05$) difference between the means of nurse aide students with SP learning preference combination, nurse aide students with SJ learning preference combination, nurse aide students with NP learning preference combination, and students with NJ learning preference combination on overall test performance, $F(3, 322) = 2.034$, $p = .109$, $\eta^2 = .019$. The effect size based on Cohen's (1988) convention is small and the observed power was .520.

In addition, to further analyze this research question, a between-group multivariate analysis of variance (MANOVA) was conducted for the categorical independent variable with four groups (SP, SJ, NP, and NJ) to evaluate the relationship between learning preference combinations by perception and attitude and test performance on specific duty areas by nurse aide students on INACE. Prior to conducting the MANOVA, a series of Pearson correlations

were performed between all the dependent variables to test MANOVA assumption that the dependent variables were correlated with each other in the moderate range (Hancock & Mueller, 2010). As can be seen in Table 4.6, a meaningful pattern of correlations was observed amongst all the dependent variables, suggesting appropriateness of MANOVA. Furthermore, the homogeneity of variance assumption was tested for all six duty areas. Based on a series of Levene's F tests, the homogeneity assumption was considered satisfied ($p > .05$, see Table 4.18). Moreover, the assumption of multivariate normality of dependent variables was evaluated and determined to be satisfied as the dependent variables' distributions were associated with skewness and kurtosis less than |2.0| and |9.0|, respectively (Schmider, et al., 2010) (see Table 4.3).

The Box M value of 79.02 was associated with a p value of .130, which was interpreted as non-significant based on Tinsley and Brown's (2000) guideline (i.e., $p < .005$, see Table 4.18). Thus, the covariance matrices between the groups were assumed to be equal, suggesting appropriateness of the MANOVA. A one-way multivariate analysis of variance (MANOVA) was conducted to test the hypotheses that there would be one or more mean differences between learning preference combinations by perception and attitude (SP, SJ, NP, and NJ) and test performance based on specific duty areas (see Table 4.17, 4.18, and 4.19). There were no statistically significant ($p < .05$) differences between the means of nurse aide students with SP learning preference combination, nurse aide students with SJ learning preference combination, nurse aide students with NP learning preference combination, and nurse aide students with NJ learning preference combination on test performance based on specific duty areas, $F(18, 897) = 1.414$, $p = .116$, $\eta^2 = .026$. The effect size based on Cohen's (1988) convention is small and the observed power was .875.

Table 4.15

Means, Standard Deviations, Skewness, and Kurtosis of Independent Variables (Learning Preference Combinations by Perception and Attitude) and Dependent Variable (Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

Variable	Overall Test Performance			
	M	*SD*	Skewness	Kurtosis
Learning preference combinations by perception and attitude				
SP	80.98	7.16	-.050	-.802
SJ	82.11	7.64	-.519	-.389
NP	80.12	7.11	.290	-.794
NJ	79.66	8.26	-.289	-.643

Note. Acceptable skewness < |2.0|. Acceptable kurtosis < |9.0|.

Table 4.16

Levene's test and One-Way Analysis of Variance of Independent Variable (Learning Preference Combinations) and Dependent Variable (Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

Variable	Test Performance				
	Levene's *F* Test		ANOVA		
	F^a	*p*	F^b	*p*	η^2
Learning preference combinations by perception and attitude					
SP					
SJ					
NP	.628	.598	2.034	.109	.019
NJ					

Note. η^2= Partial eta square. Levene's test *df* = 3, 322. Univariate *df* = 3, 322.

Table 4.17

Means and Standard Deviations of Learning Preference Combinations by Perception and Attitude and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE)

Variable	DA1		DA2		DA3		DA4		DA5		DA6	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
SP	79.96	10.89	80.74	11.53	81.40	12.54	82.89	8.29	77.98	23.56	79.52	17.38
SJ	80.56	12.89	80.63	10.54	81.91	11.59	85.06	9.96	83.87	20.29	82.13	14.87
NP	80.70	10.82	80.02	10.39	78.13	11.06	81.66	12.04	75.99	24.64	83.95	12.65
NJ	80.10	11.33	79.17	10.19	79.48	12.20	81.16	12.04	77.61	22.67	78.21	16.59

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights.

Table 4.18

Box's Test of Equality of Variances and Levene's Test of Equality of Error Variances for Learning Preference Combination by Perception-Attitude and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE)

| Variable | Box's Test | | Levene's Test | | | | | | | | | | | |
| | | | DA1 | | DA2 | | DA3 | | DA4 | | DA5 | | DA6 | |
	Box's M	*p*	*F*	*P*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*
SP														
SJ														
	79.02	.130	1.49	.215	.346	.792	.412	.744	4.28	.006	.576	.631	.831	478
NP														
NJ														

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. Levene's *df* = 3, 322.

Table 4.19

Multivariate and Univariate Analyses of Variance F *Rations for Learning Preference Combinations by Perception-Attitude and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).*

Variable	MANOVA			Duty Area 1 ANOVA			Duty Area 2 ANOVA			Duty Area 3 ANOVA		
	F^a	p	η^2	F^b	P	η^2	F^b	p	η^2	F^b	p	η^2
SP												
SJ	1.414	.116	.026	.058	.982	.001	.330	.803	.003	1.975	.118	.018
NP												
NJ												

Note. F ratios are Wilk's approximation of F. ANOVA = univariate analysis of variance; MANOVA = multi-variate analysis of variance. Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. η^2 = Partial eta square.
[a]Multivariate df = 18, 897. [b]Univariate df = 3, 322.

Table 4.19 (Continued)

Multivariate and Univariate Analyses of Variance F *Rations for Learning Preference Combinations by Perception-Attitude and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).*

Variable	MANOVA			Duty Area 4 ANOVA			Duty Area 5 ANOVA			Duty Area 6 ANOVA		
	F^a	p	η^2	F^b	p	η^2	F^b	p	η^2	F^b	p	η^2
SP												
SJ	1.414	.116	.026	2.752	.043	.025	2.608	.052	.024	2.040	.108	.019
NP												
NJ												

Note. F ratios are Wilk's approximation of F. ANOVA = univariate analysis of variance; MANOVA = multi-variate analysis of variance. Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. η^2 = Partial eta square.
[a]Multivariate df = 18, 897. [b]Univariate df = 3, 322.

Research Question and Hypothesis 4

What are the differences between the four levels of learning preference combinations by mental

process (perception and judgment) *ST, SF, NF, and NT* as determined by the Myers-Briggs Type

Indicator® with reference to the mean of *overall test performance* and the means of *overall test*

performance based on specific duty areas of nurse aide students on the multiple-choice Illinois

Nurse Aide Competency Examination (INACE)?

H_{O4}:   There are no significant differences between the four levels of learning preference

combinations by mental processes ST, SF, NF, and NT with reference to the mean

of overall test performance and means of overall test performance based on

specific duty areas.

H_{a4}:   There are significant differences between the four levels of learning preference

combinations by mental processes ST, SF, NF, and NT with reference to the mean

of overall test performance and means overall test performance based on specific

duty areas.

To analyze this research question, initially, a one-way analysis of variance (ANOVA)

was conducted to test the hypotheses whether there were one or more mean differences between

learning preference combinations levels by mental process – perception and judgment (ST, SF,

NF, and NT) and overall test performance of nurse aide students on the INACE (see Table 4.20

and 4.21). Prior to conducting an the ANOVA, the assumption of normality was evaluated and

determined to be satisfied as the distributions of dependent variables were associated with

skewness and kurtosis less than |2.0| and |9.0|, respectively (Schmider, et al., 2010) (see Table

4.20).

It was observed that students with the *SF* learning preference combination ($M = 81.93$,

$SD = 7.66$, $n = 135$) had the numerically highest mean and students with the *ST* learning

preference combination ($M = 81.69$, $SD = 7.07$, $n = 45$) had a numerically higher mean on

overall test performance. The students with the *NT* learning preference ($M = 81.21$, $SD = 6.07$, $n

= 11$) had a numerically smaller mean and students with the *NF* learning preference ($M = 79.82$,

SD = 7.81, *n* = 135) had the numerically smallest mean on overall INACE test performance. The

assumption of homogeneity of variances was satisfied based on Levene's *F* test, $F(3, 322) =$

1.316, *p* = .269. There was no statistically significant (*p* < .05) difference between the means of

nurse aide students with ST learning preference combination, nurse aide students with SF

learning preference combination, nurse aide students with NF learning preference combination,

and nurse aide students with NT learning preference combination on overall test performance,

$F(3, 322) = 1.876$, *p* = .134, $\eta^2 = .017$. The effect size based on Cohen's (1988) convention is

small and the observed power was 0.485.

In addition, to further analyze this research question, a between-group multivariate

analysis of variance (MANOVA) was conducted for the categorical independent variable with

four groups (ST, SF, NF, and NT) to evaluate the relationship between learning preference

combinations by perception and attitude and test performance on specific duty areas by nurse

aide students on the INACE. Prior to conducting a MANOVA, a series of Pearson correlations

were performed between all the dependent variables to test MANOVA assumption that the

dependent variables were correlated with each other in the moderate range (Hancock & Mueller,

2010). As can be seen in Table 4.6, a meaningful pattern of correlations was observed amongst

all the dependent variables, suggesting appropriateness of a MANOVA. Furthermore, the

homogeneity of variance assumption was tested for all six duty areas. Based on a series of

Levene's *F* tests, the homogeneity assumption was considered satisfied (*p* > .05, see Table 4.23).

Moreover, the assumption of multivariate normality of dependent variables was evaluated and

determined to be satisfied as the dependent variables' distributions were associated with

skewness and kurtosis less than |2.0| and |9.0|, respectively (Schmider, et al., 2010) (see Table

4.3).

The Box M value of 80.30 was associated with a *p* value of .217, which was interpreted as non-significant based on Tinsley and Brown's (2000) guideline (i.e., $p < .005$, see Table 4.23). Thus, the covariance matrices between the groups were assumed to be equal, suggesting the appropriateness of a MANOVA. A one-way multivariate analysis of variance (MANOVA) was conducted to test the hypotheses that there would be one or more mean differences between learning preference combinations by mental process – perception and judgment (ST, SF, NF, and NT) and test performance based on specific duty areas (see Table 4.22, 4.23, and 4.24). There were no statistically significant ($p < .05$) differences between the means of students with ST learning preference combination, students with SF learning preference combination, students with NF learning preference combination, and students with NT learning preference combination on test performance based on specific duty areas, $F(18, 897) = 1.18$, $p = .271$, $\eta^2 = .022$. The effect size based on Cohen's (1988) convention is small and the observed power was .788.

Table 4.20

Means, Standard Deviations, Skewness, and Kurtosis of Independent Variables (Learning Preference Combinations by Mental Process) and Dependent Variable (Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

Variable	Overall Test Performance			
	M	*SD*	Skewness	Kurtosis
Learning preference combinations by mental process				
ST	81.69	7.07	-.392	-.554
SF	81.93	7.66	-.414	-.447
NF	79.82	7.81	-.083	-.750
NT	81.21	6.07	.789	1.613

Note. Acceptable skewness < |2.0|. Acceptable kurtosis < |9.0|.

Table 4.21

Levene's test and One-Way Analysis of Variance of Independent Variable (Learning Preference Combinations) and Dependent Variable (Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

	Test Performance				
Variable	Levene's F Test		ANOVA		
	F^a	p	F^b	p	η^2
Learning preference combinations by mental process					
ST					
SF					
	1.316	.269	1.876	.134	.017
NF					
NT					

Note. η^2 = Partial eta square. Levene's test df = 3, 322. Univariate df = 3, 322.

Table 4.22

Means and Standard Deviations of Learning Preference Combinations by Mental Process and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE)

Variable	DA1		DA2		DA3		DA4		DA5		DA6	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
ST	81.11	14.04	79.79	10.77	80.42	10.37	85.97	10.24	83.33	19.94	80.89	12.76
SF	80.37	11.62	80.84	10.75	82.41	11.98	84.17	9.47	81.85	21.69	81.78	16.48
NF	79.94	11.31	79.80	10.23	78.33	12.04	81.53	12.07	77.04	24.06	81.19	14.82
NT	84.09	9.47	79.34	11.74	82.95	6.89	80.11	10.01	79.55	18.77	81.41	14.01

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights.

Table 4.23

Box's Test of Equality of Variances and Levene's Test of Equality of Error Variances for Learning Preference Combination by Mental Process and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE)

Variable	Box's Test	Levene's Test

	Box's M	p	DA1		DA2		DA3		DA4		DA5		DA6	
			F	P	F	p	F	p	F	p	F	p	F	p
ST														
SF														
NF	80.30	.217	1.859	.136	.047	.987	2.07	.104	3.79	.011	.994	.396	.976	.404
NT														

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. Levene's *df* = 3, 322.

Table 4.24

Multivariate and Univariate Analyses of Variance F *Rations for Learning Preference Combinations by Mental Process and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).*

Variable	MANOVA			Duty Area 1 ANOVA			Duty Area 2 ANOVA			Duty Area 3 ANOVA		
	F^{a}	p	η^2	F^{b}	p	η^2	F^{b}	p	η^2	F^{b}	p	η^2
ST												
SF												
NF	1.18	.271	.022	.478	.698	.004	.289	.833	.003	2.913	.035	.026
NT												

Note. F ratios are Wilk's approximation of F. ANOVA = univariate analysis of variance; MANOVA = multi-variate analysis of variance. Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. η^2= Partial eta square.
[a]Multivariate *df* = 18, 897. [b]Univariate *df* = 3, 322.

Table 4.24 (Continued)

Multivariate and Univariate Analyses of Variance F *Rations for Learning Preference Combinations by Mental Process and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).*

Variable	MANOVA	Duty Area 4	Duty Area 5	Duty Area 6

		ANOVA			ANOVA			ANOVA			
F^a	p	η^2	F^b	p	η^2	F^b	p	η^2	F^b	p	η^2
ST											
SF											
NF	1.18	.271	.022	2.752	.043	.025	2.608	.052	.024	2.040	.108	.019
NT											

Note. *F* ratios are Wilk's approximation of F. ANOVA = univariate analysis of variance; MANOVA = multi-variate analysis of variance. Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. η^2 = Partial eta square.
[a]Multivariate *df* = 18, 897. [b]Univariate *df* = 3, 322.

Research Question and Hypothesis 5

What are the differences between the 16 levels of psychological types or learning approaches

ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ,

ENFJ, and ENTJ types determined by the Myers-Briggs Type Indicator® with reference to the

mean of *overall test performance* and means of *overall test performance based on specific duty*

areas of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination

(INACE)?

H$_{O5}$: There are no significant differences between the 16 levels of psychological

types or learning approaches ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP,

ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ with reference to the

mean of overall test performance and means of overall test performance based on

specific duty areas.

H$_{a5}$: There are significant differences between the 16 levels of psychological types

or learning approaches ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP,

ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ with reference to the mean of

overall test performance and means of overall test performance based on specific

duty areas.

To analyze this research question, initially, a one-way analysis of variance (ANOVA) was conducted to test the hypotheses whether there were one or more mean differences between psychological or personality types or learning approaches (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ) and overall test performance of nurse aide students on the INACE (see Table 4.25 and 4.26). Prior to conducting an ANOVA, the assumption of normality was evaluated and determined to be satisfied as the distributions of dependent variables were associated with skewness and kurtosis less than |2.0| and |9.0|, respectively (Schmider, et al., 2010) (see Table 4.25). The assumption of homogeneity of variances was satisfied based on Levene's F test, $F(15, 310) = 1.569$, $p = .081$. The means of all the sixteen types are as follows (in the order of lowest to highest): ESTJ ($M = 77.33$, $SD = 6.868$, $n = 16$), INTP ($M = 78.00$, $SD = .943$, $n = 2$), ENFJ ($M = 78.67$, $SD = 8.370$, $n = 38$), ESFP ($M = 79.15$, $SD = 7.835$, $n = 22$), ENFP ($M = 79.18$, $SD = 6.703$, $n = 34$), INFJ ($M = 80.41$, $SD = 8.899$, $n = 26$), ISFJ ($M = 80.98$, $SD = 7.911$, $n = 45$), INFP ($M = 81.19$, $SD = 7.402$, $n = 37$), ENTJ ($M = 81.33$, $n = 1$), INTJ ($M = 81.33$, $SD = 1.333$, $n = 3$), ISFP ($M = 81.73$, $SD = 6.624$, $n = 10$), ENTP ($M = 82.40$, $SD = 9.160$, $n = 5$), ISTP ($M = 83.67$, $SD = 5.033$, $n = 4$), ESTP ($M = 83.73$, $SD = 5.610$, $n = 5$), ESFJ ($M = 83.75$, $SD = 7.271$, $n = 58$), and ISTJ ($M = 84.27$, $SD = 6.555$, $n = 20$). There was no statistically significant ($p < .05$) difference between the means of the 16 personality or psychological types or learning approaches (see Table 4.25 and 4.26) on overall test performance, $F(15, 310) = 1.615$, $p = .068$, $\eta^2 = .072$. The effect size based on Cohen's (1988) convention is small and the observed power was .895.

In addition, to further analyze this research question, a between-group multivariate analysis of variance (MANOVA) was conducted for the categorical independent variable with sixteen groups (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ) to evaluate the relationship between psychological or personality types or learning approaches and test performance on specific duty areas of nurse aide students on the INACE. Prior to conducting the MANOVA, a series of Pearson correlations were performed between all the dependent variables to test MANOVA assumption that the dependent variables were correlated with each other in the moderate range (Hancock & Mueller, 2010). As can be seen in Table 4.6, a meaningful pattern of correlations was observed amongst all the dependent variables, suggesting appropriateness of a MANOVA. Furthermore, the homogeneity of variance assumption was tested for all six duty areas. Based on series of Levene's F tests, the homogeneity assumption was considered satisfied ($p > .05$, see Table 4.28). Moreover, the assumption of multivariate normality of dependent variables was evaluated and determined to be satisfied as the dependent variables' distributions were associated with skewness and kurtosis less than |2.0| and |9.0|, respectively (Schmider, et al., 2010) (see Table 4.3).

The Box M value of 192.60 was associated with a p value of .882, which was interpreted as non-significant based on Tinsley and Brown's (2000) guideline (i.e., $p < .005$, see Table 4.28). Thus, the covariance matrices between the groups were assumed to be equal, suggesting appropriateness of a MANOVA. A one-way multivariate analysis of variance (MANOVA) was conducted to test the hypotheses that there would be one or more mean differences between 16 psychological or personality types or learning approaches (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ) and test performance based on specific duty areas (see Table 4.27, 4.28, and 4.29). There were no statistically

significant ($p < .05$) differences between the means of students with the 16 psychological or

personality types or learning approaches (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP,

ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ) on test performance based on

specific duty areas (INACE), $F(90, 1722) = 1.712$, $p = .135$, $\eta^2 = .054$. The effect size based on

Cohen's (1988) convention is small and the observed power was 1.00.

Table 4.25

Means, Standard Deviations, Skewness, and Kurtosis of Independent Variables (Psychological or Personality Types) and Dependent Variable (Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

Variable	Overall Test Performance			
	M	*SD*	Skewness	Kurtosis
Psychological or Personality Types				
ISTJ	84.27	6.56	-1.09	2.69
ISFJ	80.98	7.91	-.209	-.785
INFJ	80.41	8.89	-.363	-.504
INTJ	81.33	1.33	<1	0
ISTP	83.67	5.03	-.358	.257
ISFP	81.73	6.62	-.828	-.139
INFP	81.19	7.40	.002	-.899
INTP	78.00	.943	0	0
ESTP	83.73	5.60	-1.278	1.876
ESFP	79.15	7.83	.605	-.296
ENFP	79.18	6.70	.399	-.708
ENTP	82.40	9.16	.167	-1.242
ESTJ	77.33	6.86	.636	-.667
ESFJ	83.75	7.27	-1.01	1.107

ENFJ	78.67	8.37	-.138	-1.013
ENTJ*				

Note. Acceptable skewness < |2.0|. Acceptable kurtosis < |9.0|. *Test performance is constant when personality type = ENTJ is omitted.

Table 4.26

Levene's test and One-Way Analysis of Variance of Independent Variable (Psychological or Personality Types) and Dependent Variable (Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination)

	Test Performance				
Variable	Levene's F Test		ANOVA		
	F^a	p	F^b	p	η^2
16 Psychological or Personality Types	1.569	.081	1.615	.068	.072

Note. η^2 = Partial eta square. Levene's test df = 15, 310. Univariate df = 15, 310.

Table 4.27

Means and Standard Deviations of Psychological or Personality Types and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE)

	DA1	DA2	DA3	DA4	DA5	DA6
Variable	M	M	M	M	M	M
ISTJ	82.92	80.91	82.50	90.94	85.00	86.00
ISFJ	78.52	80.00	81.11	83.89	80.56	81.78
INFJ	79.17	81.64	77.88	83.17	79.81	77.69
INTJ	86.11	69.70	87.50	85.42	83.33	86.67
ISTP	91.67	85.23	79.69	82.81	75.00	80.00
ISFP	76.67	82.73	85.63	80.63	85.00	78.00
INFP	82.66	80.71	78.21	83.61	77.03	84.86
INTP	75.00	79.55	81.25	84.38	50.00	70.00
ESTP	81.67	87.27	82.50	85.00	80.00	76.00

ESFP	79.17	76.45	79.26	83.81	72.73	80.91
ENFP	77.94	79.14	78.13	80.51	76.47	83.53
ENTP	88.33	86.36	80.00	73.75	85.00	84.00
ESTJ	76.04	74.43	77.34	80.86	84.38	76.25
ESFJ	82.90	82.84	84.05	85.13	85.78	82.76
ENFJ	79.61	78.23	78.95	79.28	75.66	77.89
ENTJ	75.00	72.73	87.50	87.50	100.00	80.00

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills. Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights.

Table 4.28

Box's Test of Equality of Variances and Levene's Test of Equality of Error Variances for Psychological or Personality Types and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE)

| | Box's Test | | Levene's Test | | | | | | | | | | | |
| | | | DA1 | | DA2 | | DA3 | | DA4 | | DA5 | | DA6 | |
Variable	Box's M	p	F	p	F	p	F	p	F	p	F	P	F	p
16 Psychological Types[a]	192.6	.882	1.286	.209	1.112	.344	1.17	.295	1.99	.016	1.096	.359	1.04	.404

Note. Duty Area 1 = Communicating Information; Duty Area 2 = Performing Basic Nursing Skills; Duty Area 3 = Performing Personal Skills; Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. Levene's *df* = 189, 21187.
[a]16 Psychological or Personality Types = ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ESTJ, ESFJ, ENFJ, and ENTJ

Table 4.29

Multivariate and Univariate Analyses of Variance F *Rations for Psychological or Personality Types and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).*

Variable	MANOVA			Duty Area 1 ANOVA			Duty Area 2 ANOVA			Duty Area 3 ANOVA		
	F^a	p	η^2	F^b	p	η^2	F^b	p	η^2	F^b	p	η^2
16 Psychological or Personality Types[c]	1.172	.135	.054	1.254	.230	.057	1.538	.090	.069	1.040	.413	.048

Note. F ratios are Wilk's approximation of F. ANOVA = univariate analysis of variance; MANOVA = multi-variate analysis of variance. Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. η^2 = Partial eta square.
[a]Multivariate df = 90, 1722. [b]Univariate df = 15, 310. [c]16 Psychological or Personality Types = ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ESTJ, ESFJ, ENFJ, and ENTJ.

Table 4.29 (Continued)

Multivariate and Univariate Analyses of Variance F *Rations for Psychological or Personality Types and Test Performance based on Specific Duty Areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination (INACE).*

Variable	MANOVA			Duty Area 4 ANOVA			Duty Area 5 ANOVA			Duty Area 6 ANOVA		
	F^a	p	η^2	F^b	p	η^2	F^b	p	η^2	F^b	p	η^2
16 Psychological or Personality Types[c]	1.172	.135	.054	1.723	.046	.077	1.075	.379	.049	.873	.595	.041

Note. F ratios are Wilk's approximation of F. ANOVA = univariate analysis of variance; MANOVA = multi-variate analysis of variance. Duty Area 4 = Performing Basic Restorative Skills; Duty Area 5 = Providing Mental Health and Social Service Needs; Duty Area 6 = Providing Residents' Rights. η^2 = Partial eta square.
[a]Multivariate df = 90, 1722. [b]Univariate df = 15, 310. [c]16 Psychological or Personality Types = ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ESTJ, ESFJ, ENFJ, and ENTJ.

CHAPTER V

DISCUSSION

Overview of the Study

This study investigated the differences between learning preferences (by source of energy, perception, reaction to information or decision making, and preference to lifestyle), learning preference combinations (by orientation of energy and perception, perception and attitude, and perception and judgment), and psychological or personality types (or learning approaches) as measured by the Myers-Briggs Type Indicator® in regards to the mean score of overall test performance and mean scores of overall test performance based on specific duty areas (like communicating information, performing basic nursing skills, performing personal skills, performing basic restorative skills, providing mental health and social service needs, and providing residents' rights) by nurse aide students on the Illinois Nurse Aide Competency Examination. The research questions and hypotheses with only one categorical independent variable with two or four groups and one continuous dependent variable were analyzed using one-way analysis of variance (ANOVA). The research questions and hypotheses with only one categorical independent variable with two or four or sixteen groups and six continuous dependent variables were analyzed using one-way multivariate analysis of variance (MANOVA). The demographic information of participants and assumptions of ANOVA and MANOVA were established using descriptive statistics and correlational analyses.

Summary of Findings

A brief review of the findings of this study follows: the most common learning preferences in the sample ($N = 326$) were Extraversion ($n = 179$, 55%), Sensing($n = 179$, 55%), Feeling ($n = 270$, 83%), and Perceiving ($n = 207$, 63%); the most common learning preference

combinations were ES (*n* = 104, 32%), EN (*n* = 78, 24%), SP (*n* = 141, 43%), NP (*n = 76,* 23%),

SF (*n = 135*, 41%), and NF (*n* = 135, 41%); and the most common psychological or personality

types were ESFJ (*n* = 58, 18%), ISFJ (*n* = 45, 14%), ENFJ (*n* = 38, 12%), and ENFP (*n* = 37,

11%).

Research Question 1

What are the differences between the four-dichotomous pair of learning preferences determined

by Myers-Briggs Type Indicator® *Extraversion (E) – Introversion (I)*, *Sensing (S) – Intuition*

(N), *Thinking (T) – Feeling (F)*, and *Judging (J) – Perceiving (P)* with reference to the mean of

overall test performance and means of overall test performance based on specific duty areas of

nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination

(INACE)? The analysis indicated the following findings for learning preferences (by source of

energy, perception, reaction to information or making decisions, and preference to lifestyle),

overall test performance, and overall test performance based on specific duty areas of nurse aide

students on Illinois Nurse Aide Competency Examination:

1. There was no significant difference between the mean scores of nurse aide students with

    the Extraversion (E) learning preference and mean scores of nurse aide students with the

    Introversion (I) learning preference on overall test performance and test performance

    based on specific duty areas.

2. There was significant difference between the mean scores of nurse aide students with

    Sensing (S) learning preference and mean scores of nurse aide students with Intuition (N)

    learning preference on overall test performance and test performance based on specific

    duty areas. Thus, the nurse aide students with the Sensing (S) learning preference were

    associated with a significantly larger mean than nurse aide students with the Intuitive (N)

learning preference on overall test performance; however, the estimated effect size was small. The nurse aide students with the Sensing (S) learning preference scored higher than nurse aide students with the Intuition (N) learning preference on test performance based on the duty areas: performing personal skills and performing basic restorative skills.

3. There was no significant difference between the mean scores of nurse aide students with the Thinking (T) learning preference and mean scores of nurse aide students with the Introversion (F) learning preference on overall test performance and test performance based on specific duty areas.

4. There was no significant difference between the mean scores of nurse aide students with the Judging (J) learning preference and mean scores of nurse aide students with the Perceiving (P) learning preference on overall test performance and test performance based on specific duty areas.

Research Question 2

What are the differences between the four levels of learning preference combinations by orientation of energy and perception determined by the Myers-Briggs Type Indicator® *IS, IN, ES, and EN* with reference to the mean of *overall test performance* and means of *overall test performance based on specific duty areas* of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination (INACE)? The analysis indicated that there was no significant difference between the mean scores of nurse aide students with IS, IN, ES, and EN learning preference combinations on overall test performance and test performance based on specific duty areas.

Research Question 3

What are the differences between the four levels of learning preference combinations by perception and attitude *SP, SJ, NP, and NJ* as determined by the Myers-Briggs Type Indicator® with reference to the mean of *overall test score* and means of *overall test scores based on specific duty areas* of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination (INACE)? The analysis indicated that there was no significant difference between the mean scores of nurse aide students with SP, SJ, NP, and NJ learning preference combination on overall test performance and overall test performance based on specific duty areas.

Research Question 4

What are the differences between the four levels of learning preference combinations by mental process (perception and judgment) *ST, SF, NF, and NT* determined by the Myers-Briggs Type Indicator® with reference to the mean of *overall test performance* and means of *overall test performance based on specific duty areas* of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination (INACE)? The analysis indicated that there was no significant difference between the mean scores of nurse aide students with ST, SF, NF, and NT learning preference combinations on overall test performance and overall test performance based on specific duty areas.

Research Question 5

What are the differences between the 16 levels of psychological types or learning approaches *ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ* as determined by the Myers-Briggs Type Indicator® with reference to the mean of *overall test performance* and means of *overall test performance based on specific duty areas* of nurse aide students on the multiple-choice Illinois Nurse Aide Competency Examination

(INACE)? The analysis indicated that there was no significant difference in the mean scores of nurse aide students with ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ psychological or personality types on overall test performance and overall test performance based on specific duty areas.

Discussion

Learning preferences

In agreement with the definition of standardized test (Standardized test, n.d.), Illinois Nurse Aide Competency Examination (INACE) is a multiple-choice achievement test that determines nurse aide students' level of competence and requires all the nurse aide students to answer the same questions or selection of questions which is then scored in a consistent manner which allows it to compare the relative performance of individuals or groups of students. The research related to achievement and aptitude is abounding (Myers et al., 2003) and it is proposed that psychological type is related to aptitude and academic achievement. Students with Introversion (I) and Intuition (N) learning preferences showed greater aptitude than students with Extraversion (E) and Sensing (S) (McCaulley & Kainz, 1974; McCaulley, 1977; Schurr & Ruble, 1986; Schurr, Ruble, & Henriksen, 1988). Students with Thinking (T) learning preference are better at multiple choice questions or tasks that require logical analysis while students with Feeling (F) learning preference are better at multiple choice questions or tasks that require understanding of human relations (Gallagher, 1988). Students with the Judging (J) learning preference make higher grades than students with the Perceiving (P) learning preference while Perceiving (P) students outperformed on aptitude measures (Kalsbeek, 1987).

Although the rationale of research synthesis suggests a relationship between learning preferences determined by the MBTI® and academic achievement, findings from this research

sample suggested that there was no statistically significant difference between mean scores of learning preferences by source of energy (Extraversion-E and Introversion-I), learning preferences by reaction to information or making decisions (Thinking-T and Feeling-F), and learning preferences by preference to lifestyle (Judging-J and Perceiving-P) of nurse aide students on overall test performance and test performance based on specific duty areas (INACE) except for mean differences (see Table 4.4 and 4.7). The only learning preference pair that had statistically significant difference was by perception: Sensing (S) and Intuition (N). However, nurse aide students with Sensing (S) preference had numerically higher means than nurse students with Intuition (N) learning preference on overall test performance and test performance based on specific areas (INACE) with a small effect size, which was not in agreement with the evidence of previous research studies. The variance in findings makes it a topic worthy of further exploration. The most plausible explanation for the lack of significance and significance relevant to the Sensing (S) learning preference was the disproportionate group sizes and inadequate power (Table 3.6 and 3.7) which increased the probability of conducting Type II errors. Therefore, these findings merit further discussion and will be addressed in the recommendations section of this chapter.

Learning preference combinations

The data analysis in this study showed no statistical significant difference in the mean scores of learning preference combinations by source of energy and perception (IS, IN, ES, and EN), learning preference combinations by perception and attitude (SP, SJ, NP, and NJ), and learning preference combinations by mental process (ST, SF. NF, and NT) of nurse aide students on test performance and test performance based on specific duty areas. Lawrence (2009) suggested that these learning preference combinations will report learning style behaviors of students in terms

of their cognitive style, patterns of attitudes and interests, learning environment, and learning tools. Myers et al. (2003) suggested that students with Introversion and Intuition (IN) learning preference combinations show greater aptitude than students who prefer Extraversion and Sensing (ES) learning preference combinations. Kalsbeek (1997) in his TRAILS project identified the mean score (in the order of highest to lowest) on an achievement test for IN to be highest, followed by EN, IS, and ES. The order was different in this study for test performance and test performance based on specific duty areas (see Table 4.10 and 4.12). The findings of learning preference combinations contradicted the findings from larger scale research efforts (especially IS, IN, ES, and EN learning preference combinations), increasing the necessity for further exploration.

Psychological or personality types or learning approaches

The data analysis in this study showed no statistical significance difference in the mean scores of psychological or personality types of nurse aide students on test performance and test performance based on specific duty areas. According to Lawrence (2009), "more than 80 percent of the studies analyzed learning style differences by examining the four MBTI learning preference pairs separately rather than using the sixteen types…in many cases, by sample size: obtaining adequate number of sixteen types takes a fairly large sample" (p. 39). Though this evidence existed, this research study explored this option because this is the first time a study of psychological type was conducted for the nurse aide population. Therefore, the most plausible explanation for the lack of significance was obtaining an adequate number of the sixteen types which increases the necessity for further exploration.

Conclusion

There are various personal attributes that constitute students' learning and academic achievement which continue to be of interest to educators (Lawrence, 2009). Psychological or personality type is one of the personal attributes which is the indicator of learning and academic achievement (Provost & Anchors, 2012). There are numerous student development theories to explain that learning and achievement are influenced by various factors. One among them is the cognitive typology theory that helps us understand how students approach their world and how those approaches impact academic achievement. The study of learning and academic achievement with typology as a gross indicator is worth considering because it helps to understand the following: (a) the mental functioning of nurse aide students i.e. information processing and formation of ideas and judgments; (b) the patterns of attitudes and interests of what nurse aide students attend to in a potential learning situation; (c) a disposition to seek out learning environments compatible with nurse aide students' learning styles, attitudes, and interests; and (d) a disposition for nurse aide students to use certain learning tools while avoiding others.

Academic achievement plays a significant role in assessment of learning. In Illinois, nurse aide students have to complete a state-approved training program, pass the 21-mandated skills assessment, pass the Illinois Nurse Aide Competency Examination (INACE), and pass a background check to be certified and join the workforce as nurse aide or assistant. To do so, they must seek and retain a lot of information to provide safe and effective care. Therefore, it becomes important to understand how nurse aide students learn and perform on the achievement test (Illinois Nurse Aide Competency Examination). The researcher suggests the following

domains in which this information can be applied: (a) nurse aide trainers and students; (b)

Illinois Nurse Aide Competency Examination; and (c) nurse aide students' retention efforts.

The study provided useful information regarding the preferred learning preferences,

learning preference combinations, and psychological or personality types or learning approaches

of nurse aide students. The mean scores of only one learning preference pair by perception

(Sensing and Intuition) was statistically significant on the Illinois Nurse Aide Competency

Examination performance which agreed with the MBTI® theory and the results of previous

psychological type research, lending support to construct validity of the MBTI® inventory.

There are different proportions of nursing students with different learning preferences

(Extraversion, Introversion, Sensing, Intuition, Thinking, Feeling, Judging, and Perceiving),

learning preference combinations (IS, IN, ES, and EN; SP, SJ, NP, and NJ; and ST, SF, NF, and

NT), and psychological types (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP,

ENTP, ENFP, ESTJ, ESFJ, ENFJ, and ENTJ). The trainers of Illinois Basic Nurse Aide

Training Program should be aware of such preferences and how these would impact the learning

environment, learning situation, learning tools and mental functioning of nurse aide students

(information processing and making judgment, see Chapter II).

The learning of psychological types by nurse aide students will not only help them to

improve learning and performance, it will also have a significant impact on their career as nurse

aides. The framework of psychological types is truly effective for learning, teaching, and

preparing better test questions for Illinois Nurse Aide Competency Examination. As the nurse

aide students would have to pass the 21-mandated skills assessment and Illinois Nurse Aide

Competency Examination, it becomes necessary to grasp theoretical concepts and practical

procedures. The framework of psychological types will help the nurse aide trainers and students:

(a) describe teaching and learning in nonjudgmental ways; (b) emphasize how a trainer teaches and a student learns rather than limiting what they can do; (c) build academic confidence by matching training practice with learning; (d) move from 'right or wrong' to 'who and how'; (e) apply type to different cultures and students; (f) provide connections among varying staff development efforts; and (g) implement research-based strategies like classroom management, differentiation, student work habits and study skills, basic skill remediation, working with difficult students, collaboration with colleagues, building relationships with students, motivating students for academic achievement, and enriching and accelerating learning for all students (Kise, 2007).

Data from many studies indicate that more college professors have Intuition (N) preference than Sensing (S) preference and they tend to write exams more frequently to fit their own type (Chickering, 1969; Chichering & Reisser, 1993; and Myers et al., 2003`). The Illinois Nurse Aide Testing Project should incorporate this learning while designing the competency examination and should try to incorporate strategies that can help to suffice the difference in test taking by students with learning preferences (Sensing and Intuition) on a timed multiple-choice competency test. Retention and attrition are two complex issues and the MBTI® personality assessment tool has a clear and valuable role in retention (Provost & Anchors, 2012). The use of this tool can improve nurse aide training's responsiveness to students and its sensitivity to individual characteristics of students is certainly one means of improving students' academic and social integration within the various environments they encounter at the training program (Provost and Anchors, 2012). Kalsbeek (1986) suggested that a wide variety of avenues exist to use the MBTI® assessment tool for such ends as academic advising and educational planning,

career development, learning environment management, faculty and staff development, and student involvement opportunities.

Recommendations for Further Research

The findings from this study add to the understanding of nurse aide students; however, more research is needed. The following are the recommendations for future pursuits:

1. Statistical power is the probability of making correct decision which depends on sample size, effect size, and alpha level in order to be more generalizable and to avoid Type II error (Gliner, et al., 2009). Replicating this study with a larger participant pool and comparing groups with equal sample sizes would produce better findings in the study. However, it will be difficult to obtain all personality or psychological types because they are found in small percentages in the general population. It would be beneficial to examine the four MBTI® preference pairs separately rather than 16 types.

2. An alternative approach is to conduct a mixed-method study (quantitative followed by a qualitative study). Instead of using the four MBTI® preference pairs, focus on the most important dimensions of the MBTI® that play an important role in achievement test performance such as the Sensing – Intuition dimension and Judging – Perceiving dimension (Myers, et al., 2003).

3. The Chi square test is one of the tests of significance which is a critical part of a statistical procedure frequently used in MBTI® research. The Self-Selection Ratio Type Table (SRTT), also referred as the Index of Attraction is a unique statistical procedure derived from a special program developed by Isabel Myers (only available with Center for Applications of Psychological Types – CAPT) to the compare

distribution of type in one group with that in another group is also frequently used in a MBTI® study (Zeisset, 2000). Further studies consisting of these two approaches with the nurse aide population are suggested.

4. A longitudinal study is needed to understand the relationship of psychological concepts over time as a nurse aide student undertakes an Illinois Basic Nurse Aide Training Program, completes the 21-mandated manual skills assessment, takes the Illinois Nurse Aide Competency Examination, and develops in the health care practice setting.

TABLES

Analysis of Design and Methods

Table 3.2

Variables and their Levels of Measurement, Research Questions and Research Design

Research Question or Hypothesis	Independent or Antecedent or Predictor Variable (IV)	Active, Attribute, or Change Over Time Number of Levels or Categories Level of Measurement	Dependent or Outcome Variable & Level of Measurement	Type of Research Question	Specific and General Research Approach General Design Classification
1	*Learning preference pair by source of energy* Extraversion (E) Introversion (I)	Attribute IV Two dichotomous, unordered, categorical levels or categories	Mean of overall test performance Means of overall test performance based on specific duty areas[a] [Ratio]	Difference and Descriptive	Comparative or Descriptive Non-Experimental (to compare groups or summarize data) Between-groups design
2	*Learning preferences pair by preference pair* Sensing (S) Intuition (N)	Attribute IV Two dichotomous, unordered, categorical levels or categories	Mean of overall test performance Means of overall test performance based on specific duty areas[a] [Ratio]	Difference and Descriptive	Comparative or Descriptive Non-Experimental (to compare groups or summarize data) Between-groups design
3	*Learning preference pair by reaction to information or making decisions* Thinking (T) Feeling (F)	Attribute IV Two dichotomous, unordered, categorical levels or categories	Mean of overall test performance Means of overall test performance based on specific duty areas[a] [Ratio]	Difference and Descriptive	Comparative or Descriptive Non-Experimental (to compare groups or summarize data) Between-groups design
4	*Learning preference pair by preference of lifestyle* Judging (J) Perceiving (P)	Attribute IV Two dichotomous, unordered, categorical levels or categories	Mean of overall test performance Means of overall test performance based on specific duty areas[a] [Ratio]	Difference and Descriptive	Comparative or Descriptive Non-Experimental (to compare groups or summarize data) Between-groups design

5	*Learning preference combination by orientation of energy and perception* IS, IN, ES, and EN	Attribute IV Four nominal, unordered, categorical levels or categories	Mean of overall test performance Means of overall test performance based on specific duty areas[a] [Ratio]	Difference and Descriptive	Comparative or Descriptive Non-Experimental (to compare groups or summarize data) Between-groups design
6	*Learning preference combination by perception and attitude* SP, SJ, NP, and NJ	Attribute IV Four nominal, unordered, categorical levels or categories	Mean of overall test performance Means of overall test performance based on specific duty areas[a] [Ratio]	Difference and Descriptive	Comparative or Descriptive Non-Experimental (to compare groups or summarize data) Between-groups design
7	*Learning preference combination by mental process (i.e. perception and judgement)* ST, SF, NF, and NT	Attribute IV Four nominal, unordered, categorical levels or categories	Mean of overall test performance Means of overall test performance based on specific duty areas[a] [Ratio]	Difference and Descriptive	Comparative or Descriptive Non-Experimental (to compare groups or summarize data) Between-groups design
8	*Personality types or learning approaches* ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENFP, and ENTJ	Attribute IV Four nominal, unordered, categorical levels or categories	Mean of overall test performance Means of overall test performance based on specific duty areas[a] [Ratio]	Difference and Descriptive	Comparative or Descriptive Non-Experimental (to compare groups or summarize data) Between-groups design

Note: The research design showing the types of research question, independent variables, dependent variables, levels or categories of variables, level of measurement of each variable, general and specific research purpose and approach, and general design classification.

[a]The six duty areas are specific duty areas include communicating information, performing basic nursing skills, performing personal skills, performing basic restorative skills, providing mental health and social service needs, and providing residents' rights.

Measurement Reliability and Validity for Each Key Variable

Table 3.4

Measurement Reliability and Validity for each Key Variable

Types of Evidence for Reliability	*Evidence Acceptable/Not Acceptable*
Participants' Responses:	
Test-retest Reliability	Acceptable, .53 to .93
Internal Consistency	Acceptable, .81 to .91
Parallel forms of Reliability	Acceptable, .51 to .91
Types of Evidence for Validity	*Evidence Acceptable/Not Acceptable*
Evidence based on construct (Convergent and Divergent)	Acceptable
Evidence based on 'best-fit' type	Acceptable
Evidence based on construct (Factor Analysis)	Acceptable

Evaluation of Four Key Dimensions of Research Validity

Overall Measurement Reliability and Statistics

Table 3.5

Overall Measurement Reliability and Statistics

Desideratum	*Status*
Is the overall measurement reliability acceptable?	Acceptable
Is the power appropriate?	No because attrition rate was at 42%
Is the choice/use of statistics appropriate	Yes
Is there adequate presentation of statistical results, including effect size?	No, significance indicates small effect size.
Is the interpretation of statistical result appropriate?	Yes

Table 3.6

Effect Size and Observed Power of Independent Variable on Overall Test Performance of Nurse Aide Students on Illinois Nurse Aide Competency Examination

Variable	Effect size (η^2)	Observed power (β)	Statistical Test	Statistical Power $(1-\beta)$
Learning preferences:				
Extraversion (E) – Introversion (N)	.003[a]	.172	One-way ANOVA	.828
Sensing (S) – Intuition (N)	.015[a]	.605	One-way ANOVA	.395
Thinking (T) – Feeling (F)	.001[a]	.098	One-way ANOVA	.902
Judging (J) – Perceiving (P)	.003[a]	.157	One-way ANOVA	.843
Learning preference combinations by orientation of energy and perception: IS, IN, ES, and EN	.021[a]	.587	One-way ANOVA	.413
Learning preference combination by perception and attitude: SP, SJ, NP, and NJ	.019[a]	.520	One-way ANOVA	.48
Learning preference combination by perception and judgment: ST, SF, NF, and NT	.017[a]	.485	One-way ANOVA	.515
16 psychological or personality types or learning approaches: ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENFP, and ENTJ	.072[b]	.895	One-way ANOVA	.105

Note. Cohen's (1998) guidelines of effect size, [a]small = .01, [b]medium = .06, and [c]large = .14. Cohen's (1998) guidelines of power $(1-\beta)$, acceptable power > .80 or higher.

Table 3.7

Effect Size and Observed Power of Independent Variable on Test Performance based on specific duty areas of Nurse Aide Students on Illinois Nurse Aide Competency Examination

Variable	Effect size (η^2)	Observed power (β)	Statistical Test	Statistical Power $(1-\beta)$
Learning preferences:				
Extraversion (E) – Introversion (N)	.015[a]	.323	One-way MANOVA	.667
Sensing (S) – Intuition (N)	.039 [a]	.766	One-way MANOVA	.234
Thinking (T) – Feeling (F)	.013[a]	.287	One-way MANOVA	.713
Judging (J) – Perceiving (P)	.025[a]	.530	One-way MANOVA	
Learning preference combinations by orientation of energy and perception: IS, IN, ES, and EN	.022[a]	.787	One-way MANOVA	.213
Learning preference combination by perception and attitude: SP, SJ, NP, and NJ	.026[a]	.875	One-way MANOVA	.125
Learning preference combination by perception and judgment: ST, SF, NF, and NT	.022[a]	.788	One-way MANOVA	.212
16 psychological or personality types or learning approaches: ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENFP, and ENTJ	.054[a]	1.00	One-way MANOVA	.46

Note. Cohen's (1998) guidelines of effect size, [a]small = .01, [b]medium = .06, and [c]large = .14. Cohen's (1998) guidelines of power $(1-\beta)$, acceptable power > .80 or higher.

Internal Validity

Table 3.8

Internal Validity based on Equivalence of Groups on Participant Characteristics.

Desideratum	Status
Was there random assignment of participants to groups?	No
If no random assignment, were the participants in each group matched, made similar statistically?	Yes, on the MBTI® results
If no random assignment, were the participants in each group matched, made similar on other key participant characteristics (e.g. age, gender, IQ, etc.)?	Yes, on the MBTI® results
Was the retention of the subjects during the study high and similar across groups?	No, the attrition was 42%

Table 3.9

Accessible Sample, Actual Sample, and Attrition

Stratum	$N_{Accessible}$	N_{Actual}	Attrition (%)
Northern Illinois	184	114	38%
Central Illinois	187	111	41%
Southern Illinois	187	101	46%
Total	558	326	42%

Table 3.10

Internal Validity based on Control of Extraneous and Environmental Variables.

Desideratum	*Status*
Was the study conducted in a controlled environment?	No
Did the groups have equivalent environment?	Yes
Was there a treatment (placebo) or usual treatment comparison groups?	Yes, there were comparison groups.
Were adequate attempts to reduce other extraneous influences?	Yes [Instrumentation]

Overall Measurement Validity of the Constructs

Table 3.11

Validity of Outcome Measures (Independent Variable) and any Attribute Dependent Variables

Desideratum	*Status*
Have the measures been used with similar participants?	Yes, nurse aide students
Is adequate evidence for the validity of the outcomes based on existing empirical or theoretical research presented?	Yes
Is adequate evidence for the validity of the attribute independent variables presented?	Yes

External Validity

Population External Validity

Table 3.12

Overall Population External Validity

Desideratum	Status
Was the accessible population representative of the theoretical population?	Yes (All nurse aide students seeking certification)
Was the selected sample representative of the accessible population?	Yes (Stratified Random Sampling Technique)
Was the actual sample representative vis-à-vis the selected sample? That is, was the response rate acceptable?	No, low response rate (58.42%)

Table 3.13

Overall Ecological External Validity

Desideratum	Status
Is the setting (or conditions) natural and representative of the target setting?	Yes
Is the rapport with testers or observer's good?	Yes
Are the procedures or tasks natural and representative of the behavioral concepts of interest?	Yes
Will the results apply to more than the specific time in history that the study was done?	Yes

FIGURES
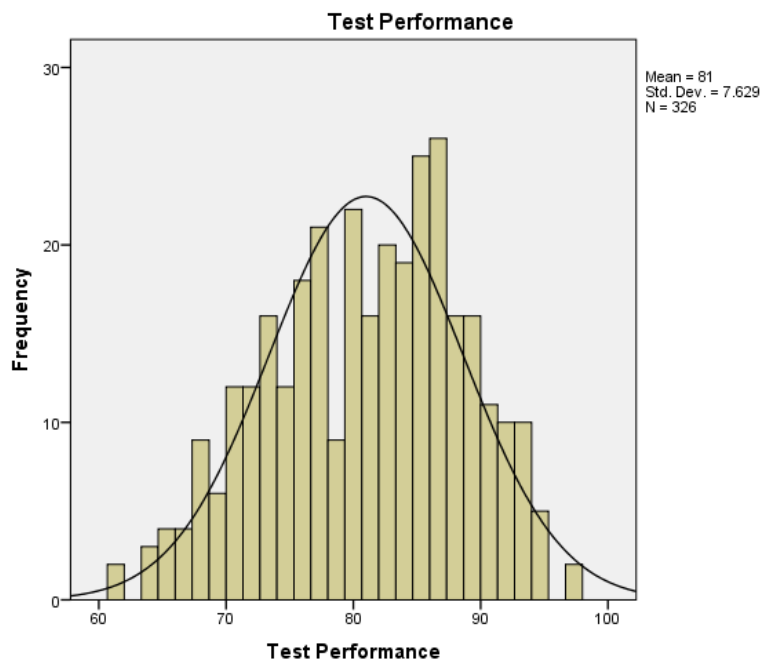
Figure 4.1. Test performance of nurse aide students on Illinois Nurse Aide Competency Examination (INACE).
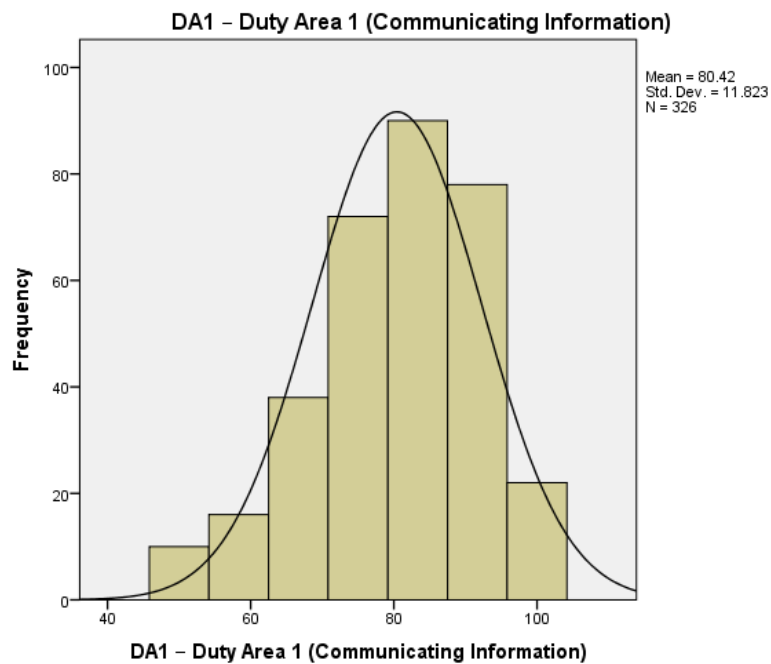
Figure 4.2. Test performance based on the duty area, communicating information of nurse aide students on Illinois Nurse Aide Competency Examination.
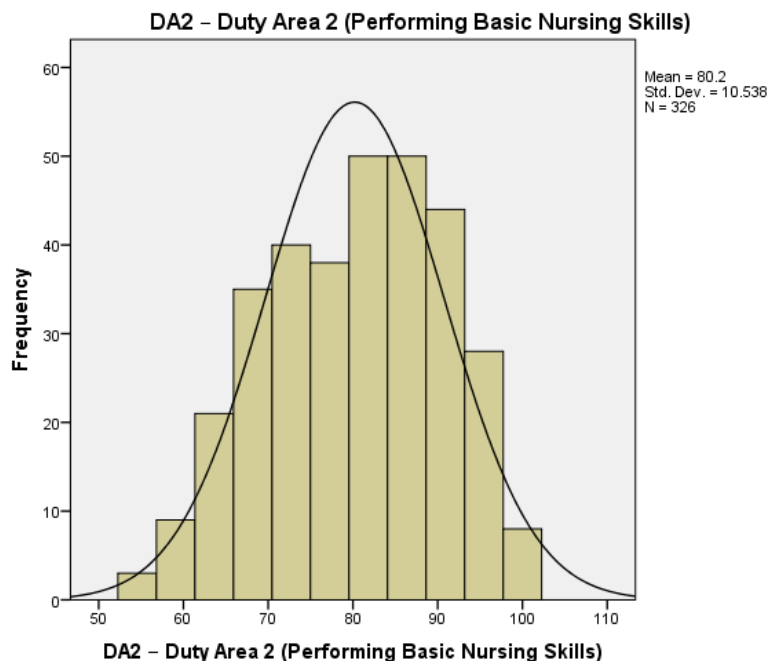
Figure 4.3. Test performance based on the duty area, performing basic nursing skills of nurse aide students on Illinois Nurse Competency Examination (INACE).
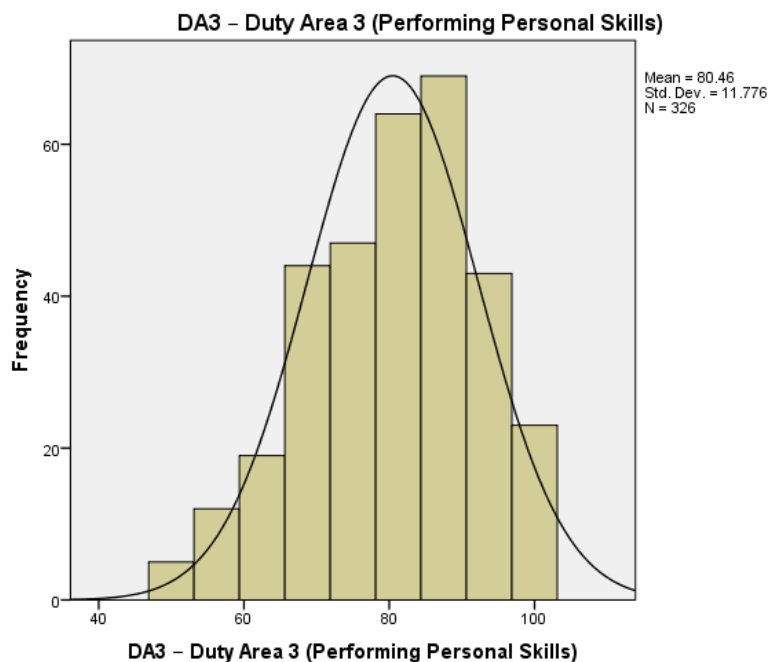
Figure 4.4. Test performance based on the duty area, performing personal skills of nurse aide students based on Illinois Nurse Aide Competency Examination (INACE).
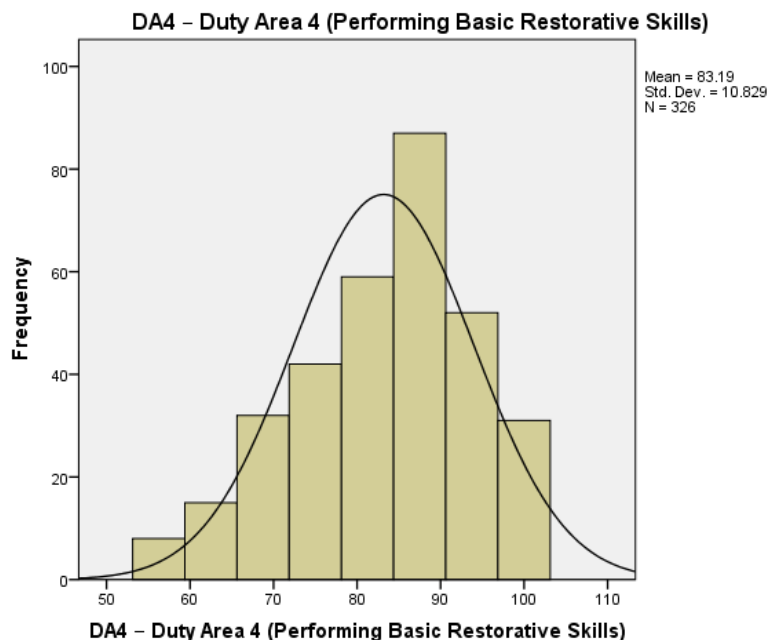
Figure 4.5. Test performance based on the duty area, performing basic restorative skills of nurse aide students on Illinois Nurse Aide Competency Examination (INACE).
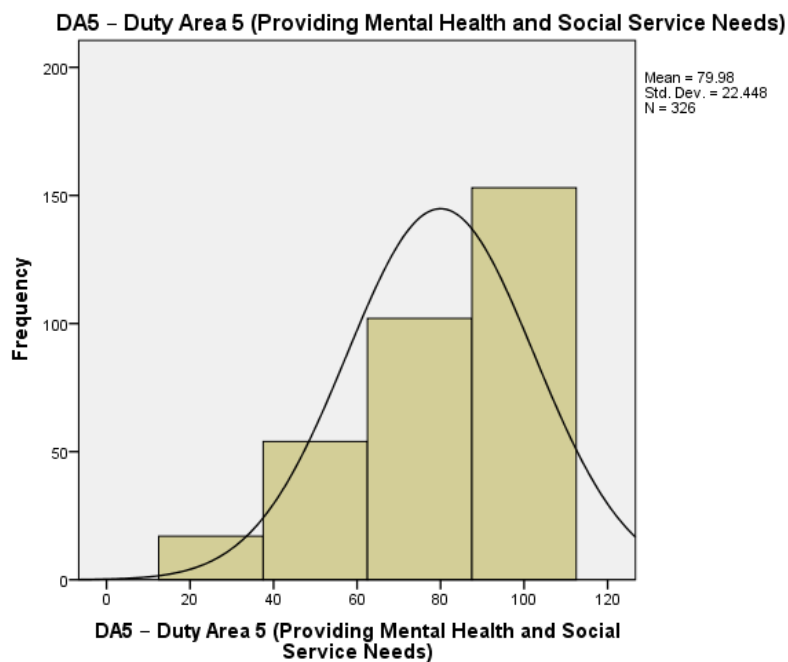
Figure 4.6. Test performance based on the duty area, providing mental health and social service needs of nurse aide students on Illinois Nurse Aide Competency Examination (INACE).
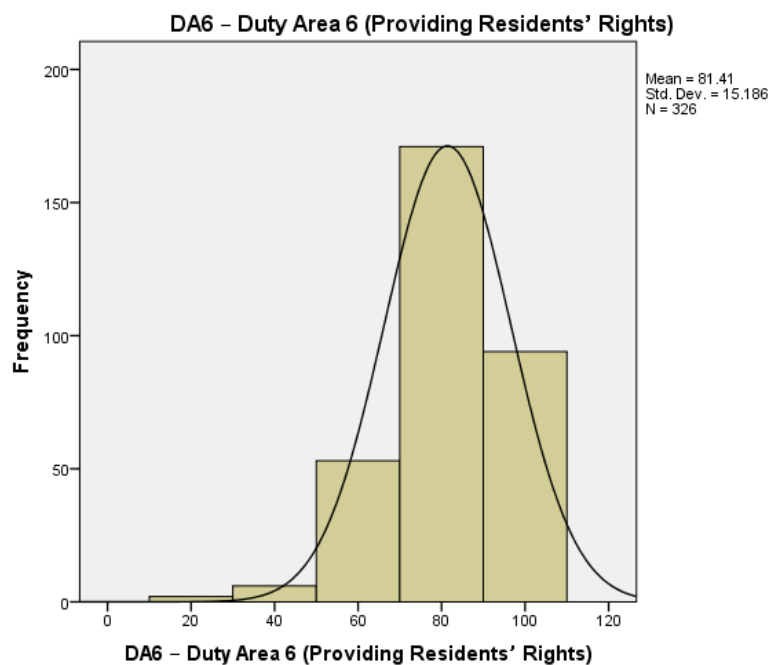
Figure 4.7. Test performance based on the duty area, providing residents' rights of nurse aide students on Illinois Nurse Aide Competency Examination.

EXHIBITS

Exhibit I – Coding

Gender: ☐ Male **(1)**

☐ Female **(2)**

☐ Other **(3)**

☐ Prefer not to answer **(4)**

Age: ☐ 18-25 **(1)**

☐ 26-30 **(2)**

☐ 31-35 **(3)**

☐ 36-40 **(4)**

☐ 41-45 **(5)**

☐ 46-50 **(6)**

☐ 51-55 **(7)**

☐ 56-60 **(8)**

☐ 61-65 **(9)**

☐ 66+ **(10)**

Ethnicity/Race:

☐ African American/Black **(1)**

☐ Asian or Pacific Islander **(2)**

☐ Hispanic, Latino **(3)**

☐ White **(4)**

☐ Native American or Alaskan Native or American Indian **(5)**

☐ Other **(6)**

Education:

☐ Some high school, no diploma **(1)**

☐ High school graduate, diploma or equivalent (for example: GED) **(2)**

☐ Some college credit, no degree **(3)**

☐ Trade/technical/vocational training **(4)**

☐ Associate Degree **(5)**

☐ Bachelor's Degree **(6)**

☐ Master's Degree **(7)**

☐ Professional Degree **(8)**

☐ Doctorate Degree **(9)**

☐ Post-doc Degree **(10)**

English is my first language (ESL)

☐ Yes **(1)**

☐ No **(2)**

Independent Variable Groups:

Q 1	Group	Q2, 3	Group	Q4	Group
Extraversion (E)	**1**	IS	1	ST	**1**
Introversion (I)	**2**	IN	**2**	SF	**2**
Sensing (S)	**1**	ES	**3**	NF	**3**
Intuition (N)	**2**	EN	**4**	NT	**4**
Thinking (T)	**1**	SP	**1**		
Feeling (F)	**2**	SJ	**2**		
Judging (J)	**1**	NP	**3**		
Perceiving (P)	**2**	NJ	**4**		

Q5			
ISTJ **(1)**	ISFJ **(2)**	INFJ **(3)**	INTJ **(4)**
ISTP **(5)**	ISFP **(6)**	INFP **(7)**	INTP **(8)**
ESTP **(9)**	ESFP **(10)**	ENFP **(11)**	ENTP **(12)**
ESTJ **(13)**	ESFJ **(14)**	ENFJ **(15)**	ENTJ **(16)**

Exhibit II – SPSS Results

      Research Question # 1. The following tables are the SPSS results of one-way analysis of variance (ANOVA) between groups (Extraversion – E and Introversion – I) of nurse aide students on test performance (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

Dependent Variable: Test Performance

E or I	Mean	Std. Deviation	N
Extraversion	80.61	7.722	179
Introversion	81.47	7.513	147
Total	81.00	7.629	326

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Test Performance

F	df1	df2	Sig.
.674	1	324	.412

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + EorI

Tests of Between-Subjects Effects

Dependent Variable: Test Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	59.501[a]	1	59.501	1.022	.313	.003	1.022	.172
Intercept	2120374.789	1	2120374.789	36436.146	.000	.991	36436.146	1.000
EorI	59.501	1	59.501	1.022	.313	.003	1.022	.172
Error	18854.942	324	58.194					
Total	2157692.444	326						
Corrected Total	18914.443	325						

a. R Squared = .003 (Adjusted R Squared = .000)

b. Computed using alpha = .05

      The following tables are the SPSS results of one-way analysis of variance (ANOVA) between groups (Sensing – S and Intuition - N) of nurse aide students on test performance (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

Dependent Variable: Test Performance

S or N	Mean	Std. Deviation	N
Sensing	81.85	7.511	179
Intuition	79.96	7.669	147
Total	81.00	7.629	326

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Test Performance

F	df1	df2	Sig.
.206	1	324	.650

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + SorN

Tests of Between-Subjects Effects

Dependent Variable: Test Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	286.366[a]	1	286.366	4.981	.026	.015	4.981	.605
Intercept	2113337.938	1	2113337.938	36757.497	.000	.991	36757.497	1.000
SorN	286.366	1	286.366	4.981	.026	.015	4.981	.605
Error	18628.077	324	57.494					
Total	2157692.444	326						
Corrected Total	18914.443	325						

a. R Squared = .015 (Adjusted R Squared = .012)

b. Computed using alpha = .05

The following tables are the SPSS results of one-way analysis of variance (ANOVA) between groups (Thinking – T and Feeling – F) of nurse aide students on test performance (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

Dependent Variable: Test Performance

T or F	Mean	Std. Deviation	N
Thinking	81.60	6.834	56
Feeling	80.87	7.789	270
Total	81.00	7.629	326

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Test Performance

F	df1	df2	Sig.
2.594	1	324	.108

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + TorF

Tests of Between-Subjects Effects

Dependent Variable: Test Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	24.121[a]	1	24.121	.414	.521	.001	.414	.098
Intercept	1224269.062	1	1224269.062	20998.222	.000	.985	20998.222	1.000
TorF	24.121	1	24.121	.414	.521	.001	.414	.098
Error	18890.322	324	58.303					
Total	2157692.444	326						
Corrected Total	18914.443	325						

a. R Squared = .001 (Adjusted R Squared = -.002)

b. Computed using alpha = .05

The following tables are the SPSS results of one-way analysis of variance (ANOVA) between groups (Judging – J and Perceiving – P) of nurse aide students on test performance (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

Dependent Variable: Test Performance

J or P	Mean	Std. Deviation	N
Judging	80.47	7.091	119
Perceiving	81.30	7.922	207
Total	81.00	7.629	326

Levene's Test of Equality of Error Variances [a]

Dependent Variable: Test Performance

F	df1	df2	Sig.
1.058	1	324	.304

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + JorP

Tests of Between-Subjects Effects

Dependent Variable: Test Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power [b]
Corrected Model	52.122[a]	1	52.122	.895	.345	.003	.895	.157
Intercept	1977447.165	1	1977447.165	33966.810	.000	.991	33966.810	1.000
JorP	52.122	1	52.122	.895	.345	.003	.895	.157
Error	18862.321	324	58.217					
Total	2157692.444	326						
Corrected Total	18914.443	325						

a. R Squared = .003 (Adjusted R Squared = .000)

b. Computed using alpha = .05

The following tables are the SPSS results of one-way multivariate analysis of variance (MANOVA) between groups (Extraversion – E and Introversion – I) of nurse aide students on test performance based on specific duty areas (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

	E or I	Mean	Std. Deviation	N
DA1 - Duty Area 1 (Communicating Information)	Extraversion	80.26	12.298	179
	Introversion	80.61	11.255	147
	Total	80.42	11.823	326
DA2 - Duty Area 2 (Performing Basic Nursing Skills)	Extraversion	79.79	10.623	179
	Introversion	80.71	10.447	147
	Total	80.20	10.538	326
DA3 - Duty Area 3 (Performing Personal Skills)	Extraversion	80.52	11.912	179
	Introversion	80.40	11.650	147
	Total	80.46	11.776	326
DA4 - Duty Area 4 (Performing Basic Restorative Skills)	Extraversion	82.16	10.685	179
	Introversion	84.44	10.908	147
	Total	83.19	10.829	326
DA5 - Duty Area 5 (Providing Mental Health and Social Service Needs)	Extraversion	80.03	23.008	179
	Introversion	79.93	21.826	147
	Total	79.98	22.448	326
DA6 - Duty Area 6 (Providing Residents' Rights)	Extraversion	80.89	15.980	179
	Introversion	82.04	14.188	147
	Total	81.41	15.186	326

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
DA1 - Duty Area 1 (Communicating Information)	.028	1	324	.868
DA2 - Duty Area 2 (Performing Basic Nursing Skills)	.117	1	324	.732
DA3 - Duty Area 3 (Performing Personal Skills)	.020	1	324	.888
DA4 - Duty Area 4 (Performing Basic Restorative Skills)	.151	1	324	.698
DA5 - Duty Area 5 (Providing Mental Health and Social Service Needs)	.433	1	324	.511
DA6 - Duty Area 6 (Providing Residents' Rights)	1.182	1	324	.278

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Eorl

Box's Test of Equality of Covariance Matrices[a]

Box's M	16.471
F	.769
df1	21
df2	356571.081
Sig.	.762

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + Eorl

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[c]
Intercept	Pillai's Trace	.992	6405.400[b]	6.000	319.000	.000	.992	38432.399	1.000
	Wilks' Lambda	.008	6405.400[b]	6.000	319.000	.000	.992	38432.399	1.000
	Hotelling's Trace	120.478	6405.400[b]	6.000	319.000	.000	.992	38432.399	1.000
	Roy's Largest Root	120.478	6405.400[b]	6.000	319.000	.000	.992	38432.399	1.000
Eorl	Pillai's Trace	.015	.817[b]	6.000	319.000	.557	.015	4.901	.323
	Wilks' Lambda	.985	.817[b]	6.000	319.000	.557	.015	4.901	.323
	Hotelling's Trace	.015	.817[b]	6.000	319.000	.557	.015	4.901	.323
	Roy's Largest Root	.015	.817[b]	6.000	319.000	.557	.015	4.901	.323

a. Design: Intercept + Eorl

b. Exact statistic

c. Computed using alpha = .05

Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[g]
Eorl	DA1 – Duty Area 1 (Communicating Information)	9.975	1	9.975	.071	.790	.000	.071	.058
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	68.067	1	68.067	.612	.435	.002	.612	.122
	DA3 – Duty Area 3 (Performing Personal Skills)	1.107	1	1.107	.008	.929	.000	.008	.051
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	419.939	1	419.939	3.610	.058	.011	3.610	.474
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	.743	1	.743	.001	.969	.000	.001	.050
	DA6 – Duty Area 6 (Providing Residents' Rights)	106.182	1	106.182	.460	.498	.001	.460	.104
Error	DA1 – Duty Area 1 (Communicating Information)	45416.065	324	140.173					
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	36021.270	324	111.177					
	DA3 – Duty Area 3 (Performing Personal Skills)	45070.907	324	139.108					
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	37693.678	324	116.339					
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	163774.180	324	505.476					
	DA6 – Duty Area 6 (Providing Residents' Rights)	74844.738	324	231.002					

a. R Squared = .000 (Adjusted R Squared = -.003)

b. R Squared = .002 (Adjusted R Squared = -.001)

c. R Squared = .000 (Adjusted R Squared = -.003)

d. R Squared = .011 (Adjusted R Squared = .008)

e. R Squared = .000 (Adjusted R Squared = -.003)

f. R Squared = .001 (Adjusted R Squared = -.002)

g. Computed using alpha = .05

The following tables are the SPSS results of one-way multivariate analysis of variance (MANOVA) between groups (Sensing – S and Intuition – N) of nurse aide students on test performance based on specific duty areas (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

	S or N	Mean	Std. Deviation	N
DA1 – Duty Area 1 (Communicating Information)	Sensing	80.49	12.338	179
	Intuition	80.33	11.204	147
	Total	80.42	11.823	326
DA2 – Duty Area 2 (Performing Basic Nursing Skills)	Sensing	80.57	10.761	179
	Intuition	79.75	10.278	147
	Total	80.20	10.538	326
DA3 – Duty Area 3 (Performing Personal Skills)	Sensing	81.91	11.636	179
	Intuition	78.70	11.744	147
	Total	80.46	11.776	326
DA4 – Duty Area 4 (Performing Basic Restorative Skills)	Sensing	84.60	9.697	179
	Intuition	81.46	11.872	147
	Total	83.19	10.829	326
DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	Sensing	82.12	21.239	179
	Intuition	77.38	23.651	147
	Total	79.98	22.448	326
DA6 – Duty Area 6 (Providing Residents' Rights)	Sensing	81.45	15.583	179
	Intuition	81.36	14.742	147
	Total	81.41	15.186	326

Box's Test of Equality of Covariance Matrices[a]

Box's M	27.393
F	1.278
df1	21
df2	356571.081
Sig.	.176

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + SorN

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
DA1 – Duty Area 1 (Communicating Information)	1.648	1	324	.200
DA2 – Duty Area 2 (Performing Basic Nursing Skills)	.174	1	324	.677
DA3 – Duty Area 3 (Performing Personal Skills)	.206	1	324	.650
DA4 – Duty Area 4 (Performing Basic Restorative Skills)	7.700	1	324	.006
DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	1.065	1	324	.303
DA6 – Duty Area 6 (Providing Residents' Rights)	.011	1	324	.917

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + SorN

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[c]
Intercept	Pillai's Trace	.992	6438.517[b]	6.000	319.000	.000	.992	38631.105	1.000
	Wilks' Lambda	.008	6438.517[b]	6.000	319.000	.000	.992	38631.105	1.000
	Hotelling's Trace	121.101	6438.517[b]	6.000	319.000	.000	.992	38631.105	1.000
	Roy's Largest Root	121.101	6438.517[b]	6.000	319.000	.000	.992	38631.105	1.000
SorN	Pillai's Trace	.039	2.156[b]	6.000	319.000	.047	.039	12.934	.766
	Wilks' Lambda	.961	2.156[b]	6.000	319.000	.047	.039	12.934	.766
	Hotelling's Trace	.041	2.156[b]	6.000	319.000	.047	.039	12.934	.766
	Roy's Largest Root	.041	2.156[b]	6.000	319.000	.047	.039	12.934	.766

a. Design: Intercept + SorN

b. Exact statistic

c. Computed using alpha = .05

Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[g]
SorN	DA1 – Duty Area 1 (Communicating Information)	2.189	1	2.189	.016	.901	.000	.016	.052
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	55.263	1	55.263	.497	.481	.002	.497	.108
	DA3 – Duty Area 3 (Performing Personal Skills)	833.989	1	833.989	6.108	.014	.019	6.108	.693
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	795.496	1	795.496	6.907	.009	.021	6.907	.745
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	1814.961	1	1814.961	3.631	.058	.011	3.631	.476
	DA6 – Duty Area 6 (Providing Residents' Rights)	.683	1	.683	.003	.957	.000	.003	.050
Error	DA1 – Duty Area 1 (Communicating Information)	45423.850	324	140.197					
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	36034.074	324	111.216					
	DA3 – Duty Area 3 (Performing Personal Skills)	44238.025	324	136.537					
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	37318.121	324	115.179					
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	161959.963	324	499.876					
	DA6 – Duty Area 6 (Providing Residents' Rights)	74950.238	324	231.328					

a. R Squared = .000 (Adjusted R Squared = -.003)

b. R Squared = .002 (Adjusted R Squared = -.002)

c. R Squared = .019 (Adjusted R Squared = .015)

d. R Squared = .021 (Adjusted R Squared = .018)

e. R Squared = .011 (Adjusted R Squared = .008)

f. R Squared = .000 (Adjusted R Squared = -.003)

g. Computed using alpha = .05

The following tables are the SPSS results of one-way multivariate analysis of variance (MANOVA) between groups (Thinking – T and Feeling – F) of nurse aide students on test performance based on specific duty areas (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

	T or F	Mean	Std. Deviation	N
DA1 – Duty Area 1 (Communicating Information)	Thinking	81.70	13.240	56
	Feeling	80.15	11.516	270
	Total	80.42	11.823	326
DA2 – Duty Area 2 (Performing Basic Nursing Skills)	Thinking	79.63	10.860	56
	Feeling	80.32	10.486	270
	Total	80.20	10.538	326
DA3 – Duty Area 3 (Performing Personal Skills)	Thinking	80.92	9.786	56
	Feeling	80.37	12.162	270
	Total	80.46	11.776	326
DA4 – Duty Area 4 (Performing Basic Restorative Skills)	Thinking	84.82	10.380	56
	Feeling	82.85	10.908	270
	Total	83.19	10.829	326
DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	Thinking	82.59	19.610	56
	Feeling	79.44	22.989	270
	Total	79.98	22.448	326
DA6 – Duty Area 6 (Providing Residents' Rights)	Thinking	81.07	12.888	56
	Feeling	81.48	15.641	270
	Total	81.41	15.186	326

Box's Test of Equality of Covariance Matrices[a]

Box's M	23.995
F	1.096
df1	21
df2	35756.860
Sig.	.343

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + TorF

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
DA1 – Duty Area 1 (Communicating Information)	1.446	1	324	.230
DA2 – Duty Area 2 (Performing Basic Nursing Skills)	.020	1	324	.888
DA3 – Duty Area 3 (Performing Personal Skills)	4.320	1	324	.038
DA4 – Duty Area 4 (Performing Basic Restorative Skills)	.723	1	324	.396
DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	1.792	1	324	.182
DA6 – Duty Area 6 (Providing Residents' Rights)	2.175	1	324	.141

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + TorF

Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[g]
TorF	DA1 – Duty Area 1 (Communicating Information)	110.297	1	110.297	.789	.375	.002	.789	.144
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	22.290	1	22.290	.200	.655	.001	.200	.073
	DA3 – Duty Area 3 (Performing Personal Skills)	13.766	1	13.766	.099	.753	.000	.099	.061
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	180.767	1	180.767	1.544	.215	.005	1.544	.236
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	458.703	1	458.703	.910	.341	.003	.910	.158
	DA6 – Duty Area 6 (Providing Residents' Rights)	7.799	1	7.799	.034	.854	.000	.034	.054
Error	DA1 – Duty Area 1 (Communicating Information)	45315.743	324	139.863					
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	36067.048	324	111.318					
	DA3 – Duty Area 3 (Performing Personal Skills)	45058.248	324	139.069					
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	37932.850	324	117.077					
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	########	324	504.062					
	DA6 – Duty Area 6 (Providing Residents' Rights)	74943.122	324	231.306					

a. R Squared = .002 (Adjusted R Squared = -.001)
b. R Squared = .001 (Adjusted R Squared = -.002)
c. R Squared = .000 (Adjusted R Squared = -.003)
d. R Squared = .005 (Adjusted R Squared = .002)
e. R Squared = .003 (Adjusted R Squared = .000)
f. R Squared = .000 (Adjusted R Squared = -.003)
g. Computed using alpha = .05

The following tables are the SPSS results of one-way multivariate analysis of variance (MANOVA) between groups (Judging – J and Perceiving – P) of nurse aide students on test performance based on specific duty areas (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

	J or P	Mean	Std. Deviation	N
DA1 - Duty Area 1 (Communicating Information)	Judging	80.53	10.810	119
	Perceiving	80.35	12.392	207
	Total	80.42	11.823	326
DA2 - Duty Area 2 (Performing Basic Nursing Skills)	Judging	80.29	10.722	119
	Perceiving	80.15	10.456	207
	Total	80.20	10.538	326
DA3 - Duty Area 3 (Performing Personal Skills)	Judging	79.36	11.637	119
	Perceiving	81.10	11.837	207
	Total	80.46	11.776	326
DA4 - Duty Area 4 (Performing Basic Restorative Skills)	Judging	82.14	10.803	119
	Perceiving	83.79	10.825	207
	Total	83.19	10.829	326
DA5 - Duty Area 5 (Providing Mental Health and Social Service Needs)	Judging	76.68	24.079	119
	Perceiving	81.88	21.283	207
	Total	79.98	22.448	326
DA6 - Duty Area 6 (Providing Residents' Rights)	Judging	82.35	14.538	119
	Perceiving	80.87	15.555	207
	Total	81.41	15.186	326

Box's Test of Equality of Covariance Matrices[a]

Box's M	23.599
F	1.099
df1	21
df2	227045.199
Sig.	.339

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + JorP

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
DA1 – Duty Area 1 (Communicating Information)	2.831	1	324	.093
DA2 – Duty Area 2 (Performing Basic Nursing Skills)	.143	1	324	.706
DA3 – Duty Area 3 (Performing Personal Skills)	.009	1	324	.924
DA4 – Duty Area 4 (Performing Basic Restorative Skills)	.065	1	324	.799
DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	.498	1	324	.481
DA6 – Duty Area 6 (Providing Residents' Rights)	.180	1	324	.671

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + JorP

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[c]
Intercept	Pillai's Trace	.991	5954.203[b]	6.000	319.000	.000	.991	35725.217	1.000
	Wilks' Lambda	.009	5954.203[b]	6.000	319.000	.000	.991	35725.217	1.000
	Hotelling's Trace	111.991	5954.203[b]	6.000	319.000	.000	.991	35725.217	1.000
	Roy's Largest Root	111.991	5954.203[b]	6.000	319.000	.000	.991	35725.217	1.000
JorP	Pillai's Trace	.025	1.357[b]	6.000	319.000	.232	.025	8.141	.530
	Wilks' Lambda	.975	1.357[b]	6.000	319.000	.232	.025	8.141	.530
	Hotelling's Trace	.026	1.357[b]	6.000	319.000	.232	.025	8.141	.530
	Roy's Largest Root	.026	1.357[b]	6.000	319.000	.232	.025	8.141	.530

a. Design: Intercept + JorP

b. Exact statistic

c. Computed using alpha = .05

Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
JorP	DA1 – Duty Area 1 (Communicating Information)	2.393	1	2.393	.017	.896	.000	.017	.052
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	1.502	1	1.502	.013	.908	.000	.013	.052
	DA3 – Duty Area 3 (Performing Personal Skills)	228.714	1	228.714	1.652	.200	.005	1.652	.249
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	204.067	1	204.067	1.744	.188	.005	1.744	.261
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	2045.840	1	2045.840	4.099	.044	.012	4.099	.523
	DA6 – Duty Area 6 (Providing Residents' Rights)	166.266	1	166.266	.720	.397	.002	.720	.135
Error	DA1 – Duty Area 1 (Communicating Information)	45423.647	324	140.196					
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	36087.836	324	111.382					
	DA3 – Duty Area 3 (Performing Personal Skills)	44843.300	324	138.405					
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	37909.550	324	117.005					
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	########	324	499.164					
	DA6 – Duty Area 6 (Providing Residents' Rights)	74784.655	324	230.817					

a. R Squared = .000 (Adjusted R Squared = -.003)
b. R Squared = .000 (Adjusted R Squared = -.003)
c. R Squared = .005 (Adjusted R Squared = .002)
d. R Squared = .005 (Adjusted R Squared = .002)
e. R Squared = .012 (Adjusted R Squared = .009)
f. R Squared = .002 (Adjusted R Squared = -.001)
g. Computed using alpha = .05

Research Question # 2. The following tables are the SPSS results of one-way analysis of variance (ANOVA) between groups (IS, IN, ES, and EN) of nurse aide students on test performance (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

Dependent Variable: Test Performance

EI(SN)	Mean	Std. Deviation	N
IS	82.04	7.433	76
IN	80.80	7.710	68
ES	81.74	7.572	104
EN	79.16	7.625	78
Total	81.00	7.629	326

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Test Performance

F	df1	df2	Sig.
.168	3	322	.918

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + EISN

Tests of Between-Subjects Effects

Dependent Variable: Test Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	404.935[a]	3	134.978	2.348	.073	.021	7.044	.587
Intercept	2083727.598	1	2083727.598	36249.492	.000	.991	36249.492	1.000
EISN	404.935	3	134.978	2.348	.073	.021	7.044	.587
Error	18509.509	322	57.483					
Total	2157692.444	326						
Corrected Total	18914.443	325						

a. R Squared = .021 (Adjusted R Squared = .012)

b. Computed using alpha = .05

The following tables are the SPSS results of one-way multivariate analysis of variance (MANOVA) between groups (IS, IN, ES, and EN) of nurse aide students on test performance based on specific duty areas (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

	EI(SN)	Mean	Std. Deviation	N
DA1 – Duty Area 1 (Communicating Information)	IS	79.93	12.336	76
	IN	81.25	10.117	68
	ES	81.01	12.369	104
	EN	79.38	12.067	78
	Total	80.42	11.823	326
DA2 – Duty Area 2 (Performing Basic Nursing Skills)	IS	80.98	10.490	76
	IN	80.55	10.648	68
	ES	80.24	10.948	104
	EN	79.08	10.027	78
	Total	80.20	10.538	326
DA3 – Duty Area 3 (Performing Personal Skills)	IS	81.99	10.848	76
	IN	78.58	12.421	68
	ES	81.85	12.178	104
	EN	78.77	11.277	78
	Total	80.46	11.776	326
DA4 – Duty Area 4 (Performing Basic Restorative Skills)	IS	85.03	10.159	76
	IN	83.55	11.775	68
	ES	84.31	9.339	104
	EN	79.57	11.776	78
	Total	83.19	10.829	326
DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	IS	81.91	21.055	76
	IN	77.57	22.913	68
	ES	82.45	21.441	104
	EN	76.92	24.432	78
	Total	79.98	22.448	326
DA6 – Duty Area 6 (Providing Residents' Rights)	IS	82.37	15.652	76
	IN	81.76	12.806	68
	ES	80.96	15.612	104
	EN	80.77	16.258	78
	Total	81.41	15.186	326

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
DA1 - Duty Area 1 (Communicating Information)	.605	3	322	.612
DA2 - Duty Area 2 (Performing Basic Nursing Skills)	.081	3	322	.971
DA3 - Duty Area 3 (Performing Personal Skills)	.270	3	322	.847
DA4 - Duty Area 4 (Performing Basic Restorative Skills)	3.298	3	322	.021
DA5 - Duty Area 5 (Providing Mental Health and Social Service Needs)	.558	3	322	.643
DA6 - Duty Area 6 (Providing Residents' Rights)	.827	3	322	.480

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + EISN

Box's Test of Equality of Covariance Matrices[a]

Box's M	69.574
F	1.067
df1	63
df2	209250.667
Sig.	.335

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + EISN

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[d]
Intercept	Pillai's Trace	.992	6372.802[b]	6.000	317.000	.000	.992	38236.810	1.000
	Wilks' Lambda	.008	6372.802[b]	6.000	317.000	.000	.992	38236.810	1.000
	Hotelling's Trace	120.621	6372.802[b]	6.000	317.000	.000	.992	38236.810	1.000
	Roy's Largest Root	120.621	6372.802[b]	6.000	317.000	.000	.992	38236.810	1.000
EISN	Pillai's Trace	.065	1.175	18.000	957.000	.275	.022	21.143	.817
	Wilks' Lambda	.936	1.177	18.000	897.097	.273	.022	19.965	.787
	Hotelling's Trace	.067	1.179	18.000	947.000	.271	.022	21.230	.819
	Roy's Largest Root	.048	2.528[c]	6.000	319.000	.021	.045	15.170	.839

a. Design: Intercept + EISN

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

d. Computed using alpha = .05

Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
EISN	DA1 – Duty Area 1 (Communicating Information)	185.245	3	61.748	.439	.725	.004	1.318	.138
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	152.763	3	50.921	.456	.713	.004	1.369	.142
	DA3 – Duty Area 3 (Performing Personal Skills)	842.150	3	280.717	2.044	.108	.019	6.131	.522
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	1422.083	3	474.028	4.160	.007	.037	12.480	.851
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	2040.638	3	680.213	1.354	.257	.012	4.063	.360
	DA6 – Duty Area 6 (Providing Residents' Rights)	131.308	3	43.769	.188	.904	.002	.565	.085
Error	DA1 – Duty Area 1 (Communicating Information)	45240.795	322	140.499					
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	35936.574	322	111.604					
	DA3 – Duty Area 3 (Performing Personal Skills)	44229.864	322	137.360					
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	36691.533	322	113.949					
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	161734.286	322	502.280					
	DA6 – Duty Area 6 (Providing Residents' Rights)	74819.612	322	232.359					

a. R Squared = .004 (Adjusted R Squared = -.005)

b. R Squared = .004 (Adjusted R Squared = -.005)

c. R Squared = .019 (Adjusted R Squared = .010)

d. R Squared = .037 (Adjusted R Squared = .028)

e. R Squared = .012 (Adjusted R Squared = .003)

f. R Squared = .002 (Adjusted R Squared = -.008)

g. Computed using alpha = .05

Research Question # 3. The following tables are the SPSS results of one-way analysis of variance (ANOVA) between groups (SP, SJ, NP, and NJ) of nurse aide students on test performance (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

Dependent Variable: Test Performance

SN(JP)	Mean	Std. Deviation	N
SP	80.98	7.159	42
SJ	82.11	7.640	141
NP	80.12	7.106	76
NJ	79.66	8.260	67
Total	81.00	7.629	326

Levene's Test of Equality of Error Variances [a]

Dependent Variable: Test Performance

F	df1	df2	Sig.
.628	3	322	.598

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + SNJP

Tests of Between-Subjects Effects

Dependent Variable: Test Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	351.825[a]	3	117.275	2.034	.109	.019	6.103	.520
Intercept	1767395.354	1	1767395.354	30658.460	.000	.990	30658.460	1.000
SNJP	351.825	3	117.275	2.034	.109	.019	6.103	.520
Error	18562.619	322	57.648					
Total	2157692.444	326						
Corrected Total	18914.443	325						

a. R Squared = .019 (Adjusted R Squared = .009)

b. Computed using alpha = .05

The following tables are the SPSS results of one-way multivariate analysis of variance (MANOVA) between groups (SP, SJ, NP, and NJ) of nurse aide students on test performance based on specific duty areas (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

	SN(JP)	Mean	Std. Deviation	N
DA1 - Duty Area 1 (Communicating Information)	SP	79.96	10.898	42
	SJ	80.56	12.897	141
	NP	80.70	10.819	76
	NJ	80.10	11.326	67
	Total	80.42	11.823	326
DA2 - Duty Area 2 (Performing Basic Nursing Skills)	SP	80.74	11.526	42
	SJ	80.63	10.544	141
	NP	80.02	10.394	76
	NJ	79.17	10.199	67
	Total	80.20	10.538	326
DA3 - Duty Area 3 (Performing Personal Skills)	SP	81.40	12.537	42
	SJ	81.91	11.590	141
	NP	78.13	11.063	76
	NJ	79.48	12.203	67
	Total	80.46	11.776	326
DA4 - Duty Area 4 (Performing Basic Restorative Skills)	SP	82.89	8.289	42
	SJ	85.06	9.960	141
	NP	81.66	12.047	76
	NJ	81.16	12.041	67
	Total	83.19	10.829	326
DA5 - Duty Area 5 (Providing Mental Health and Social Service Needs)	SP	77.98	23.557	42
	SJ	83.87	20.296	141
	NP	75.99	24.644	76
	NJ	77.61	22.670	67
	Total	79.98	22.448	326
DA6 - Duty Area 6 (Providing Residents' Rights)	SP	79.52	17.384	42
	SJ	82.13	14.871	141
	NP	83.95	12.657	76
	NJ	78.21	16.599	67
	Total	81.41	15.186	326

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
DA1 – Duty Area 1 (Communicating Information)	1.499	3	322	.215
DA2 – Duty Area 2 (Performing Basic Nursing Skills)	.346	3	322	.792
DA3 – Duty Area 3 (Performing Personal Skills)	.412	3	322	.744
DA4 – Duty Area 4 (Performing Basic Restorative Skills)	4.276	3	322	.006
DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	.576	3	322	.631
DA6 – Duty Area 6 (Providing Residents' Rights)	.831	3	322	.478

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + SNJP

Box's Test of Equality of Covariance Matrices[a]

Box's M	79.019
F	1.203
df1	63
df2	92449.804
Sig.	.130

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + SNJP

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[d]
Intercept	Pillai's Trace	.990	5381.387[b]	6.000	317.000	.000	.990	32288.320	1.000
	Wilks' Lambda	.010	5381.387[b]	6.000	317.000	.000	.990	32288.320	1.000
	Hotelling's Trace	101.856	5381.387[b]	6.000	317.000	.000	.990	32288.320	1.000
	Roy's Largest Root	101.856	5381.387[b]	6.000	317.000	.000	.990	32288.320	1.000
SNJP	Pillai's Trace	.078	1.411	18.000	957.000	.118	.026	25.391	.898
	Wilks' Lambda	.924	1.414	18.000	897.097	.116	.026	23.980	.875
	Hotelling's Trace	.081	1.417	18.000	947.000	.115	.026	25.503	.899
	Roy's Largest Root	.052	2.785[c]	6.000	319.000	.012	.050	16.710	.878

a. Design: Intercept + SNJP

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

d. Computed using alpha = .05

Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
SNJP	DA1 – Duty Area 1 (Communicating Information)	24.381	3	8.127	.058	.982	.001	.173	.060
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	110.696	3	36.899	.330	.803	.003	.991	.114
	DA3 – Duty Area 3 (Performing Personal Skills)	814.499	3	271.500	1.975	.118	.018	5.926	.507
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	952.629	3	317.543	2.752	.043	.025	8.255	.663
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	3884.610	3	1294.870	2.608	.052	.024	7.823	.637
	DA6 – Duty Area 6 (Providing Residents' Rights)	1397.878	3	465.959	2.040	.108	.019	6.120	.522
Error	DA1 – Duty Area 1 (Communicating Information)	45401.658	322	140.999					
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	35978.641	322	111.735					
	DA3 – Duty Area 3 (Performing Personal Skills)	44257.515	322	137.446					
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	37160.987	322	115.407					
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	########	322	496.554					
	DA6 – Duty Area 6 (Providing Residents' Rights)	73553.042	322	228.426					

a. R Squared = .001 (Adjusted R Squared = -.009)
b. R Squared = .003 (Adjusted R Squared = -.006)
c. R Squared = .018 (Adjusted R Squared = .009)
d. R Squared = .025 (Adjusted R Squared = .016)
e. R Squared = .024 (Adjusted R Squared = .015)
f. R Squared = .019 (Adjusted R Squared = .010)
g. Computed using alpha = .05

Research Question # 4. The following tables are the SPSS results of one-way analysis of variance (ANOVA) between groups (ST, SF, NF, and NT) of nurse aide students on test performance (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

Dependent Variable: Test Performance

SN(TF)	Mean	Std. Deviation	N
ST	81.69	7.069	45
SF	81.93	7.655	135
NF	79.82	7.808	135
NT	81.21	6.065	11
Total	81.00	7.629	326

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Test Performance

F	df1	df2	Sig.
1.316	3	322	.269

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + SNTF

Tests of Between-Subjects Effects

Dependent Variable: Test Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	324.857[a]	3	108.286	1.876	.134	.017	5.627	.485
Intercept	823761.357	1	823761.357	14268.803	.000	.978	14268.803	1.000
SNTF	324.857	3	108.286	1.876	.134	.017	5.627	.485
Error	18589.587	322	57.732					
Total	2157692.444	326						
Corrected Total	18914.443	325						

a. R Squared = .017 (Adjusted R Squared = .008)
b. Computed using alpha = .05

The following tables are the SPSS results of one-way multivariate analysis of variance (MANOVA) between groups (ST, SF, NF, and NT) of nurse aide students on test performance based on specific duty areas (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

	SN(TF)	Mean	Std. Deviation	N
DA1 – Duty Area 1 (Communicating Information)	ST	81.11	14.035	45
	SF	80.37	11.762	135
	NF	79.94	11.305	135
	NT	84.09	9.468	11
	Total	80.42	11.823	326
DA2 – Duty Area 2 (Performing Basic Nursing Skills)	ST	79.70	10.774	45
	SF	80.84	10.745	135
	NF	79.80	10.234	135
	NT	79.34	11.742	11
	Total	80.20	10.538	326
DA3 – Duty Area 3 (Performing Personal Skills)	ST	80.42	10.373	45
	SF	82.41	11.980	135
	NF	78.33	12.044	135
	NT	82.95	6.898	11
	Total	80.46	11.776	326
DA4 – Duty Area 4 (Performing Basic Restorative Skills)	ST	85.97	10.249	45
	SF	84.17	9.469	135
	NF	81.53	12.070	135
	NT	80.11	10.007	11
	Total	83.19	10.829	326
DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	ST	83.33	19.943	45
	SF	81.85	21.689	135
	NF	77.04	24.059	135
	NT	79.55	18.769	11
	Total	79.98	22.448	326
DA6 – Duty Area 6 (Providing Residents' Rights)	ST	80.89	12.760	45
	SF	81.78	16.476	135
	NF	81.19	14.815	135
	NT	81.82	14.013	11
	Total	81.41	15.186	326

Box's Test of Equality of Covariance Matrices[a]

Box's M	80.303
F	1.136
df1	63
df2	4463.035
Sig.	.217

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + SNTF

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
DA1 - Duty Area 1 (Communicating Information)	1.859	3	322	.136
DA2 - Duty Area 2 (Performing Basic Nursing Skills)	.047	3	322	.987
DA3 - Duty Area 3 (Performing Personal Skills)	2.074	3	322	.104
DA4 - Duty Area 4 (Performing Basic Restorative Skills)	3.778	3	322	.011
DA5 - Duty Area 5 (Providing Mental Health and Social Service Needs)	.994	3	322	.396
DA6 - Duty Area 6 (Providing Residents' Rights)	.976	3	322	.404

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + SNTF

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[d]
Intercept	Pillai's Trace	.979	2498.411[b]	6.000	317.000	.000	.979	14990.467	1.000
	Wilks' Lambda	.021	2498.411[b]	6.000	317.000	.000	.979	14990.467	1.000
	Hotelling's Trace	47.289	2498.411[b]	6.000	317.000	.000	.979	14990.467	1.000
	Roy's Largest Root	47.289	2498.411[b]	6.000	317.000	.000	.979	14990.467	1.000
SNTF	Pillai's Trace	.065	1.180	18.000	957.000	.271	.022	21.236	.819
	Wilks' Lambda	.936	1.180	18.000	897.097	.271	.022	20.009	.788
	Hotelling's Trace	.067	1.179	18.000	947.000	.271	.022	21.230	.819
	Roy's Largest Root	.043	2.308[c]	6.000	319.000	.034	.042	13.846	.798

a. Design: Intercept + SNTF

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

d. Computed using alpha = .05

Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
SNTF	DA1 – Duty Area 1 (Communicating Information)	201.386	3	67.129	.478	.698	.004	1.434	.147
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	96.962	3	32.321	.289	.833	.003	.867	.105
	DA3 – Duty Area 3 (Performing Personal Skills)	1191.069	3	397.023	2.913	.035	.026	8.740	.691
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	954.210	3	318.070	2.756	.042	.025	8.269	.664
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	2150.344	3	716.781	1.428	.234	.013	4.284	.378
	DA6 – Duty Area 6 (Providing Residents' Rights)	39.136	3	13.045	.056	.983	.001	.168	.060
Error	DA1 – Duty Area 1 (Communicating Information)	45224.654	322	140.449					
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	35992.376	322	111.778					
	DA3 – Duty Area 3 (Performing Personal Skills)	43880.945	322	136.276					
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	37159.407	322	115.402					
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	########	322	501.940					
	DA6 – Duty Area 6 (Providing Residents' Rights)	74911.785	322	232.645					

a. R Squared = .004 (Adjusted R Squared = -.005)

b. R Squared = .003 (Adjusted R Squared = -.007)

c. R Squared = .026 (Adjusted R Squared = .017)

d. R Squared = .025 (Adjusted R Squared = .016)

e. R Squared = .013 (Adjusted R Squared = .004)

f. R Squared = .001 (Adjusted R Squared = -.009)

g. Computed using alpha = .05

Research Question # 5. The following tables are the SPSS results of one-way analysis of variance (ANOVA) between groups (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP, ENFP, and ENTJ) of nurse aide students on test performance (Illinois Nurse Aide Competency Examination).

Descriptive Statistics

Dependent Variable: Test Performance

Personality Types	Mean	Std. Deviation	N
ISTJ	84.27	6.555	20
ISFJ	80.98	7.911	45
INFJ	80.41	8.899	26
INTJ	81.33	1.333	3
ISTP	83.67	5.033	4
ISFP	81.73	6.624	10
INFP	81.19	7.402	37
INTP	78.00	.943	2
ESTP	83.73	5.610	5
ESFP	79.15	7.835	22
ENFP	79.18	6.703	34
ENTP	82.40	9.160	5
ESTJ	77.33	6.868	16
ESFJ	83.75	7.271	58
ENFJ	78.67	8.370	38
ENTJ	81.33	.	1
Total	81.00	7.629	326

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Test Performance

F	df1	df2	Sig.
1.569	15	310	.081

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Type

Tests of Between-Subjects Effects

Dependent Variable: Test Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	1371.172[a]	15	91.411	1.615	.068	.072	24.229	.895
Intercept	579785.145	1	579785.145	10245.147	.000	.971	10245.147	1.000
Type	1371.172	15	91.411	1.615	.068	.072	24.229	.895
Error	17543.271	310	56.591					
Total	2157692.444	326						
Corrected Total	18914.443	325						

a. R Squared = .072 (Adjusted R Squared = .028)

b. Computed using alpha = .05

The following tables are the SPSS results of one-way multivariate analysis of variance (MANOVA) between groups (ISTJ, ISFJ, INFJ, INTJ, ISTP, ISFP, INFP, INTP, ESTP, ESFP,

ENFP, and ENTJ) of nurse aide students on test performance based on specific duty areas

(Illinois Nurse Aide Competency Examination).

Descriptive Statistics

Personality Types		Mean	Std. Deviation	N
DA1 – Duty Area 1 (Communicating Information)	ISTJ	82.92	13.100	20
	ISFJ	78.52	11.983	45
	INFJ	79.17	10.607	26
	INTJ	86.11	12.729	3
	ISTP	91.67	11.785	4
	ISFP	76.67	8.607	10
	INFP	82.66	9.698	37
	INTP	75.00	0.000	2
	ESTP	81.67	6.972	5
	ESFP	79.17	11.994	22
	ENFP	77.94	11.584	34
	ENTP	88.33	7.454	5
	ESTJ	76.04	16.066	16
	ESFJ	82.90	11.725	58
	ENFJ	79.61	12.807	38
	ENTJ	75.00		1
	Total	80.42	11.823	326
DA2 – Duty Area 2 (Performing Basic Nursing Skills)	ISTJ	80.91	9.162	20
	ISFJ	80.00	11.235	45
	INFJ	81.64	9.998	26
	INTJ	69.70	9.462	3
	ISTP	85.23	10.079	4
	ISFP	82.73	9.040	10
	INFP	80.71	11.206	37
	INTP	79.55	3.214	2
	ESTP	87.27	6.742	5
	ESFP	76.45	12.280	22
	ENFP	79.14	9.634	34
	ENTP	86.36	12.448	5
	ESTJ	74.43	11.954	16
	ESFJ	82.84	9.635	58
	ENFJ	78.23	10.034	38
	ENTJ	72.73		1
	Total	80.20	10.538	326

Descriptive Statistics

Personality Types		Mean	Std. Deviation	N
DA3 – Duty Area 3 (Performing Personal Skills)	ISTJ	82.50	9.851	20
	ISFJ	81.11	10.701	45
	INFJ	77.88	13.833	26
	INTJ	87.50	0.000	3
	ISTP	79.69	13.858	4
	ISFP	85.63	12.517	10
	INFP	78.21	12.114	37
	INTP	81.25	0.000	2
	ESTP	82.50	9.270	5
	ESFP	79.26	13.277	22
	ENFP	78.13	10.688	34
	ENTP	80.00	9.270	5
	ESTJ	77.34	10.674	16
	ESFJ	84.05	12.232	58
	ENFJ	78.95	12.280	38
	ENTJ	87.50		1
	Total	80.46	11.776	326
DA4 – Duty Area 4 (Performing Basic Restorative Skills)	ISTJ	90.94	8.231	20
	ISFJ	83.89	10.617	45
	INFJ	83.17	13.319	26
	INTJ	85.42	3.608	3
	ISTP	82.81	5.984	4
	ISFP	80.63	8.565	10
	INFP	83.61	11.539	37
	INTP	84.38	4.419	2
	ESTP	85.00	11.354	5
	ESFP	83.81	8.105	22
	ENFP	80.51	12.382	34
	ENTP	73.75	12.022	5
	ESTJ	80.86	10.818	16
	ESFJ	85.13	9.206	58
	ENFJ	79.28	11.359	38
	ENTJ	87.50		1
	Total	83.19	10.829	326

Descriptive Statistics

Personality Types		Mean	Std. Deviation	N
DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	ISTJ	85.00	17.014	20
	ISFJ	80.56	21.246	45
	INFJ	79.81	22.382	26
	INTJ	83.33	14.434	3
	ISTP	75.00	20.412	4
	ISFP	85.00	26.874	10
	INFP	77.03	23.847	37
	INTP	50.00	0.000	2
	ESTP	80.00	20.917	5
	ESFP	72.73	23.028	22
	ENFP	76.47	26.786	34
	ENTP	85.00	13.693	5
	ESTJ	84.38	23.936	16
	ESFJ	85.78	19.930	58
	ENFJ	75.66	23.601	38
	ENTJ	100.00		1
	Total	79.98	22.448	326
DA6 – Duty Area 6 (Providing Residents' Rights)	ISTJ	86.00	11.425	20
	ISFJ	81.78	15.269	45
	INFJ	77.69	14.229	26
	INTJ	86.67	11.547	3
	ISTP	80.00	0.000	4
	ISFP	78.00	23.944	10
	INFP	84.86	10.960	37
	INTP	70.00	14.142	2
	ESTP	76.00	16.733	5
	ESFP	80.91	16.877	22
	ENFP	83.53	13.458	34
	ENTP	84.00	16.733	5
	ESTJ	76.25	13.102	16
	ESFJ	82.76	16.091	58
	ENFJ	77.89	18.477	38
	ENTJ	80.00		1
	Total	81.41	15.186	326

Box's Test of Equality of Covariance Matrices [a]

Box's M	192.610
F	.904
df1	189
df2	21186.984
Sig.	.822

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + Type

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
DA1 - Duty Area 1 (Communicating Information)	1.286	15	310	.209
DA2 - Duty Area 2 (Performing Basic Nursing Skills)	1.112	15	310	.344
DA3 - Duty Area 3 (Performing Personal Skills)	1.168	15	310	.295
DA4 - Duty Area 4 (Performing Basic Restorative Skills)	1.986	15	310	.016
DA5 - Duty Area 5 (Providing Mental Health and Social Service Needs)	1.096	15	310	.359
DA6 - Duty Area 6 (Providing Residents' Rights)	1.049	15	310	.404

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Type

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[d]
Intercept	Pillai's Trace	.973	1801.644[b]	6.000	305.000	.000	.973	10809.863	1.000
	Wilks' Lambda	.027	1801.644[b]	6.000	305.000	.000	.973	10809.863	1.000
	Hotelling's Trace	35.442	1801.644[b]	6.000	305.000	.000	.973	10809.863	1.000
	Roy's Largest Root	35.442	1801.644[b]	6.000	305.000	.000	.973	10809.863	1.000
Type	Pillai's Trace	.322	1.173	90.000	1860.000	.132	.054	105.597	1.000
	Wilks' Lambda	.716	1.172	90.000	1721.814	.135	.054	98.636	1.000
	Hotelling's Trace	.347	1.169	90.000	1820.000	.137	.055	105.204	1.000
	Roy's Largest Root	.115	2.386[c]	15.000	310.000	.003	.104	35.795	.985

a. Design: Intercept + Type

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

d. Computed using alpha = .05

Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[g]
Type	DA1 – Duty Area 1 (Communicating Information)	2599.271	15	173.285	1.254	.230	.057	18.815	.780
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	2499.481	15	166.632	1.538	.090	.069	23.068	.876
	DA3 – Duty Area 3 (Performing Personal Skills)	2160.209	15	144.014	1.040	.413	.048	15.606	.677
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	2932.507	15	195.500	1.723	.046	.077	25.840	.918
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	8094.911	15	539.661	1.075	.379	.049	16.119	.695
	DA6 – Duty Area 6 (Providing Residents' Rights)	3037.125	15	202.475	.873	.595	.041	13.092	.578
Error	DA1 – Duty Area 1 (Communicating Information)	42826.769	310	138.151					
	DA2 – Duty Area 2 (Performing Basic Nursing Skills)	33589.856	310	108.354					
	DA3 – Duty Area 3 (Performing Personal Skills)	42911.805	310	138.425					
	DA4 – Duty Area 4 (Performing Basic Restorative Skills)	35181.109	310	113.487					
	DA5 – Duty Area 5 (Providing Mental Health and Social Service Needs)	155680.012	310	502.194					
	DA6 – Duty Area 6 (Providing Residents' Rights)	71913.796	310	231.980					

a. R Squared = .057 (Adjusted R Squared = .012)

b. R Squared = .069 (Adjusted R Squared = .024)

c. R Squared = .048 (Adjusted R Squared = .002)

d. R Squared = .077 (Adjusted R Squared = .032)

e. R Squared = .049 (Adjusted R Squared = .003)

f. R Squared = .041 (Adjusted R Squared = -.006)

g. Computed using alpha = .05

REFERENCES

ACTE. (2006). *Expanding opportunities: Postsecondary career and technical education and preparing tomorrow's workforce.* A Position Paper. Retrieved from https://www.acteonline.org/uploadedFiles/Assets_and_Documents/Global/files/Publicatio ns/Expanding_Opportunities_Postsecondary_CTE_full.pdf

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (1999). *Standards for educational and psychological testing*. Washington, DC: American Educational Research Association.

Anchors, S., Robins, M. A., & Gershman, E. S. (1989). The relationship between Jungian type and persistence to graduate among college students. *Journal of Psychological Type, 17*, 20-25.

Aragon, S. R., Johnson, S. D., & Shaik, N. (2002). The influence of learning style preference on student success in online versus face-to-face environments. *The American Journal of Distance Education, 16*, 227 – 245.

Arnold, K. & King, I. C. (1997). *College student development and academic life: Psychological intellectual, social and moral issues*. New York, NY: Garland Publishing.

Bastable, S. (2014). *Nurse as educator: Principles of teaching and learning for nursing practice*. Burlington, MA: Jones and Bartlett Learning.

Bean, C. A., & Holcombe, J. K. (1993). Personality types of oncology nurses. *Cancer Nursing, 16*(6), 479 – 85. http:dx.doi.org/ 10.1097/00002820-199312000-00009

Bell, J. (2008). *An examination of cognitive and non-cognitive factors and academic success on the pre-engineering curriculum at a four-year Southeastern University* (Doctoral dissertation). Auburn University, AL.

Bloom, B. (1956). *Taxonomy of educational objectives: Cognitive domains*. White Plains, NY: Longman.

Bortz, R. F. (2014a). *A learner's guide to individualizing learning*. Carbondale, IL: Southern Illinois University.

Bortz, R. F. (2014b). *Occupational analysis and curriculum development*. Carbondale, IL: Southern Illinois University.

Brown, V. L., & DeCoster, D. A. (1991). The Myers-Briggs Type Indicator® as developmental measure: Implications for student learners in higher education. *Journal of College Student Development, 32*, 378 – 379.

Bureau of Labor Statistics (2015). *Occupational outlook handbook*. Retrieved from http://www.bls.gov/ooh/healthcare/nursing-assistants.htm

Campbell, D. T., & Kenny, D. A. (1999). *A primer regression artifact*. New York, NY: Guilford Press.

Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi-experimental designs for research*. Chicago, IL: Rand McNally.

Carlson, J. G. (1985). Recent assessment of Myers-Briggs Type Indicator®. *Journal of Personality Assessment, 49*, 356 – 365. http://dx.doi.org/10.1207/s15327752jpa4904_3

Carraher, T. N., Carraher, D. W., & Schilemann, D. D. (1985). Mathematics in the streets and schools. *British Journal of Developmental Psychology, 3*(1), 21-29. http://dx.doi.org/10.1111/j.2044-835X.1985.tb00951.x

Center for Applied Cognitive Studies. (2004). *What are the big five?* Retrieved from http://www.centacs.com/starting.htm

Charlton, R. E. (1980). Cognitive style considerations form the improvement of biology education. *The American Biology Teacher, 42*(4), 244 – 247. http://dx.doi.org/10.2307/4446912

Chickering, A. W., & Reisser, L. (1993). *Education and identify in college*. Palo Alto, CA: Consulting Psychologist Press.

Chickering, A. W. (1969). *Education and identity*. San Francisco, CA: Jossey-Bass.

Chomsky, N. (2002). *Syntactic structures*. AQ, The Hague: Mouton.

Cohen, J. (1988). Statistical power analysis for behavioral sciences. Hillsdale, NJ: Erlbaum.

Cornett, C. (1983). *What you should know about teaching and learning styles*. Bloomington, IA: Phi Delta Kappa Educational Foundation.

Cronbach, L. J. (1960). *Essentials of psychological testing*. New York, NY: Harper & Row.

Dearnley, C., & Matthew, B. (2007). Factors that contribute to undergraduate student success. *Teaching in Higher Education, 12*(3), 377-391. http://dx.doi.org/10.1080/13562510701278740

Dill, M. J., & Salsberg, E. S. (2008). The complexities of physician supply and demand: Projections through 2025. *Association of Medical Colleges*, 1-90. Retrieved from http://www.innovationlabs.com/pa_future/1/background_docs/AAMC%20Complexities%20of%20physician%20demand,%202008.pdf

DiTiberio, J. K. (1996). Education, learning styles, and cognitive styles. In A. L. Hammer (Ed.), *MBTI® applications: A decade of research on Myers-Briggs Type Indicator®* (pp. 123-166). Mountain View, CA: Consulting Psychologist Press.

Dunn, R., & Beaudry, J. & Kalvas, A. (1989). Survey of research on learning styles. *Educational Leadership, 46*(6), 50-58.

Dunn, R., Gemake, J., Jalali, F., Zenhausern, R., Quinn, P., & Spiridakis, J. (1990). Cross cultural differences in learning styles of elementary-age-students from four ethnic background. *Journal of Multicultural Counseling and Development, 18*, 68-93. http://dx.doi.org/10.1002/j. 2161-1912.1990.tb00438.x

Edelman, G. M. (1978). Group selection and phasic reentrant signaling: A theory of higher brain function. In G. M. Edelman & V. Mountcastle (Eds.)., *The mindful brain*. Cambridge, MA: The MIT Press.

Edelman, G. M. (1987). *Neural Darwinism: The theory of neuronal group selection*. New York, NY: Basic Books.

Erikson, E. H. (1959). *Identity and the life cycle: Psychological issues monograph I*. New York, NY: International Universities Press.

Erlen, J. A. (2001). The nursing shortage, patient care, and ethics. *Orthopedic Nursing, 20*(6), 61-65.

Evans, N. J., Forney, D. S., & Guido-DiBrito, F. (1998). *Student development in college: Theory, research, and practice*. San Francisco, CA: Jossey-Bass.

Eysenck, H. J., & Eysenck, M. W. (1985). *Personality and individual differences: A natural science approach*. New York City, NY: Springer Publishing.

Gallagher, S. A. (1988). An analysis of visual-spatial ability, intellectual efficiency, and learning style on mathematics achievement of gifted male and gifted female adolescents (Doctoral dissertation, University of North Carolina at Chapel Hill). *Dissertation Abstracts International*, 48/07-A, 1733.

Gambles, M., Wilkinson, S. M., & Dissanayake, C. (2003). What are you like? A personality profile of cancer and palliative care nurses in the United Kingdom. *Cancer Nursing, 26*(2), 97-104.

Ghiselli, E. E., Campbell, J. P., & Zedeck, S. (1981). *Measurement theory of behavioral sciences*. San Francisco, CA: WH Freeman and Company.

Gibson, E. J. (1969). *Principles of perpetual learning and development*. New York, NY: Pearson.

Gliner, J. A., Morgan, G. A., & Leech, N. L. (2009). *Research methods in applied settings: An integrated approach to design and analysis*. New York, NY: Routledge.

Greeno, J. G., Smoth, D. R., & Moore, G. L. (1992). Transfer of situated learning. In D. Detterman and R. J. Sternberg (Eds.)., *Transfer on trial: Intelligence, cognition, and instruction*. Norwood: NJ: Ablex.

Griffin, R., MacKewin, A., Moser, E., & VanVuren, K. W. (2013). Learning skills and motivation: Correlates to superior academic performance. *Business Education and Accreditation, 5*(1), 53-65.

Grindler, J., & Bandler, R. (1976). *The structure of magic II*. Palo Alto, CA: Science and Behavior Books.

Guild, P., & Garner, S. (1985). *Marching to different drummers*. Alexandria, VA: Association for Supervision and Curriculum Development.

Halstead, J. (2012). Advancing our nation's health: Caring for our aging population. Nursing *Education Perspectives, 33*(3), 140.

Hammer. A. E. (1996). *MBTI® applications: A decade of research on the Myers-Briggs Type Indicator®*. Mountain View, CA: Consulting Psychologist Press.

Hancock, G. R., & Mueller, R. O. (2010). *The reviewer's guide to quantitative methods in social sciences*. New York, NY: Routledge.

Handel, M. (2006). *Worker skills and job requirements: Is there a mismatch?* Washington, DC: Economic Policy Institute.

Health and Medicine Policy Research Group. (2015). *Homecare workforce in Illinois: Workforce categories, certification, training needs, and other challenges.* Retrieved from http://hmprg.org/assets/root/Workforce/Final.%20%20Home%20Care%20Update%20%20January%202015.pdf

Holland, J. L. (1997). *MBTI® applications: A decade of research on the Myers-Briggs Type Indicator®*. Palo Alto, CA: Consulting Psychologists Press.

Illinois Center for Nursing. (2009). *Nursing in Illinois*. Retrieved from http://nursing.illinois.gov/nursinginillinois.asp

Illinois Center for Nursing. (2015). *Licensed Practical Nurse: Workforce survey report 2015*. Retrieved from http://nursing.illinois.gov/PDF/20160309_ICN_LPN_2015_Survey_Report_Final.pdf

Illinois Department of Public Health (2016). *Healthcare worker registry: Certified nursing assistant facts*. Retrieved from https://hcwrpub.dph.illinois.gov/

Illinois Nurse Aide Testing (2016b). *Training programs.* Retrieved from http://www.nurseaidetesting.com/nurse-aide-students/training-programs

Illinois Nurse Aide Testing. (2016a). *Nurse aide testing program.* Retrieved from http://www.nurseaidetesting.com/

Institute of Medicine. (2012). *The future of nursing: Leading change, advancing health*.

    Retrieved from http://www.iom.edu/reports/2010/the-future-of-nursing-leading-change-

    advancing-health.aspx

Jensen, G. H. (1986). The reification of the basic writer. *Journal of Basic Writing, 5*(1), 52- 64.

Jensen, G. H., & DiTiberio, J. K. (1983). The MBTI® and writing blocks. *MBTI News, 5*, 14-15.

Jenson, G. H., & DiTiberio, J. K. (1984). Personality and individual writing processes. *College*

    Composition and Communication, 35, 285 – 300.

Jung, C. G. (1923). *Psychological types*. Princeton, NJ: Princeton University Press.

Jung, C. G. (1971). *Psychological types*. Princeton, NJ: Princeton University Press.

Jung, C. G. (1990). *Psychological types*. Princeton, NJ: Princeton University Press.

Kalsbeek, D. (1987). Campus retention: MBTI® instrument in institutional self-studies. In J. A.

    Provost & S. Anchors (Eds.), *Application of the Myers-Briggs Type Indicator® in higher*

    education (pp. 31 – 63). Mountain View, CA: Davies-Black Publishing.

Kalsbeek, D. H. (1989). *Linking learning style theory with retention research: The TRAILS*

    project. Paper presented at the Association for Institutional Research forum, Orlando, FL.

Keefe, J. W. (1982). Assessing student learning styles: An overview. In T. F., Koerner (Ed.),

    Student learning styles and brain behavior. Reston, VA: National Association of

    Secondary School Principals.

Keefe, J. W. (1991). *Learning style: Cognitive and thinking skills*. Reston, VA: National

    Association of Secondary School Principals.

Keefe, J. W., & Ferrell, B. G. (1990). Developing a defensible learning style paradigm.

    Educational leadership, 48(2), 57 – 61.

Kelly, M. M. C. (1998). *Personality traits of nurses in anesthesia and family nurse practitioner* (Master's Thesis). Retrieved from Uniformed Services of Health Sciences. (Order No. 0704-188). Southern Illinois University, Carbondale.

Kim, M. R., & Han, S. J. (2014). Relationship between the Myers-Briggs Type Indicator personality profiling, academic performance, and student satisfaction in nursing students. *International Journal of Bio-Technology, 6*(6), 1-12. http://dx.doi.org/10.14257/ijbsbt.2014.6.6.01

Kinnair, D. (2012). An aging population requires radical changes to nursing education and practice. *Journal of Holistic Healthcare, 9*(1), 24-26.

Kise, J. A. (2007). *Differentiation through personality types*. Thousand Oaks, CA: Corwin Press.

Kise, J. A. G., & Russell, B. (2008). *Differentiated school leadership: Effective collaboration, communication, and change through personality type*. Thousand Oaks, CA: Corwin.

Kolb, D. (1981). The modern American college: Responding to the new realities of diverse students and a changing society. In A. W. Chickering and Associates (Ed.), *Learning styles and disciplinary differences*, pp. 232-252). San Francisco, CA: Jossey-Bass.

Kolb, D. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice Hall.

Koran, J. (2015). *Introduction to quantitative methods*. Carbondale, IL: Southern Illinois University.

Langer, N. (2008). Integrating compliance, communication, and culture: Delivering health care to an aging population. *Educational Gerontology, 34*(5), 385 - 396. http://dx.doi.org/10.1080/03601270701838381

Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life*. Cambridge, MA: Cambridge University Press.

Lawrence, G. (1982). *People types and tiger stripes: A practical guide to learning styles*. Gainesville, FL: Center for Applications of Psychological Types.

Lawrence, G. (1984). A synthesis of learning style research involving the MBTI®. *Journal of Psychological Type*, 8, 2 – 15.

Lawrence, G. (2009). *People types and tiger stripes: Using psychological types to help students discover their unique potential*. Gainesville, FL: Center for Application of Psychological Type.

Lee, Y. H., Lee, Y. M., & Kim, D. K. (2009). The relationship between personality types and the academic achievement levels of dental students. *Korean Journal Human Development, 16*, 179.

Levy, N., & Padilla, A. (1982) A Spanish translation of the Myers-Briggs Type Indicator® Form. *Psychological Reports, 51*, 109-110. http://dx.doi.org/ 10.2466/pr0.1982.51.1.109

Li, Y. (2003). *Assessment of nursing college students' learning styles in Taiwan using the Myers-Briggs Type Indicator®* (Doctoral Dissertation). Retrieved from ProQuest Information and Learning Company. (Order No. 3116740). University of Southern California, CA.

Li, Y., Yu, W., Liu, C., Sheih, S., & Yang, B. (2014). An exploratory study of relationship between academic performance among students in different nursing programs. *Contemporary Nurse: A Journal of the Australian Nursing Profession, 48*(2), 229 – 239.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: SAGE.

Love, P. G., & Guthrie, V. L. (1999). *Understanding and applying cognitive development theory.* San Francisco, CA: Jossey-Bass.

Lowen, W. (1982). *Dichotomies of mind: A systems science model of mind and personality*. New York, NY: John Wiley & Sons.

Malloy, H. D. (2007). *The relationship of learning style, academic achievement, and psychological type of baccalaureate nursing students* (Doctoral Dissertation). Retrieved from ProQuest. (Order No. 3324183).

Marieb, E. N. & Hoehn, K. (2013). *Human anatomy and physiology*. Glenview, IL: Pearson Education.

Mathews, C. (2013). Health's triple aim. *Health Management Technology, 34*(1), 24-26.

McCaulley, M. H. (1977). Personality variables: Modal profiles that characterize the various fields of science and what they mean for education. *Journal of College Science Teaching, 7*, 114-120.

McCaulley, M. H. (1990). The MBTI® and the individual pathways in engineering design. *Engineering Education*, *80*, 537-542.

McCaulley, M. H. (1999). Lifelong type development: Insights from the letters of Isabel Briggs Myers. In P. McReynolds (Ed.). *Advances in personality assessment*. San Francisco, CA: Jossey Bass.

McCaulley, M. H., & Kainz, R. I. (1974). *The University of Florida longitudinal study: First follow-up*. Unpublished paper.

McCaulley, M. H., & Natter, F. L. (1974). *Psychological (Myers-Briggs) type differences in education*. Gainesville, FL: Center for Applications of Psychological Types.

McCaulley, M. H., & Natter, F. L. (1980). *Psychological type differences in education*. Gainesville, FL: Center for Application of Psychological Type.

Morgan, G. A., Gliner, J. A., & Harmon, R. J. (2006). *Understand and evaluating research in applied and clinical settings*. Mahwah, NJ: Lawrence Erlbaum Associates.

Morgan, H. (1997). *Cognitive styles and classroom learning*. Westport, CT: Praeger.

Murphy, K. R., & Davidshofer, C. O. (1985). *Psychological testing*. Upper Saddle River, NJ: Prentice-Hall.

Myers, I. B. (1988). *Introduction to type: A guide to understanding your results on the MBTI Instrument*. Mountain View, CA: Consulting Psychologist Press.

Myers, I. B., & Kirby, L. K. (1994). *Introduction to type dynamics and development: Exploring the next level of type*. Palo Alto, CA: Consulting Psychologist Press.

Myers, I. B., & McCaulley, M. H. (1985). *Manual: A guide to the development and use of the Myers-Briggs Type Indicator®*. Mountain View, CA: Consulting Psychologist Press.

Myers, I. B., & Myers, P. B. (1980). *Gifts differing*. Palo Alto, CA: Consulting Psychologist Press.

Myers, I. B., & Myers, P. B. (1995). *Gifts differing: Understanding personality type*. Mountain View, CA: Davies-Black.

Myers, I. B., McCaulley, M. H., Quenk, N. L., & Hammer, A. L. (1998). *MBTI® manual: A guide to the development and use of the Myers-Briggs Type Indicator®*. Palo Alto, CA: Consulting Psychologist Press.

Myers, I.B., McCaulley, M. H., Quenk, N. L., & Hammer, A. L. (2003). *MBTI® manual: A guide to the development of the Myers-Briggs Type Indicator®* (3rd ed.). Mountain View, CA: Consulting Psychologist Press.

Naomi, L. Q. (2009). *Essentials of Myers-Briggs Type Indicator® assessment*. Hoboken, NJ:

> John Wiley & Sons.

Neral, S. M. (1989). *Determining whether a predictive relationship exists between non-cognitive*

> *characteristics and academic achievement levels of freshmen medical students* (Doctoral

> Dissertation). Retrieved from Dissertation Abstracts International. (Order No. 50/04-A,

> 906)

O*Net Online. (2016). *Summary report for: Nursing Assistants*. Retrieved from

> http://www.onetonline.org/link/summary/31-1014.00

Pascarella, E. T., & Terrazini, P. T. (1997). *How college affects students: Findings and insights*

> *from twenty years of research.* San Francisco, CA: Jossey-Bass.

Paul, G. (2014, March). *Are multiple choice exams biased against the global majority of*

> *students?* Paper presented at the 21st Annual Oxford Round Table on Childhood

> Education, University of Oxford, England.

Pelly, J. W., & Dalley, B. K. (1997). *Success types for medical students: A program for*

> *improving academic performance*. Palo Alto, CA: Consulting Psychologist Press.

Peterson, E., Rubie-Davies, C., Elley-Brown, M., Widdowson, D., Dixon, R., & Earl-Irving, S.

> (2011). Who is to blame? Students, teachers, and parents view on who is responsible for

> student achievement. *Research in Education, 86*(1), 1-12.

> http://dx.doi.org/10.7227/RIE.86.1

PHI State Facts. (2013). *Illinois' direct care workforce.* Retrieved from

> http://phinational.org/sites/phinational.org/files/clearinghouse/PHI-StateFacts-IL.pdf

Pollard, C. K. (1989). *The relationship of GPA to personality factors of students as measured by the MBTI® and the 16F®* (Doctoral Dissertation). Retrieved from Dissertation Abstract International. (Order No. 49/10-A, 3006)

Prestia, A., & Dyess, S. (2012). Maximizing caring relationships between nursing assistants and patients: Care partners. *Journal of Nursing Administration, 42*(3), 144-147. http://dx.doi.org/10.1097/NNA.0b013e3182484efd

Provost, J. A. (1985). Type watching and college attrition. *Journal of Psychological Type, 9*, 16-23.

Provost, J. A., & Anchors, S. (2003). *Using the MBTI® instrument in colleges and universities*. Gainesville, FL: Center for Applications of Psychological Type.

Provost, J. A., & Anchors, S. (2012). *Using the MBTI® instrument in colleges and universities*. Gainesville, FL: Center for Applications of Psychological Type.

Quenk, N. L. (2009). *Essentials of Myers-Briggs Type Indicator® Assessment*. Hoboken, NI: John Wiley & Sons.

Ross, J. L., Drysdale, T. B., & Schulz, R. A. (2001). Cognitive learning styles and academic performance in two secondary computer application courses. *Journal of Research on Computing in Education, 33*, 400 – 413.

Sak, U. (2004). A synthesis of research on psychological types of gifted adolescents. *The Journal of Secondary Gifted Education, 15*(2), 70 – 79. http://dx.doi.org/10.4219/jsge-2004-449

Sanborn, D. K. (2013). *Myers-Briggs® preferences and academic success in the first college semester* (Doctoral Dissertation). Retrieved from Graduate Theses and Dissertation. (Order No. 13059)

Sandeen, A. (1991). *The professional student affairs administrator*. San Fransisco, CA: Jossey Bass.

Schaubhut, N. A., Herk, N. A., Thompson, R. C. (2009). *MBTI® Form M manual supplement*. Palo Alto, CA: Consulting Psychologist Press.

Schmeck, R. R. (1998). *Learning strategies and learning styles*. New York City, NY: Springer Science & Business Media.

Schmider, E., Ziegler, M., Danay, E., Beyer, L., & Bühner, M. (2010). Is it really robust: Reinvestigating the robustness of ANOVA against violations of normal distribution assumption. *Methodology, 6*(4), 147-151. http://dx.doi.org/ 10.1027/1614-2241/a000016

Schurr, K. T., & Ruble, V. E. (1986). The Myers-Briggs Type Indicator® and first year college achievement: A look beyond aptitude test results. *Journal of Psychology Type, 12*, 25-37.

Schurr, K. T., Rubble, V. E., & Henriksen, L. (1988). Relationship of Myers-Briggs Type Indicator® personality characteristics and self-reported academic problems and skill ratings with scholastic aptitude test scores. *Educational and Psychological Measurement, 48*, 187-194.

Sharpe, C. P. (1986). *A study of the relationship between nursing students' psychological type and completion of the associate degree nursing program* (Doctoral Dissertation). Retrieved from Dissertation Abstract International. (Accession No. DAI 50-01B, 105)

Shiflett, S. C. (1989). Validity evidence of the Myers-Briggs Type Indicator as a measure of hemispheric dominance. *Educational and Psychological Measurement, 49*(3), 741-745. https://doi.org/10.1177/001316448904900329

Snyder, R. F. (2000). The relationship between learning styles/multiple intelligences and

    academic achievement of high school students. *High School Journal, 83*, 11 – 20.

Standardized test [Def. 1.] (n.d.). In *The Glossary of education reform for journalist, parents,*

    and community members, Retrieved from http://edglossary.org/standardized-test/

Stone, R., & Weiner, J. (2001). *Who will care for us? Addressing the long-term care workforce*

    crisis. Washington, D.C.: Urban Institute and Robert Wood Johnson Foundation.

Swanson, R. A. (2013). *Theory building in applied disciplines*. San Francisco, CA: Berrett-

    Koehler.

Tabachnick, B. G., & Fidell, L. S. (2012). *Using multivariate statistics*. Boston, MA: Pearson.

Taggart, W. M., Kroeck, G., & Escoffier, M. R. (1991). Validity evidence of the Myers-Briggs

    Type Indicator as a measure of hemispheric dominance: Another view. *Educational and*

    Psychological Measurement, 51(3), 775-783. https://doi.org/10.1177/0013164491513029

Tashakkori, A., & Teddlie, C. (2002). *Handbook of mixed methods in social and behavioral*

    research. Thousand Oaks, CA: SAGE.

Tharp, G. D. (1992). Relationship between personality type and achievement in an undergraduate

    physiology course. *American Journal of Physiology, 262*(6), 1-3.

Thompson, B. (2003). *Score reliability: Contemporary thinking about reliability issues*.

    Thousand Oaks, CA: SAGE.

Tinsley, H. E. A., & Brown, S. D. (2000). *Handbook of applied multivariate statistics and*

    mathematical modeling. San Diego, CA: Academic Press.

United States Department of Health & Human Services. (2004). *Nursing aides, home health*

    aides, and related care occupations: National and local workforce shortages and

    associated data needs. Retrieved from http://www.bhpr.hrsa.gov/healthworkforce/

Vygotsky, L. S. (1962). *Thought and language*. Cambridge, MA: The MIT Press.

Walker, M. (2008). *Working with college students and student development theory primer*. Retrieved from http://uncw.edu/studentaffairs/pdc/documents/StudentDevelopmentTheorybyM.Walker.pdf

Whittington, K. D. (2014). *Utilizing the expectancy theory as a predictor of student academic success on the Illinois nurse assistant competency examination* (Doctoral dissertation). Southern Illinois University Carbondale, IL.

Wilson, M. A., & Languis, M. L. (1989). Differences in brain electrical activity patterns between introverted and extraverted adults. *Journal of Psychological Type, 18*, 14-23.

Woodruff, R.G.V., & Clarke, F. M. (1993). *Understanding the academic needs of minority students at the University of Hawaii, Manoa*. Psychological Type and Culture –East and West: A Multicultural Symposium (pp. 199–205).

Zeisset, R. M. (2000). *Statistics and measurement: An introduction for MBTI® users*. Gainesville, FL: Center for Applications of Psychological Type.

Zywiak, W. (2013). U.S. healthcare workforce shortages: Caregivers. *Computer Sciences Corporation, 8022*(14), 1-10. Retrieved from https://assets1.csc.com/health_services/downloads/CSC_US_Healthcare_Workforce_Shortages_Caregivers.pdf

APPENDICES

Appendix A – Letter to Project Coordinator of Illinois Nurse Aide Testing Project

SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE **DEPARTMENT OF WORKFORCE EDUCATION AND DEVELOPMENT**

SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE **NURSE AIDE TESTING**

Dr. Thomas Hovatter,

Project Coordinator,
Illinois Nurse Aide Testing Project,
Southern Illinois University, Carbondale, IL.

I am a doctoral candidate from the Department of Workforce Education and Development in the College of Education and Human Services at Southern Illinois University, Carbondale. I am writing this letter to seek your consent for a research project that I have planned so as to fulfill an important requirement for my doctoral degree. I am planning to conduct a study to better understand issues and challenges nurse aide students face taking the Certified Nursing Aide or Assistant (CNA) competency exam. The study involves students enrolled in Illinois Basic Nurse Aide Training programs at community colleges across Illinois. Since the Certified Nursing Aide or Assistant (CNA) competency exam is conducted by the Illinois Nurse Aide Testing Project at Southern Illinois University, Carbondale and you being a Project Coordinator, I want to seek your consent.

The research is being conducted after the Certified Nursing Aide or Assistant (CNA) competency examination, the Myers-Briggs Type Indicator® instrument (MBTI®) will be administered and demographic information (i.e. gender, age, ethnicity or race, education, and ESL) will be collected along with the last four digits of the SSN along with email address. The information related to truncated SSN is being collected to match the MBTI® data with the overall test scores and overall test scores based on specific duty areas. This will take approximately 10 to 15 minutes to complete. In addition, I need the CNA competency examination test scores and test scores based on duty areas of the participants. As you are a certified MBTI consultant, I request that you be my supervisor while the MBTI® is being administered at various test sites to answer any questions related to the survey and in sending the personality type and description related to it to the participants via email as an incentive for participation.

The collected data will be stored in a secure locked cabinet in my office. There will be no cost to students for participation. The participation poses no risks, to the participants either. This study will also seek an approval from SIUC Human Subjects Committee. Once I receive the approval letter, I will email a copy to you. I deeply appreciate your help and generosity and once again thank you for helping me in this important research. If you have any questions, please feel free to email me at sameer.ahmed@siu.edu or contact me on (618) 559 8853. You may also contact Dr. Seburn Pense at (618) 453 2467 or sebpense@siu.edu. Your signature on this document will be your consent.

SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE **DEPARTMENT OF WORKFORCE EDUCATION AND DEVELOPMENT**

SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE **NURSE AIDE TESTING**

Sameer Ahmed
Doctoral Candidate
Department of Workforce Education and Development
College of Education and Human Services
Southern Illinois University Carbondale

Dr. Seburn Pense
Doctoral Committee Chair and Professor
Plant Soil and Agricultural Systems
College of Agricultural Sciences
Southern Illinois University Carbondale

Dr. Thomas Hovatter

Project Coordinator
Illinois Nurse Aide Testing Project
Southern Illinois University Carbondale

Appendix B – Cover Letter for Students

SIU CARBONDALE SOUTHERN ILLINOIS UNIVERSITY **DEPARTMENT OF WORKFORCE EDUCATION AND DEVELOPMENT**

SIU CARBONDALE SOUTHERN ILLINOIS UNIVERSITY **NURSE AIDE TESTING**

Dear *Student*,

I am a doctoral candidate from the Department of Workforce Education and Development in the College of Education and Human Services at Southern Illinois University, Carbondale. I am inviting you to participate in a research study, which is designed to better understand the issues and challenges nurse aide students face taking the Certified Nursing Aide or Assistant (CNA) competency examination and help me fulfill an important requirement for my doctoral degree. This study is being conducted at test sites (i.e. community colleges) across Illinois. The study involves students enrolled in the Illinois approved CNA training programs and you were randomly selected for participation. Enclosed with this letter are the demographics and instructions sheet and the Myers-Briggs Type Indicator® (MBTI®) instrument. The information that you will provide will be contributing to the body of knowledge regarding nursing aide education. The findings of this study can be used by nursing aide educators and will help to make improvements to the Illinois Certified Nursing Aide (CNA) Competency Exam and training programs.

The instrument will take 15 – 20 minutes or less to complete. Please answer questions as honestly as possible and return the completed inventory to the proctor or instructor. The study has been approved by SIUC's Internal Review Board, ensuring that responses are confidential and participation in the survey poses no risks to the participants. Your answers are strictly confidential and only generalized findings will be documented in any reports. The data will be kept in a locked cabinet in my office. There is also no cost for participation. I deeply appreciate your help and generosity, **everyone who completes and returns the survey will receive their personality type and description related to it via email from a certified MBTI consultant**.

Completion of this survey indicates your voluntary consent in the study. Your key contact, should you have any questions about this research project, is *Sameer Ahmed* – please feel free to contact me at sameer.ahmed@siu.edu or (618) 559 8853. You may also contact *Dr. Seburn Pense* at (618) 453 2467 or sebpense@siu.edu. While completing the survey, if you have any questions related to the instrument, contact *Dr. Thomas Hovatter* (a certified MBTI consultant) or me at Illinois Nurse Aide Competency Evaluation Program Phone: (618) 456 4367 or cobra7@siu.edu.

Sameer Ahmed

Doctoral Candidate
Department of Workforce Education and Development
College of Education and Human Services
Southern Illinois University, Carbondale

This project has been reviewed and approved by the SIUC Human Subject Committee. Questions concerning your rights as a participant in this research study may be addressed to the committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453 4533. Email: siuhsc@siu.edu

Appendix C – Instructions to the Proctor

SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE **DEPARTMENT OF WORKFORCE
EDUCATION AND DEVELOPMENT**

SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE **NURSE AIDE TESTING**

Dear **Proctor**:

Enclosed in the test booklets for the January examination are a cover letter for nurse aide students, instructions to complete the questionnaire, and the Myers-Briggs Type Indicator ® questionnaire as part of a research study being conducted by a doctoral student from the Department of Workforce Education and Development at Southern Illinois University, Carbondale.

Please instruct the following to the students before the exam:

➢ Please inform the students to complete the competency exam first and then answer the questionnaire. The questionnaire is not part of the competency exam, their participation will be voluntary and answering the questionnaire will not impact their competency exam score.

➢ Please ask them to thoroughly ***read the instructions*** and ***complete the activity*** in the instructions sheet before attempting the questionnaire. The activity gives a sense of understanding as to how to answer the questionnaire.

➢ It takes 10 – 15 minutes to complete the questionnaire, and you are requested to proctor while the participants complete it. The researcher and a certified MBTI consultant will be available on (618) 456 4367 to answer any questions related to the questionnaire.

➢ Upon completion, please collect the instructions sheet, demographics sheet, and questionnaire. Place it with the test material.

Thank you for heling in this important research study. We deeply appreciate your help and generosity.

Sameer Ahmed
Doctoral Candidate
Department of Workforce Education and Development
College of Education and Human Services
Southern Illinois University Carbondale

Dr. Seburn Pense
Doctoral Committee Chair and Professor
Plant Soil and Agricultural Systems
College of Agricultural Sciences
Southern Illinois University Carbondale

Dr. Thomas Hovatter
Project Coordinator
Illinois Nurse Aide Testing Project
Southern Illinois University Carbondale

This project has been reviewed and approved by the SIUC Human Subject Committee. Questions concerning your rights as a participant in this research study may be addressed to the committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453 4533. Email: siuhsc@siu.edu

Appendix D – Activity, Instructions, and Demographics Sheet for Students

SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE **DEPARTMENT OF WORKFORCE
EDUCATION AND DEVELOPMENT**

SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE **NURSE AIDE TESTING**

Instructions

The following are some basic instructions on how to complete this questionnaire:

1. Answer all the questions honestly and remember that your answers to this questionnaire will not impact your grade.
2. Your answers to these questions will indicate how you like to look at things and how you like to go about deciding things.
3. Read each questions carefully and indicate your answer by marking an "☑" in the appropriate box.
4. The questionnaire is not a "test." There are no "right" or "wrong" answers.
5. Please sign your name on the line below as you normally do:

   _____

6. Now, sign your name again on the line below, but this time use your other hand:

   _____

7. Now think about your experience of writing with your *preferred hand* and with *your non-preferred hand*. Most people who try this immediately notice a number of differences:
   Preferred Hand: Feels natural! | Didn't think about it! | Effortless, easy! | Looks neat, legible, and adult!

   Non-Preferred Hand: Feels unnatural! | Had to concentrate while doing it! | Awkwardly and Clumsy! | Looks Childlike!

   Remember, you can use either hand when you have to, and you use both hands regularly; but for writing, one is natural and competent, while the other requires effort and feels awkward.

   You might feel the same way while answering this instrument. You might feel like both the options of a particular question or word pairs are correct, but you have to remember that one is natural and other is unnatural, just like the activity you did earlier. Attempt to focus on 'how you really are' rather than 'how you should be.'
8. Work quietly without spending too much time weighing your responses – your first response is usually the best response.
9. Upon completion, please return the questionnaire and demographics sheet to the proctor.

Next page please.

Page **1** of **2**

SIU CARBONDALE · SOUTHERN ILLINOIS UNIVERSITY · **DEPARTMENT OF WORKFORCE EDUCATION AND DEVELOPMENT**

SIU CARBONDALE · SOUTHERN ILLINOIS UNIVERSITY · **NURSE AIDE TESTING**

Participation in this study is completely voluntary. A doctoral candidate is gathering information in an effort to evaluate the effect of an individual's personality attributes on his/her performance on the Illinois CNA Certification Exam. All information provided will be kept strictly confidential in a secure locked cabinet. The information will be used for the sole purpose of improving the Nurse Aide Testing Project. Once learning style is matched to the test data, all identifying information will be removed.

Please fill in the information or place a tick (✓) for the appropriate choice before completing the inventory:

1. Social Security Number (Last 4 digits)*: ☒☒☒ - ☒☒ - _____ _____ _____ _____

2. Name: _____

3. Program Code:_____   Instructor' Name: _____

4. Institution/College/Organization Name: _____

5. Gender: ☐ Female   ☐ Male   ☐ Other   ☐ Prefer not to answer

6. Age: ☐ Less than 18   ☐ 18 – 25   ☐ 26 – 30   ☐ 31 – 35   ☐ 36 – 40
   ☐ 41 – 45   ☐ 46 – 50   ☐ 51 – 55   ☐ 56 – 60   ☐ 61 – 65
   ☐ 66 +

7. Ethnicity/Race: ☐ African American/Black   ☐ Asian or Pacific Islander   ☐ Hispanic, Latino
   ☐ White   ☐ Native American or Alaskan Native or American Indian
   ☐ Other _____

8. Education ☐ Some high school, no diploma
   ☐ High school graduate, diploma or equivalent (for example: GED)
   ☐ Some college credit, no degree   ☐ Trade/technical/vocational training
   ☐ Associate Degree   ☐ Bachelor's Degree   ☐ Master's Degree   ☐ Professional Degree
   ☐ Doctorate Degree   ☐ Post-doc Degree

9. English is my first language: ☐ Yes   ☐ No

10. Email address to send personality type and description related to it. _____

11. **Do you want to participate in the second phase of this research, if so give your consent here to be contacted via email?**   ☐ Yes   ☐ No

* The last four digits of the SSN being collected is merely for data analysis purposes. After the data collection is completed the last four digits SSN data will be deleted.

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL. 62901-4709. Phone (618) 453 4533. Email: siuhsc@siu.edu

Next Page Please

Page **2** of **2**

Appendix E – Letter to Center for Application for Psychological Type and Approval Letter

SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE **DEPARTMENT OF WORKFORCE EDUCATION AND DEVELOPMENT**

December 14, 2016

Center for Applications of Psychological Type

2815 NW 13th Street, Suite 401,
Gainesville, FL 32609

To whom it may concern,

This letter is to request your permission to administer the Myers-Briggs Type Indicator® (MBTI®) for use in my dissertation research. I am currently a doctoral candidate from the Department of Workforce Education and Development in the College of Education and Human Services at Southern Illinois University, Carbondale. I have prepared a dissertation proposal and am ready to conduct the research. The title of the proposal is "A quantitative inquiry into the relationship between standardized achievement exam performance, learning styles, and psychological type of nurse aide students."

This study is being conducted to better understand issues and challenges nurse aide students face pertinent to learning, thinking, and test taking while pursuing the Illinois approved Basic Certified Nursing Aide or Assistant training, the 21-mandated skills assessment, and the Certified Nursing Aide or Assistant (CNA) Competency Examination with typology being the gross indicator of what students have in common and the differences between them. The purpose of the research study involves administering MBTI self-scoreable Form M to nurse aide students who are enrolled in the training program, completed the 21-mandated skills assessment, and are taking CNA certification exam in January 2017.

So as to accomplish this study, I have completed a course (WED 598 – Special Investigations) with a Certified MBTI Consultant Dr. Gina Paul, Associate Professor, Southern Illinois University School of Medicine –MEDPREP, Carbondale. The coursework included the following objectives: an overview of the theory of psychological types, exploration of the four dichotomous scales that results in the 16 personality types, common applications of the MBTI® instrument when working with both individuals and organizations, how to give type feedback, relationship between psychological types and standardized multiple choice examination, observing the psychological type relationship within the anatomical sites of brain, and observing type in relation to student performance and type description.

In addition, I administered the MBTI to a group of 20 students under the able supervision of a certified MBTI Consultant, Dr. Thomas Hovatter, Project Coordinator, Illinois Nurse Aide Testing Project, Carbondale. Moreover, I have completed courses like EDUC 512 – Behavioral and Cognitive Foundations of Education (a second coursework focused on administering a number of other personality measurements), QUAN 505 Quantitative Research Methods, EAHE 587 Qualitative and Mixed Research Methods, and Inferential Statistics Coursework (i.e., Difference Inferential and Associational Inferential) so as to be

SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE **DEPARTMENT OF WORKFORCE EDUCATION AND DEVELOPMENT**

knowledgeable, skilled, and competent to conduct the study. I also have experience in research and statistics over the span of my academic career.

There are three certified MBTI® consultant in my doctoral research committee: Dr. Gina Paul, Dr. Christopher Keith Waugh, and Dr. Thomas Hovatter to supervise me and guide me in this research study. I have already purchased approximately 3000 MBTI Self Scorable Form M so as to use in this research study. I hope that my academic background and research experience qualifies me to administer the MBTI as a part of my dissertation research. Thank you for considering this request and I look forward to your response.

Sincerely yours,

Sameer Ahmed

1942 Evergreen Terrace Dr. E., Apt 4
Carbondale, IL 62901
(618) 559 8853 | sameer.ahmed@siu.edu

VITA

Graduate School

Southern Illinois University

SAMEER AHMED

drahmed.sameerriaz@gmail.com

1942 Evergreen Terrace Dr. E., Apt 4.
Carbondale, IL 62901

Education and Certifications:

Osmania University, Hyderabad, Andhra Pradesh, India.
Master of Business Administration (MBA)

Osmania University, Hyderabad, Andhra Pradesh, India.
Bachelor of Engineering (B.E.)

Society of Human Resource Management (SHRM)
Senior Certified Professional (SCP)

Association of Talent Development (ATD)
Certified Professional in Learning and Performance (CPLP)

Dissertation Title:

A Quantitative Inquiry into the Relationship between Learning Styles, Psychological Types, and Standardized Achievement Examination Performance of Nurse Aide Students.

Major Professor: Dr. Seburn Pense

Thesis Title:

The Role of Hard Skills and Soft Skills in Recruitment Practices.

Major Professor: Dr. Moses Thalla

Academic Honors, Awards, & Recognition:

Recipient of College of Business, Outstanding Graduate Assistant Teacher of the Year Award, 2018
Recipient of SHRM Certification Scholarship from SHRM Foundation, January 2018
Acknowledged in the SIU Carbondale News for Research Contribution, http://news.siu.edu/2015/06/061115cjm15100.php, June 2015
Recipient of Workforce Education and Development Excellence Award, Spring 2014

Academic/Teaching Experience:

Graduate Research and Teaching Assistant, Southern Illinois University, 2013 – 2018
Projects: Business Placement Center – College of Business, Illinois Nurse Aide Testing Program, Office of Workforce Innovation and Research

Lecturer, Osmania University, 2011 – 2013

Courses Taught:

Undergraduate:
BUS 101 Open to Business, BUS 302 Business Career Transitions, MGMT 341 Organizational Behavior, MGMT 345 Human Resource Management, MGMT 485 Organizational Change and Behavior

Graduate:
Management and Organizational Behavior, Human Resources Management, Management Theory and Practice, Organizational Development, Strategic Management, Operations Management, Performance Management, Talent and Knowledge Management, Introduction to Quantitative Research Methods, and Introduction to Qualitative Research Methods

Professional Experience:

Genpact-Nipe, HR & Training Consultant, 2011 – 2013
Projects: Google, NBC Universal, U.S. Visa Facilitating Services, One GE, All State, and Invensys

Knoah Soultions, Team Lead HR & Training, 2007 – 2011
Projects: Earthlink, Rosetta Stone, Samsung, Palm, BOLT Insurance, Kensington, Ask Sunday, Barnes and Noble, and TWC

Next Link, Training Consultant, 2006 – 2007
Projects: IBM, IBM Daksh, United Bank of Switzerland, and Bank of America

Professional Development:

Volunteer, Society of Human Resource Management (SHRM) 2016 Annual Conference and Exposition, Washington D. C., June 19 – 22
Volunteer, Society of Human Resource Management (SHRM) 2017 Annual Conference and Exposition, New Orleans, June 18 – 21
Volunteer, American Psychological Association (APA) 124th Annual Convention, Colorado, Denver, August 4 – 7
Volunteer, American Psychological Association (APA) 125th Annual Convention, District of Columbia, Washington, August 3 – 6

Professional Affiliations:

Member, Society of Human Resource Management (SHRM), National (USA)
Member, Society of Human Resource Management (SHRM), Chicago Chapter
Member, American Psychological Association (APA), National (USA)
Member, Association of Talent Development (ATD), National (USA)
Member, Association of Talent Development (ATD), St Louis Chapter