Undergraduate Business Students: Multiple Intelligences and Academic Majors

by

Liesl Anne Reiners

A dissertation submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Doctor of Philosophy

Auburn, Alabama
August 5, 2023

Keywords: academic majors, multiple intelligences, higher education

Approved by

Maria Witte, Chair, Associate Dean of the Graduate School and Professor of Adult Education
Norman Godwin, Associate Provost for Academic Affairs & Faculty Affairs
Asim Ali, Executive Director, Biggio Center for the Enhancement of Teaching & Learning
David Paradice, Harbert Eminent Scholar, Business Analytics & Information Systems

Abstract

This study explored the potential relationship between multiple intelligences and academic majors declared by undergraduate business students in the largest college at a mid-size public university in the southeast. To determine these relationships, a quantitative study was performed using data collected electronically. The research questions in this study were explored using a quantitative research design and the data were analyzed to examine relationships between variables. Participants were also asked to respond to academic demographic questions (major, classification, grade point average) as well as demographic questions (race/ethnicity, gender). This study contributes to the body of work that tests Gardner's theory. Some of the results from this study appear to confirm Gardner's ideas. For example, the primary intelligence category for many finance, business analytics, and information systems management majors was Logical-Mathematical. Interestingly, the primary intelligence category for many accounting majors was musical intelligence. This suggests that the patterns in musical transfer to accounting as well. With respect to gender, more males had Logical Mathematical as their primary intelligence category than females, however, more females had Interpersonal and Intrapersonal intelligences as their primary intelligence category. These results suggest that a deeper examination of Gardner's Multiple Intelligence categories is warranted. There is a relationship between some majors and Gardner's intelligence categories. There is also a relationship between gender and Gardner's intelligence categories. The data was inadequate to determine a relationship between ethnicity and Gardner's intelligence categories. No relationship between academic class and Gardner's intelligence categories was found. The results of this research can provide insight into

2

different types of intelligence in order to increase flexibility in teaching methods and adult

learning while still providing a high-quality education.

Dedication

This is dedicated to my family. To my parents, Nancy Hill Nourse Reiners and Darrell Dean Reiners: I know that you both have been with me through this and are very proud of me. Many of the ethics, morals, and values you instilled in me provided me the strength and courage to see this process through. Thank you for teaching me, showing me, instilling in me the value and importance of education. I am very proud to be a third-generation educator, with hopefully a fourth generation on the way! I will always love both of you. I will see you again one day. To my grandmother, Eula Pope Hill Nourse: Your love of learning and appreciating the differences in each person left a lasting mark on my life. Your love for the English language, for caring for others well, and for sharing with others prodded this along, even when I could not see it. To my children, Mayson Reiners, Karston Elizabeth, Carter Thomas, and Anna Katherine: I know that you are tired of hearing me talk about your different intelligences, letters from various inventories, asking you how you are learning and what you think, crock pot dinners (oh, the crock pot dinners!), Memphis with mom writing, books and articles laying around the house, and worrying if your mom will graduate the same semester you do. I hope I have shown you that being passionate, forever learning, helping others, setting goals, working hard, and wanting to add and contribute to the world matters. You are MY world. Guess what?! Momma did it. She really did it. Please know that perseverance and grit pay off- that learning is life long and does not end. Ever. To my heavenly father, daddy God: Thank you for allowing me the opportunity to grow, add, mentor, love, care, support, and encourage young adults and faculty. Your way is always the best way. Through health concerns, single mom-ness, professional and personal obstacles, pandemics, added responsibilities and challenges (that even I could not imagine or

fathom), breaking points and break ups, you were faithful. You bless me more than I deserve. I pray that this encourages even just one nontraditional learner who is independently working through life and this process to continue. Please do not stop! You can do this.

Acknowledgments

Dr. Cleone Brock. Who knew when you helped my child with anxiety from having dealt with a learning disability for years and not being diagnosed properly, that you would introduce a book to me that would literally change my world. It changed my world as a mom, since I was able to understand her mind and her struggles and help her to see her kinds of smart. Six years later, I would come across that book again, but as a PhD candidate, trying to further knowledge to help students who do not have their needs met in a traditional way. As I read that book again, I realized it was a part of my personal history. Now, it has become part of my professional history. Thank you for loving and caring for others so well. Dr. M. Dan Givens, my first real mentor, leader, and friend. You showed, demonstrated, walked out what a true educator, academic, and parent is, allowing and supporting me in this goal. The leader I am is much due to you and your mentorship, thank you. Brian Paul Sexton, my friend, encourager, safe place, loyal pirate. I cannot imagine this without your presence. You are always there, thank you. Dr. Maria Witte, my chair and champion. You picked up the pieces when everyone had stepped away. You bailed me out, thank you. Dr. Norman Godwin, thank you for supporting me, even when you did not have to. Much of my professional world is due to you, thank you. Dr. Asim Ali, my go-to, resource champion, and hero. You believed, stepped up, and mentored me both professionally and personally, thank you. Dr. Daniel Butler, my University Reader, my clown. When it was a challenge to get an answer, you talked me through it. You took time to explain, answer questions, walk through it, help me organize my thoughts, thank you. Dr. David Paradice, my professional mentor, and now my personal friend. Through your accountability, tutoring, encouraging, explaining, and understanding, I was able to make progress. You believed in me

6

when I wasn't sure I could believe in myself any longer. My world is better because you are in it, thank you. My committee, you will never quite understand, but thank you is just not enough.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

IQ (Intelligence Quotient)- a measure of a person's ability to reason and problem solve from a specific test.

MIDAS (Multiple Intelligences Development Assessment Scale)- a comprehensive, self-report measure providing an understanding of a person's multiple intelligences profile.

STEM (Science Technology Engineering Math Education)- an acronym for education in these fields that prepares students in these fields.

List of Terms Used

Adult Education- a varied field with multiple contexts and arenas, with at least two major attributes- the students are adults, and the activities are purposeful and planned.

Adult Learner- a student pursuing a post-secondary education.

Andragogy- the method and practice of teaching adult learners; the understanding of the art, science, and method of adult learning.

Intelligence Quotient (IQ)- a measure of a person's ability to reason and problem solve from a specific test.

Multiple Intelligence- a theory that states that each person has eight intelligences that exist at various degrees of proficiency based on genetics and experience.

Multiple Intelligences Development Assessment Scale (MIDAS)- a comprehensive, self-report measure providing an understanding of a person's multiple intelligences profile.

Science Technology Engineering Math Education (STEM)- an acronym for education in these fields that prepares students in these fields.

CHAPTER 1. INTRODUCTION

Undergraduate students choose a major based on a variety of factors, including parental influence, peer influence, potential, salary, perceived prestige, and guidance counselor or teacher influence (Aldosary & Assaf, 1996). A variety of factors also dissuade students from choosing certain majors. For example, fewer males choose nursing, fashion design, and education, while fewer females choose engineering, architecture, science, and math majors (Morgan et al., 2013). Some students perceive certain ethnicities to have advantages in some majors (Kanter, 1993; Lackland, 2001; Solnick, 1995). For example, some students perceive Asian students to have an advantage in science, technology, engineering, and math majors, leading them to avoid those majors (England & Li, 2006; Gradin, 2011; Sloane et al., 2019).

Typically, students do not receive much assistance or advice in deciding their academic major or minor (Aldosary & Assaf, 1996). This explains why most college students change their major or minor at least once during their college years. Because changing an academic major or minor requires a change in degree plans, this decision can add an entire semester or more to the student's total time in college. By changing of major or minor, students are required to take different courses which leads to additional time and energy in classes that are not required for their ultimate major choice. In addition to additional time in college and delayed graduation, a change of major incurs additional cost for tuition, textbooks, and fees" (Stock & Stock, 2018).

Students change their major an average of three times in their undergraduate degree search (Marcus, 2018). The reasons for these changes are varied. Some students lack an understanding of aptitudes necessary for successful completion of a major choice, others are unaware of the roles and responsibilities of career positions for which the degree prepares them. Some students simply lack appropriate self-awareness, values, and skills. Choosing a major in

college can be a life altering decision. When an accurate major choice is made, students are more likely to experience good mental health, higher grades, career success, and overall happiness. When their major choice is not a good fit, students find cognitive dissonance. Graduating with a degree that is not a good fit can sometimes lead to students starting a career in which they have no interest. The result is that students must start their career again, costing both energy, time, and forfeiture of wages while between jobs. According to Marcus in 2018, almost six in 10 students in pursuit of bachelor's degrees were taking longer than four years to graduate, even further increasing that financial burden, and forestalling the careers they often need to pay for it.

Four-year institutions have traditionally used quantitative and verbal aptitudes to identify applicants most likely to be successful graduates. Students with strong quantitative skills are directed to STEM, finance, and accounting majors, among others. Students with strong verbal skills are directed to English, history, education, counseling, human sciences, and similar majors. In addition, specialized programs rely on other competencies. For example, music programs rely on musical aptitude, visual arts programs on artistic expertise, and dance programs on physical aptitude and spatial comprehension. Anecdotally, athletic programs refer to sports' specific knowledge, such as football intelligence, baseball intelligence, and basketball intelligence.

Multiple types of intelligence have been posited in addition to a traditional IQ. For example, Howard Gardner (1983) explored the connections between diverse types of intelligence. Math and Musical intelligence both revolve around patterns and patterning. Bodily kinesthetic intelligence relates to athletics and body movement in dance, theatre. By changing admissions processes to tap into multiple intelligences, institutions could also modify placement in honors curricula to include students with musical or intrapersonal intelligence, for example. There are some institutions with open admissions, where talented, driven individuals are able to

pursue types of postsecondary education. These students with strengths in other than linguistic or logical-mathematical intelligence may not receive admission to an elite institution. Kezar (2001) considered that this limitation in typical admission processes limits our potential as a society.

With the increase in college tuition and student debt, higher education institutions are under increasing pressure to demonstrate that students are graduating with a degree of increasing value (Lederman, 2019). Post-secondary schools need to be purposeful with the knowledge, skills, and content they are teaching and assess whether learning occurs. Doug Lederman (2019) noted that the pressure to be more intentional about the outcomes a college or program aims to develop is not likely to abate soon. Focusing on facilitating, coaching, and advising students to majors well-suited for them as early as possible would help students, professors, and institutions.

Significance of the Study

This study examined the various multiple intelligence levels of undergraduate students pursuing a post-secondary degree. The results of this research can provide insight into diverse types of intelligence in order to increase flexibility in teaching methods and adult learning while still providing a high-quality education. Factoring in the increasing cost of a post-secondary degree, there is a growing importance of providing a quality student experience and understanding of various learning methods in the higher education classroom. The current study seeks to expand the body of knowledge of multiple intelligences in order to add additional information and layers of student understanding of material. By expanding the research in multiple intelligences, educators will be able to consider more than just a learner's IQ. By understanding multiple intelligences, instructors may be better able to adapt instruction, and teaching techniques, and better motivate their learners. Higher Education Administration may gain valuable insight into varying ways students learn and process information, resulting in

teaching enhancement methods in the post-secondary environment. Further, this research may aid in the development of continuing education for faculty and instructors in teaching methods.

Statement of the Problem

The current study sought to examine the multiple intelligences of current undergraduate, College of Business students. Further, this study sought to determine if there were any relationships certain majors and intelligences. This research could assist instructors, administration, and staff provide a more relevant, quality experience to their student body. Previous studies have considered learning styles, motivation, teaching methods, and academic majors in relation to personality. However, there is a lack of studies that consider various intelligences in relation to declared majors, degrees, or career paths.

Purpose of the Study

The purpose of this study was to examine relationships between multiple intelligence and academic major within a business school setting at a major university in southeast Alabama. Data was also compared across race/ethnicity, gender, and academic classification.

In the Harbert College of Business, undergraduate students declare their major after 30 credit hours. The options include eight different majors: Accounting, Business Administration, Business Analytics, Finance, Information Systems, Management, Marketing, and Supply Chain. Students provide their standardized test scores and high school grade point average as qualifications to be admitted to college. Howard Gardner (1983) posited that there are eight Multiple Intelligences that should also be considered including Linguistic (words and language), Logical-Mathematical (logic and numbers), Musical (music, sound, and rhythm), Bodily-Kinesthetic (body and movement), Spatial-Visual (images and space), Interpersonal (other people's feelings), Intrapersonal (self-aware), and Naturalist (natural environment).

18

By analyzing multiple intelligences in business students, this research can aid students in their appraisal of their skills and abilities in relationship to their academics and career path. In addition, the results of this research will help educators and career coaches to articulate the types of intelligences that are specific to majors and careers.

Research Questions

The following research questions were used in this study:

1. Is there a relationship between a business student's academic major and their multiple intelligence?

2. Is there a relationship between a business student's gender and their multiple intelligence?

3. Is there a relationship between a business student's race/ethnicity and their multiple intelligence?

4. Is there a relationship between a business student's academic classification and their multiple intelligence?

Assumptions of the Study

The following assumptions were made:

1. Adult Education includes higher education.

2. Multiple Intelligence Development Assessment Scale is a valid instrument to determine the multiple intelligences of young adult and adult learners.

3. Undergraduate business students answered the survey questions honestly and truthfully.

Limitations of the Study

This study had the following limitations:

1. This study examined students at a single business school geographically located in the southeastern region of the United States; generalization and assumption beyond the institution in this study should be exercised with caution.

2. Surveys were conducted with undergraduate, business students. Graduate students and other undergraduate majors were not in the scope of this research study.

Organization of the Study

This research study is organized into five chapters. The first chapter presents an overview of adult learners, multiple intelligences, and undergraduate business majors. Therefore, it also states the problem, purpose, research questions, limitations, and overall significance of the research study. Next, the second chapter explains the history about intelligence quotient, learning theories, multiple intelligence, and the state of higher education. The third chapter explains what and how the research study was conducted identifying the population and sample. The fourth chapter reveals the results of the study and an interpretation of data. Finally, the fifth and closing chapter makes conclusions and reinforces conclusions with recommendations for further research.

Definitions of Terms

Adult Education- a varied field with multiple contexts and arenas, with at least two major attributes- the students are adults, and the activities are purposeful and planned.

Adult Learner- a student pursuing a post-secondary education.

Andragogy- the method and practice of teaching adult learners; the understanding of the art, science, and method of adult learning.

Intelligence Quotient (IQ)- a measure of a person's ability to reason and problem solve from a specific test.

Multiple Intelligences Development Assessment Scale (MIDAS)- a comprehensive, self-report measure providing an understanding of a person's multiple intelligences profile.

Multiple Intelligence- a theory that states that each person has eight intelligences that exist at various degrees of proficiency based on genetics and experience.

Science Technology Engineering Math Education (STEM)- an acronym for education in these fields that prepares students in these fields.

CHAPTER 2. LITERATURE REVIEW

Introduction

Chapter 1 introduced the study by providing the general background information of the topic, statement of the problem, purpose of the study, significance of the study, research questions, assumptions of the study, limitations of the study, organization of the study, and definitions of terms. Chapter 2 provides a review of literature synthesized and organized into major sections.

Purpose of the Study

The purpose of this study was to examine relationships between multiple intelligence and academic major within a business school setting at a major university in southeast Alabama. Data was also compared across race/ethnicity, gender, and academic classification.

In the Harbert College of Business, undergraduate students declare their major after 30 credit hours. The options include eight different majors: Accounting, Business Administration, Business Analytics, Finance, Information Systems, Management, Marketing, and Supply Chain. Students provide their standardized test scores and high school grade point average as qualifications to be admitted to college. Howard Gardner (1983) posited that there are eight Multiple Intelligences that should also be considered including Linguistic (words and language), Logical-Mathematical (logic and numbers), Musical (music, sound, and rhythm), Bodily-Kinesthetic (body and movement), Spatial-Visual (images and space), Interpersonal (other people's feelings), Intrapersonal (self-aware), and Naturalist (natural environment).

By analyzing multiple intelligences in business students, this research can aid students in their appraisal of their skills and abilities in relationship to their academics and career path. In

addition, the results of this research will help educators and career coaches to articulate the types of intelligences that are specific to majors and careers.

Research Questions

The following research questions were used in this study:

1. Is there a relationship between a business student's academic major and their multiple intelligence?

2. Is there a relationship between a business student's gender and their multiple intelligence?

3. Is there a relationship between a business student's race/ethnicity and their multiple intelligence?

4. Is there a relationship between a business student's academic classification and their multiple intelligence?

Learning Theories

Merriam and Bierema (2014) explain that "theory provides an explanation of how learning occurs, as well as being suggestive as to how such an explanation translates into practice" (p. 25). Learning theories, then, are explanations of what happens when learning takes place. Theory does not help much when it is just understood by educators. Instead, educators need to be able to put the knowledge they have into practice in the classroom. The following

theories describe what happens when learning takes place. These theories include application of adult learning (Merriam, Caffarella, & Baumgartner, 2007).

Behaviorism

Behaviorism has its roots in a study that was conducted in the 1890s by Ivan Pavlov, a Russian psychologist. Pavlov's research found that if a bell were rung, a dog would salivate upon hearing the bell. The reflex of the dog stemmed from conditioning by Pavlov. Pavlov would ring a bell whenever food was presented to the dog. Eventually, a conditioned response occurred even when food was not present, thus the beginning of behaviorism.

Beginning in the 1920s, researchers of this theory determined that an arrangement of environmental stimuli results in certain human behaviors. In 1971, according to Watson, Skinner, and others, behavior that is rewarded and acknowledged continues, while behavior that is not reinforced does not continue and eventually stops. Therefore, in adult learning, students respond to environments where the stimuli are positioned and arranged to maximize their learning. This learning results in observable behaviors that demonstrate the learning that has occurred. Skinner (1971) defined a change in observable behavior as learning. Behaviorists did not measure the internal mental processes and feelings in their definition of learning.

The first studies of adult learners occurred in 1928 by Edward L. Thorndike. His research included intelligence testing, learning transference, environmental versus innate causes of behavior, and measurements of the quality of life. The findings of Thorndike and his colleagues were revolutionary at the time in both learning theory as well as educational practice. These researchers examined whether adults could learn at the same pace as they did in their earlier years. Through presenting adult learners with a variety of memory and learning tasks, Thorndike

24

(1928) and his group were able to determine that there was not a decline in learning as people age. As educators of students ages twenty-five to forty-five, we should expect our student to learn at a similar rate and in an equivalent manner to when they were in their twenties (pp. 178-179).

We continue to see the themes of behaviorism in pediatric and adult education. Learning outcomes in curriculum and content may utilize behavioral objectives to determine proficiency. Instructional design, competency-based curricula, and programming may include behavioral objectives. "What has become known as evidence-based practice wherein quantifiable, systematic, and observable "outcomes" are used as markers of learning and in turn used to structure learning activities is a behavioristic-oriented model permeating adult basic education" (Merriam & Bierema, 2014, p. 27).

There are several industries that rely heavily on behaviorism in education. Military, business, career, and technical education all focus on certain skills, and competency of performing those skills, to determine readiness for that occupation. This continues into the performance in the role. For example, yearly performance reviews focus on the employees' performance of duties, improvements needed, training opportunities, and behavioral change over time. From focusing on what skills are specific to the industry, to teaching those skills in various levels of proficiency, to assessing the proficiency in competency of those skills, behaviorism theory is prevalent in adult education.

Humanism

An alternate theory sought to consider other explanations of why learning takes place. In the 1950s, Maslow and Rogers presented a self-directed model that included a more humanistic

worldview of learning. In contrast to the teacher controlling the environment to produce a behavior, Humanism adopted humanistic psychologists' thoughts that students have the potential for growth and determine their behavior. Maslow's research determined that the goal of learning is rooted in self-actualization (1970). Similarly, Rogers believed that people have the potential to become a fully functioning person (1983). According to these authors, learning involves the entire person: body, mind, and spirit. These researchers developed a different perspective to that of behaviorism called self-actualization.

In 1970, Maslow described self-actualization as "the desire to become more and more what one is, to become everything that one is capable of becoming" (p. 92). This translates well into adult education, where students learn because they desire to learn, to become more knowledgeable. Maslow also posits, that this learning cannot take place if the student's basic needs are not met. However, Maslow points out, that if the student does not feel safe or secure, he/she will not be able to learn, no matter the longing for self-actualization. To have a meaningful learning experience, the learners' needs must first be met.

Carl Rogers was a visionary in learning theories, well before his time. In 1969, Rogers stated that critical to survival would be that all people become lifelong learners (p. 104). He emphasized that an educated person is "one who has learned how to learn…how to adapt and change" while realizing "that no knowledge is secure, that only the process of seeking knowledge" is the foundation of feeling and being secure (p. 104). In 1983, Rogers noted in his book Freedom to Learn for the 80s the importance of the "student centered" approach, which derived from his client-centered therapy approach. This approach to learning was the opposite to the teacher-centered theory where the teacher bestows information and knowledge. Rogers

26

establishes that learning is self-directed by the student and facilitated by the teacher. His belief stated learning,

> *...has a quality of personal involvement- the whole person in both feeling and cognitive aspects being in the learning event. It is self-initiated. Even when the impetus or stimulus comes from outside, the sense of discovery, of reaching out, of grasping and comprehending, comes from within. It is pervasive. It makes a difference in the behavior, the attitudes, perhaps even the personality of the learner. It is evaluated by the learner. She knows whether it is meeting her need, whether it leads toward what she wants to know, whether it illuminates the dark area of ignorance she is experiencing. The locus of evaluation, we might say, resides in the learner. Its essence is meaning. When such learning takes place, the element of meaning to the learner is built into the whole experience (p.20).*

Humanistic psychology provides the launching pad for three of the major learning theories for adult learners: andragogy, self-directed learning, and transformative learning. Malcolm Knowles authored statements including the adult learner's participation in making decisions about their learning, their independence, self-direction, internal motivation, and their utilization of their experiences and capacity to grow and develop. Self-directed learning is noted by the instructor as having a guiding role instead of a "content expert" (Caffarella, 1993, p. 26). Transformative learning focuses on self-development and personal development. Mezirow believed that through transformative learning experiences are central to the development of

adults, believing that perspectives of adults are more open, permeable, and inclusive through leaning experiences (1991, p. 155).

Constructivism

Constructivism is used to describe a collection of theories based on the assumption that people make sense of their experience through learning. According to Merriam and Bierma, construction of meaning from experience is learning (p. 36). Pulling from Piaget, Dewey, and Vygotsky, constructivists see knowledge as learners making sense of their experience. Driscoll believes that learners are not empty vessels waiting to be filled, but rather active organisms seeking meaning" (2005, p. 387). Piaget's theory of cognitive development points out that as we mature and age, our cognitive structure changes. This allows us to process information and experience, in a manner to construct meaning at deeper levels. Dewey's explained in 1938 that genuine education is the transaction that takes place between an individual and their environment (p. 41).

Andragogy

In 1998, John Henschke wrote that andragogy is the "art and science of helping adults learn and facilitating self-directed learning" (p. 3). Adult education is a varied field with multiple contexts and arenas. It has at least two defining characteristics- the students are adults, and the activities are purposeful and planned. Bryson (1936) described adult education as consisting of "all the activities with an educational purpose that are carried on by people, engaged in the ordinary business of life" (p. 3). In Europe, it is defined as "the entire range of formal, non-formal and informal learning activities which are undertaken by adults after a break since leaving initial education and training, and which results in the acquisition of new knowledge and skills"

(REALM, 2010, p.6). Merriam & Brockett described it as "activities intentionally designed for the purpose of bringing about learning among those whose age, social roles, or self-perception define them as adults" (2007, p.8). Adult education is a life-long process that happens in many forms and can continue throughout the lifespan (Stewart, 2018).

Malcolm Knowles used the term andragogy for the first time in an article in Adult Leadership in 1968. European adult educators "coined the label andragogy, which is based on the Greek word aner (with the stem andr-), meaning "man, not boy" or adult" (Knowles, 1970, p. 42). He further states that "a great deal of other knowledge about adult learning was accumulating during the sixties from related disciplines- clinical psychology, developmental psychology (especially from a new group of life-span developmental psychologists) gerontology, sociology, and anthropology" (p. 42). Knowles appeared to have a working definition of andragogy to begin with, that defined it in contrast to pedagogy. "Originally I defined andragogy as the art and science of helping adults learn, in contrast to pedagogy as the art and science of teaching children" (1970, p. 43). As educators applied the concepts of andragogy in elementary and secondary learning environments, Knowles determined that the two models were not exclusive of each other but fit together. "The models are probably most useful when seen not as dichotomous, but rather as two ends of a spectrum, with a realistic assumption in a given situation falling in between the two ends. As I see it, whenever a pedagogical assumption is the realistic one, then pedagogical strategies are appropriate, regardless of the age of the learner- and vice versa" (1070, p. 43). Knowles determined that there were at least four differences in andragogy and pedagogy. "As individuals mature: their self-concept moves from one of being a dependent personality toward being a self-directed human being; they accumulate a growing reservoir of experience that becomes an increasingly rich resource for learning; their readiness to

learn becomes oriented increasingly to the developmental tasks of their social roles; and their time perspective changes from one of postponed application of knowledge to immediacy of application, and accordingly, their orientation toward learning shifts from one of subject-centeredness to one of performance-centeredness (1970, p.44-45).

Houle

    Cyril O. Houle was a Professor of Adult Education at the University of Chicago where he also earned his Ph.D. He grew up in Florida and received his bachelor's and master's degrees from the University of Florida in 1934. He conducted a seminal study in the 1960s that focused on the internal process of adult learning. Houle (1961) found that his 22 subjects fell into three groups: "the goal oriented, are those who use education as a means of accomplishing clear-cut objectives. These can also be called purposeful learners. Those learners who were activity-oriented, participated for the social contact that learning provided. For these learners, the focus was on the learning itself as opposed to the content (Houle, 1961).

    The second, the activity-oriented, are those who take part because they find in the circumstances of the learning a meaning which has no necessary connection, and often no connection at all, with the content or the announced purposes of the activity. The third, the learning-oriented, seek knowledge for its own sake.

    The third type of learner was the learning-oriented learners who were motivated by the internal desire to know. For this group, they would be classically avid readers, join groups or classes for educational reasons and found learning to be an innately enjoyable experience resulting in it being a constant in their life (Houle, 1961).

Tough

Allen Tough was a Canadian educator and researcher in youth and adult education, as well as psychology. Tough was one of Houle's students and is internationally recognized as a pioneer in adult learning. His research focused on self-directed growth and personal change in adult learners. Tough's research question was, paraphrased: "How do adults learn naturally-when they are not being taught." According to H. Paul Shuch, "Until the end of the 1970s, Dr. Tough's line of research focused on the adult's successful efforts to learn and change, particularly the 70% of adults who are self-guided without relying much on professionals or institutions. His two best-known books from this line of research are The Adult's Learning Projects and Intentional Changes." (2008).

Knowles

Malcolm Knowles wrote the first major accounts of informal adult education and the history of adult education in the United States. These written accounts caused him to develop the notions of informal adult education, andragogy, and self-direction. His work was a significant factor in reorienting adult educators from 'educating people' to 'helping them learn' (Knowles, 1950, p. 6). Knowles received his master's degree from the University of Chicago where Cyril O. Houle was his adviser. As part of his master's program, he was in a seminar in group counseling under Arthur Shedlin who was an associate of Carl Rogers. Through his studies there he began to think about what it meant to be a facilitator of learning rather than a teacher. In the 1970s Knowles wrote two key books, *The Modern Practice of Adult Education* (1970) and *The Adult Learner* (1973) where the notion of andragogy was fully developed. He also published a book on self-directed learning during that same time.

31

Havinghurst

Dr. Robert J. Havinghurst completed foundational work on developmental tasks including life stages, transitions, and transformations in the adult years. Havinghurst (1961) described developmental tasks as "a task which arises at or about a certain period in the life of the individual, successful achievement of which leads to his happiness and to success with later tasks, while failure leads to unhappiness in the individual, disapproval by the society, and difficulty with later tasks" (p.2). He believed that development tasks in the adult years are the products of the evolution of social roles. Dr. Havinghurst was "one of the pioneers in this area of research, dividing the adult years into three phases- early adulthood, middle age, and later maturity- and identifying ten social roles of adulthood: worker, mate, parent, homemaker, son or daughter of aging parents, citizen, friend, organization member, religious affiliate, and user of leisure time" (Knowles, 1970, p. 51).

Havinghurst stated "there are three broad social role categories: family, work, and community" (1973, p. 598). He felt that the work category is typically the simplest because it is a sole role of worker. The family role can be that of parent, child, grandparent, spouse, and sibling. The community role is anything that does not fit in the first two categories. Havinghurst first described teachable moments in 1952. He believed that "when the timing is right, the ability to learn a particular task will be possible. This is referred to as a 'teachable moment.' It is important to keep in mind that unless the time is right, learning will not occur. Hence, it is important to repeat important points whenever possible so that when a student's teachable moment occurs, s/he can benefit from the knowledge" (Havinghurst, 1952).

Assumptions of Adult Learners

When Knowles introduced andragogy in 1980, there were four assumptions that he felt were imperative to adult learners and then added two additional ones later in 1984. The first four were self-direction, experience, readiness, and immediacy, with internal motivation and the need to understand the reason for learning added later (p. 44-45). These characteristics distinguish pedagogy from andragogy. Pedagogy is content driven by the instructor. Meaning that the educator determines what is taught, how it is organized, presented, delivered, and assessed. Knowles' andragogy theory highlights the process, emphasizing the learner and their experience while giving the control over to the adult learner.

Self- Direction

Understanding that adults have responsibilities and roles outside of learning, is a major difference between pedagogy and andragogy. A child's primary role is that of a student, while adult learners have social roles and responsibilities before being a learner. As people grow and mature, they become more responsible, independent, and take on ownership. This must be a part of the adult learners' experience, not only physically, but also psychologically. A mature physical environment that displays trust, respect, collaboration is a major hallmark of andragogy. Otherwise, resistance as well as resentment, will permeate the educational experience. Knowles points out that adult learners have autonomy over their lives, and therefore, desire autonomy in self-directing in their educational experience (1984, p. 9).

Experience

Experience is central to all of learning. From Dewey's frameworks of experience and education in 1938, to the experiential learning cycle by Kolb in 1984 there has been a constant relationship between learning and experience in the student. Schon noted this in his reflective practices in 1983. Fenwick pointed out in 2003 that learners' use their experiences as their basis for learning. Adult educators assist in their students tying new concepts to their previous experiences. If facilitators of learning ignore their adult learners' experiences, it will threaten their identity, according to Knowles (p. 65).

Readiness

Readiness of adult learners is an important quality of andragogy. Because adults have more social roles, and experiences, and are less focused on self, they have a greater readiness to learn, resulting in more learning opportunities. As an adult, I may want to learn because I have new responsibilities as a parent, because I am becoming a leader in my career, because I am developing a greater understanding of how the world works or due to what is happening in a more global sense.

Immediacy

Adult learners have greater needs, reasons, and problems to manage where a need for learning is more immediate. Financial circumstances, physical changes, and evolving roles and responsibilities, all may cause an adult to need to learn quickly, even immediately, and seek out information with a desire to learn as soon as possible. Children do not see the importance of learning the alphabet, until a later date. Adult learners have a greater understanding of the need to learn now. With these four assumptions of adult learners, Knowles added two additional

items. He noted that with adult learners there is a greater internal motivation and a need to understand the reason they need to know. Adult learners want to see why something is important to learn. This comes from adults encountering life and its situations along with their roles in society. The reasoning for adult learners also comes from the understanding and knowledge that they will immediately apply what they have learned.

Developmental Stages of Adult Learners

Even though children have been the primary educational audience, adult students have existed for centuries. Pedagogy was the sole instructional model, therefore adult learners were told what, how, and when to learn by the instructor as well (Cullen, 1999). This was unchallenged until the late 19th and early 20th century. During this time period, Savicevic noted in 1991, that adult learners became increasingly dissatisfied with the quality and type of educational practices. These workers were trying to enhance their opportunities through learning, due to economic and political pressure of the late 19th and early 20th centuries. In 1919, the World Association for Adult Learners was established to help with these concerns. Malcom Knowles increased the interest in adult learning in the mid-1960s, collecting information and knowledge for the next 20 years. From his research his theory of andragogy was formed, as noted previously.

In 2009, Conaway investigated the various stages of adulthood. She noted that emerging adults consisted of adults ages 18-25, young adults were ages 26-39, and mature adults included those ages 40-59. Emerging adults exist in Knowles theory where they are central to the learning process, not the subject matter (1977). These adult learners have instructors that are facilitators and guides, not directors of learning. Pedagogical methodology emphasizes extrinsic motivation

as the driver of learning. Emerging adults are intrinsically motivated, therefore are part of andragogical methodology. Knowles stated in 1988 that adult learning consists of the role of experience, the learner's need to know, self-directedness, orientation to learning, and intrinsic satisfaction. Zmeyov pointed out that adults perform best in an autonomous, self-directed learning environment, while their learning orientation shifts from subject-centered to a problem-centered perspective, and their satisfaction moves from external influence on internal meaningfulness (1998).

Knowles began to consider in the 1970s that pedagogy and andragogy were on a continuum instead of separate orientations. A better representation was to view the two perspectives on opposite side of the continuum, where students travel from subject centeredness to learner centeredness in their educational journey (Merriam, 2001). There is a point where pedagogical methods are not optimal for learning but andragogical ones are. These are determined by cognitive and developmental stages of the learner. The key is readiness of the learner to accept the andragogical principles, and of the facilitator to provide andragogically based instruction.

Brookfield (1986) and Carlson (1979) defined adults as individuals who have attained the chronological and legal status of adulthood, with the rights and responsibilities that it entails. In the state of Alabama, which is 19 years of age. Therefore, emerging adulthood is the first stage of adulthood, encompassing ages 18-25. Arnett (2000) posited these individuals have discarded the dependent features of childhood, such as school and parental structured frameworks. Emerging adults accept responsibility for their actions and can make independent decisions, a hallmark of self-directedness. Conaway (2009) notes that recent literature acknowledges this age

group and includes it in the adult learning space. Many in this age group choose a major in higher education, therefore showing a need and desire to learn.

Young adulthood is characterized by marriage and parenthood, which 75% have chosen to do (Arnett, 2000). Arnett further states that these 26- to 39-year-old adults believe that they have achieved full adulthood with the ability to make independent decisions, are financially independent, in addition to personal accountability. Erikson noted the cognitive transition from acquiring knowledge to the application of it in everyday life (Berk, 2004). Berk further posited that young adults are gaining additional experience that will lead to expertise. This knowledge form experience is immediately applied toward concrete life tasks.

Mature adulthood, according to developmental theorist, refers to the years between ages 40-59 (Berk, 2004). The developmental tasks of midlife are an existential extension of the self. Individuals create personal truth through mentoring and caring for others, creating, and contributing to their legacy, help find meaning in mature adults' life. These adults are able and willing to create new realities that are meaningful through the skills and experience they have acquired over the years (Sinnott, 1998). With this maturity comes the cognitive ability to ask significant questions and uncover meaningful, culturally significant problems, which in turn contributes to further cognitive development (Berk, 2004; Sinnott, 1994, as cited by Conaway, 2009). Berk (2004) and Sinnott (1998) further state that midlife issues and problems are addressed in creative ways, using advanced strategies, different perspectives, and logical analytical thinking, as well as viewing everyday cognitive events in socially constructed frameworks. According to Piaget, the natural maturation of cognition combined with increased societal interaction contributes to personal development (1936/1952, as cited in Davenport & Davenport, 1984).

History of the Study of Intelligence

Intelligence involves the level of ability to learn, recognize, and solve problems using mental abilities such as logic, reasoning, problem solving, and planning. Intelligence, as demonstrated by using language and the ability to think, reason, test hypotheses, and understand rules, is shared by all humans. MacKintosh defines intelligence as the ability to learn, recognize and solve problems as well as referring to the level of that ability (2011, p. 5). In addition to this, he determines that intelligence includes the different mental abilities of logic, reasoning, problem-solving, and planning. Mackintosh further notes that intelligence involves language and the capacity to think, reason, test hypotheses, and understand rules (p.6). The study of human intelligence attempted to understand how and why people differ in intelligence.

History of intelligence

One of the early figures in the field of intelligence was an Englishman, Francis Galton, who was a cousin of Charles Darwin. Many of his ideas on intelligence came from Darwin's theory of evolution by natural selection (Mackintosh, 2011, p. 7). Galton believed that members of any species vary, with this variation being inherited from parents to offspring. He suggested that mental ability, or intelligence, was one of these characteristics that was an inherited difference. Parents transmit their differences to their offspring; therefore, intelligence or mental ability could be an inherited difference. Galton attempted to establish the hereditary basis for differences in ability by pointing out that eminence runs in families in his book *Hereditary Genius*. He argued that close relatives, rather than distant ones, were more apt to be eminent (1869, p. 37).

Galton found a wide range of marks on examinations among undergraduates at

Cambridge University in a two-year span of time (p. 7). He argued this was due to variations in

natural ability and the natural ability was due to hereditary factors. His theory was that eminence

runs in families, that closely related people were more likely to be eminent than distant relatives.

For example, between 1660 and 1865, of the 286 judges that were appointed to the English

bench 36% of judges' sons, but only 9.5% of their grandsons and 1.5% of their great-grandsons

became judges. Similar occupations had related results in Galton's analysis, however there were

several issues with his argument, most notably- that promotions were made based on family

influence, not natural ability that was inherited. Thus, he compared sons with adopted sons. He

found that the adopted sons were much less likely to achieve eminence than the natural sons.

Galton stated that "the social helps are the same, but hereditary gifts are wanting" (1869, p. 38).

Galton then considered similarities and differences in twin, both identical and fraternal in

1883. He found that identical twins were similar in things other than just physical appearance.

For example, identical twins had similar character, temperament, tastes, and dispositions.

However, the most important item Galton determined was that identical twins have similar

associations of ideas. This led into Galton borrowing the phrase nature and nurture from William

Shakespeare's play, *The Tempest* (p. 8). The only differences were found when one twin had

suffered a serious illness or accident. Galton did recognize that the nurture was the same or at

least similar for identical twins. Further, as he collected information on fraternal twins, Galton

uncovered that even in these twins, with the same nurture, sets of twins were dissimilar not only

physically, but also mentally and emotionally.

From this experience, Galton went on in 1884 to measure "Keenness of Sight and of

Hearing, Colour Sense, Judgement of Eye, Breathing Power, Reaction Time, Strength of Pull and

of Squeeze, Force of Blow, Span of Arms, Height- both standing and sitting, and Weight" in the Anthropometric Laboratory at the International Health Exhibition in London (1908, p. 245). In *Inquiries into human faculty,* Galton argued that some of these should be considered as measures of intelligence. Galton reasoned that since "the only information that reaches us concerning outward events appears to pass through the avenue of our senses; and the more perceptive the sense are of difference, the larger is the field upon which our judgement and intelligence can act" (1883, p. 19).

Intelligence Quotient

Alfred Binet, a French psychologist, developed the very first intelligence test. Alfred Binet's career began at the Salpêtrière Hospital in Paris where he collaborated with Jean-Martin Charcot. Binet then became the associate director and researcher at the Laboratory of Experimental Psychology. In 1894, he was appointed the director of the lab and he remained in this position until his death in 1911. During his tenure, he became interested in the study of development and intelligence. Binet's two daughters were often included in his observations and research (Fancher, RE & Rutherford, A, 2016). Binet was the first to introduce the concept of mental age or a set of abilities that certain ages possess. The French government determined that they wanted to identify children that needed extra academic assistance, as well as remedial studies. Binet and colleague Theodore Simon developed a series of tests designed to assess mental abilities. The instrument concentrated on mental abilities such as attention and memory instead of learned information such as math and reading (Terman LM.). Thus, the Binet-Simon Intelligence Scale was developed by Binet along with his collaborator, Theodore Simon.

While Binet's original intent was to use the test to identify children who needed additional academic assistance, unfortunately the test soon became a means to identify those deemed "feeble-minded" by the eugenics movement. Eugenics was the belief that the human population could be genetically improved by controlling who was allowed to have children. By doing this, the eugenicists believed they could produce more desirable inherited characteristics. Lewis Terman used the scale with an American sample, revising the instrument and standardizing the test. Terman's iteration of the scale became known as the Stanford-Binet Intelligence Scales. The test remains one of the most widely used intelligence tests and is still in use today (Silverman W, et al., 2010).

Although modern intelligence tests are still based on Binet's intelligence scale today. Binet himself believed that the intelligence test he had designed had limitations. He believed that intelligence was complex and could not be fully captured by a single quantitative measure. He also believed that intelligence was not fixed. He suggested that factors such as motivation and other variables can play a role in test scores (Binet, A., 1916, p.5). Perhaps most importantly, Binet also felt that such measures of intelligence were not always generalizable and could only apply to children with similar backgrounds and experiences. Despite disagreements regarding what comprises intelligence, Alfred Binet is often cited as one of the most influential psychologists in history.

In the exploration of human intelligence, Charles Spearman played a pivotal role. As a British psychologist, he discovered general intelligence (g-centric) using factor analysis. His research proved that intelligence is a cognitive ability that is measurable. By employing a factor analysis examining the tests, he was able to determine that the factors related to intelligence could be expressed numerically. In 1938, an American psychologist, Louis Thurstone used factor

41

analysis with tests of specific abilities. Through his research, he felt that Spearman had over simplified intelligence. Thurstone's results determined nine specific factors that he named primary abilities. These are the most widely used items that are evaluated today. Indeed, "a traditional definition that posits a unitary geocentric view, proposed by Spearman (1904), can be contrasted with other theories of the construct, such as the pluralistic views proposed by Gardner (1983) or Sternberg (2003)" (p.5).

Multiple Intelligences

Debates over the views of the nature of the mind and knowledge have been held since the times of Plato and Aristotle. Some view the idea that intelligence is a singular capacity, while others embrace a pluralistic view of the mind. There are implications in education based on these views to determine which is the most effective educational view to develop the mind and intelligences. The mind is complex, mysterious, unique, and intricate so practitioners have devoted themselves to the improvement of educational practice.

In 1983, Howard Gardner began a new era by publishing his theory in his book, *Frames of Mind: The Theory of Multiple Intelligences*. He argued that human intelligence is not a single capacity, but pluralistic abilities to solve a problem, create a product, or find and solve problems that are of value (Gardner, 1983, pp. 60-61). His definition of intelligence is built on the notion that "the problem-solving skill permits one to approach a situation, in which a goal is to be obtained, and to locate and pursue appropriate routes to that goal", whereas "the creation of a cultural product is the preferred route to capturing knowledge, transmitting knowledge, formulating new knowledge, and expressing views or feelings" (Walter & Gardner, 1986, pp. 165-166). For Gardner, intelligence is not a "property of the brain," but rather the "interaction

42

between potentials in the brain/mind and learning opportunities in the society" (1993, November). Gardner determined that intelligence is not a trait fixed at birth that remains stable throughout the life span but can grow and be learned (p. 14).

The eight intelligences posited by Gardner are: musical, bodily kinesthetic, logical-mathematical, spatial, linguistic, interpersonal, intrapersonal, and naturalist. For a construct to be considered an intelligence, several criteria had to be met, such as: being an identifiable and separate function of the brain, being a biopsychological predisposition, being found across cultures and over time, and being supported by evolutionary biology and cognitive research. Everyone possesses varying abilities in each domain, with certain domains having more ability than others. These intelligences act in accord, with certain domains dominating an individual's cognitive profile. The abilities in each domain can be improved and developed with new experiences, learning, and practice. Gardner explains "we all have these intelligences; individuals differ for both genetic and experiential reasons in their respective profiles of intellectual strengths and weaknesses" (p. 5). "Each intelligence is capable of being symbolized" while further stating "the ability to symbolize-or depict ideas and experiences through representations like pictures, numbers, or words- is a hallmark of human intelligence" (p.13).

Linguistic intelligence

Linguistic intelligence refers to an individual's ability with distinct functions of language including semantics, phonology, and syntax. Linguistic intelligence is one form of intelligence that provides the basis for I.Q exams. It is sensitivity to the meaning and order of words. These individuals can think in words and to use language to express and understand complex meanings, be sensitive to the meaning of words as well as the order among words, their sounds, rhythms,

inflections, and to reflect on the use of language in everyday life. This intelligence has *skill* in the use of words for expressive and practical purposes, in reading, ability and interest in writing projects such as poems, stories, books or letters, and skill in oral communication for persuasion, memorization and description.

Great writers and speakers are often associated with this form of intelligence. Gardner described it as the "ability to reason, sequence, think in terms of cause-and-effect, create hypotheses, look for conceptual regularities or numerical patterns, enjoy a generally rational outlook on life" (p. 10). Individuals with this intelligence can argue, persuade, entertain, and instruct effectively through the spoken word. These individuals typically love to play around with sounds of language through puns, word games, and tongue twisters, may be trivia experts because of their ability to retain facts in their mind. Considered experts in literacy, these individuals read voraciously, can write clearly, and can gain meaning in other ways from the medium of print.

Logical-mathematical

Logical-mathematical intelligence is described as an individual's capacity to discern logical or numerical patterns and demonstrate skills of complex reasoning. These individuals think of cause-and-effect connections, understand relationships among actions, objects, or ideas, are able to calculate, quantify, consider propositions, and perform complex mathematical or logical operations. This intelligence involves inductive and deductive reasoning skills as well as critical and creative problem-solving, organization, problem solving, logical reasoning, curiosity, and investigation, can conduct calculations with numbers for mathematical operations such as addition and division.

Logical-mathematical thinkers use numbers and Greek letters, among other symbols, to serve their rational needs. Logical-mathematical intelligence is familiar to most of us as it is the ability to manage chains of reasoning and to recognize patterns and order (Hoerr, 2000). Gardner notes that this form of intelligence is often labeled scientific thinking, the "ability to reason, sequence, think in terms of cause-and-effect, create hypotheses, look for conceptual regularities or numerical patterns, enjoy a generally rational outlook on life" (1999, p. 10).

Spatial intelligence

Spatial intelligence includes components of perceiving the visual-spatial world accurately, transforming images, developing mental images of forms, and producing accurate graphic images based on spatial information. Spatial intelligence is a less familiar area; it is the ability to perceive the world accurately and to create or transform aspects of that world. Individuals with this intelligence can think in pictures and to perceive the visual world accurately, think in three-dimensions, transform one's perceptions and re-create aspects of one's visual experience via imagination and work with objects effectively. This intelligence includes using mental imagery for observation, artistic, creative, and other visual activities, creating artistic designs, drawings, paintings or other crafts, and constructions, making, building, or assembling things.

Engineers, architects, navigators, and chess players all demonstrate this type of intelligence by thinking in pictures and images, with an ability to perceive, transform, and re-create various aspects of the visual-spatial world. In addition to thinking in pictures and images, they can perceive, transform, and re-create several aspects of the visual-spatial world, while

45

being acutely sensitive to visual details. These individuals visualize vividly, draw, or sketch their ideas graphically, and orient themselves in three-dimensional space with ease.

Bodily-kinesthetic

Bodily-kinesthetic intelligence relates to the ability to use the body skillfully and handle objects adroitly. These individuals think in movements and use the body in skilled and complicated ways for expressive as well as goal-directed activities. This intelligence involves a sense of timing and coordination for whole body movement and the use of hands for manipulating objects. These individuals have an ability to move the whole body for physical activities such as balancing, coordination and sports, dancing, acting, use the body in expressive, rhythmic, and imitative ways, may use hands with dexterity and skill for detailed activities and small work.

Gardner suggested that expressing an emotion in a dance, playing a game skillfully in sports, or creating a new product or invention is evidence of the cognitive features of body usage (1993, pg. 19). Athletes, dancers, and crafts persons are often associated with this form of intelligence. Called the intelligence of the physical self, this intelligence includes talent in activities such as sewing, carpentry, or model building. Many occupations, including mechanics and surgeons, possess some measure of this kind of thinking, while enjoying physical pursuits like hiking, dancing, jogging, camping, swimming, or boating. These are typically hands-on people who have good tactile sensitivity, need to move their bodies frequently, and get "gut reactions" to things.

Musical intelligence

46

Musical intelligence includes the ability to appreciate and produce rhythms, pitches, and timbres, as well as a sensitivity to the forms of musical expressiveness. Individuals with this intelligence typically use notes of the bass and treble clef to symbolize melodies and rhythms. They have a good ear, can sing in tune, keep time to music, and listen to different musical selections with some degree of discernment (p. 10).

Musical Intelligence includes the ability to think in sounds, rhythms, melodies, and rhymes, to be sensitive to pitch, rhythm, timbre, and tone, to be able to recognize, create and reproduce music by using an instrument or voice. It includes active listening and a strong connection between music and emotions. Some individuals with this intelligence have an awareness of and sensitivity to music, rhythms, tunes, and melody, may have skill and experience in playing a musical instrument, good voice for singing in tune and along with other people, and typically actively enjoy listening to music.

Interpersonal intelligence

Interpersonal intelligence involves the ability for an individual to be sensitive to the emotions and actions of others. Individuals with this intelligence can think about and understand another person, have empathy, and recognize distinctions among people and to appreciate their perspectives with sensitivity to their motives, moods, and intentions. This intelligence involves interacting effectively with one or more people in familiar, casual, or working circumstances, a sensitivity to and understanding of other people's moods, feelings, and point of view. Individuals with this intelligence can maintain good relationships with other people especially friends and siblings, and to take a leadership role among people through problem solving and influence.

Interpersonal intelligence is the ability to understand people and relationships and can be found among religious and political leaders, counselors, and teachers. These individuals easily use social symbols, such as waving goodbye, accessing a room of people, and easily notice signs and communication through body language, expressions, and emotions. People with this intelligence have a capacity to notice distinctions among other people, such as contrasts in their moods, temperaments, motivations, and intentions. These individuals understand and work with other people easily, exhibiting a capacity to perceive and be responsive to the moods, temperaments, intentions, and desires of others (p. 11). Individuals with this intelligence can get "into the skin of another person and view the world from that individual's perspective" (p. 11). They are wonderful networkers, negotiators, coaches, and teachers.

Intrapersonal intelligence

Intrapersonal intelligence is the capacity for a person to have insight about their own emotional, intellectual, and psychological makeup. Individuals with this intelligence can think about and understand oneself, are aware of one's strengths and weaknesses, plan effectively to achieve personal goals, and are able to reflect on and monitoring one's thoughts and feelings and regulating them effectively. This intelligence includes the ability to monitor oneself in interpersonal relationships, to act with personal efficacy, awareness of one's ideas, abilities, personal decision-making skill, and self-correction and monitoring considering a goal. These individuals can regulate one's feelings, moods, and emotional responses and to regulate one's mental activities and behavior.

Gardner uses the example of symbols of the self, as found, for example, in early morning dream images. Intrapersonal intelligence relates to accessing one's emotional life to understand

48

oneself and others. Gardner notes that "since this intelligence is the most private, it requires evidence from language, music, or some other expressive form of intelligence to be observed" (1993, p. 25). This is an intelligence of the inner self, with access to one's own feelings, and an ability to discriminate between many kinds of inner emotional states. These individuals use self-understanding to enrich and guide their lives. Individuals with this ability are counselors, theologians, and self-employed businesspeople, as they can be very introspective. Intrapersonal intelligent people enjoy meditation, contemplation, and other forms of soul-searching. They tend to be fiercely independent, highly goal-oriented, and intensely self-disciplined (p. 11).

Naturalist

According to Furnham, et al. (2002), Gardner later added an eighth intelligence (p. 6). The naturalist intelligence focuses on recognizing and classifying phenomena such as flora and fauna in the environment. Observation and pattern identification are critical in this intelligence. This talent is seen in people such as Jane Goodall and Charles Darwin.

The Relative Influence of Various Intelligences

Gardner points out that although you may strongly identify with one or two of the intelligences, you possess all intelligences. He noted that every individual can develop every one of the seven kinds of minds to a reasonable level of proficiency. Gardner explains that there are "a few intelligences that stand out, some that seem average, and others that we've had considerable difficulty within our lives" (p. 12). Gardner's theory states that "there is room for everyone to shine in this model of intelligence" (p. 12).

Most people exhibit several intelligences, not just one; in fact, Gardner specifically states that "all humans possess certain core abilities in each of the intelligences" (1993, p. 28). Even though all humans partake in each intelligence, certain individuals have more potential in particular intelligences. Some intelligences arise at an early age such as logical-mathematical and musical, while others arise more gradually such as the personal intelligences.

Sternberg (1999) argues there are three different, but interrelated aspects of intelligence: analytical intelligence, creative intelligence, and practical intelligence. Analytical intelligence involves one executive processes. Creative intelligence involves problem-solving and decision-making abilities. Practical intelligence is descriptive of behavior required to adapt, shape, and select appropriate real-world environments. Sternberg (2003) labels the sum of these three intelligences as successful intelligence (p. 6). Sternberg stated on the three aspects of intelligence that the two views, general intelligence (g-centric) and pluralistic of intelligence suggest that interventions designed to enhance career decision making can vary widely in application. A g-centric view, for example, might focus on information processing capacities and identifying careers that are suited for a person based on their IQ. On the other hand, pluralistic intelligence perspectives (such as those suggested by Gardner and Sternberg) "might focus more on idiosyncratic strengths and weaknesses a student might have and advocate self-awareness of one's profile as conducive to making good career decisions" (p. 8).

Gardner took a sabbatical in 1994-95 and used part of that time to review evidence for the existence of new intelligences. He concluded that there was ample evidence for a naturalist intelligence; and suggestive evidence as well for a possible existential intelligence ("the intelligence of big questions"). In addition, he also explored much more deeply the relation between intelligences, the various domains and disciplines that exist in various cultures.

According to the theory of multiple intelligences, each intelligence emerges at a certain point in childhood, has periods of potential blossoming during the life span, and contains its own unique pattern of either gradual or rapid decline as a person ages. The theory goes on to explain that no two individuals have the exact same intelligence combination, including identical twins. Each of the other intelligences has its own patterns of waxing and waning during the human life cycle, while being vulnerable to impairment through insult or injury to specific areas of the brain. Multiple Intelligence theory predicts that intelligences can actually be isolated through brain damage" (p. 14).

Gardner suggests that in order to be viable, any theory of intelligence must be biologically based- that is rooted in the physiology of brain structure (p. 14). What makes Gardner's model powerful is that he backs it up with research from a wide range of fields, including anthropology, cognitive psychology, developmental psychology, psychometrics, biographical studies, animal psychology, and neuroanatomy. Gardner's work reinforces these other cognitive studies and suggests that student affairs play a primary role in the development of intelligence. Because the personal intelligences tend to be developed later in life, it is more important for higher education to be involved in fostering these talents than elementary and secondary schooling.

Gardner's theory also has implications for accountability, especially related to the assessment of learning outcomes in higher education. Gardner's theory reinforces the notion that learning goals, curriculum, instruction, and related assessment should be integrated, into the assessment and accountability movements. Educational institutions that are conducting outcomes assessment might develop ways to measure multiple intelligences.

Other Studies and Views of Intelligence

In the past two hundred years there has been a wide range of theories touting up to 150 distinct kinds of intelligence. Specific requirements were established that each intelligence had to meet in order to be included in Gardner's theory. Spearman suggested intelligence could be measured by a single construct (intelligence quotient or IQ), Gardner suggested intelligence could be measured by a combination of seven different constructs or intelligence abilities. Scholarly writings about intelligence focus on a combination of linguistic and logical intelligences—the intellectual strengths, where a fuller appreciation of human beings occurs if we consider spatial, bodily kinesthetic, musical, interpersonal, and intrapersonal intelligences.

Psychologist Robbie Case proposed the notion of central conceptual structures—broader than specific intelligences but not as all-encompassing as Piagetian general intelligence. Philosopher Jerry Fodor contrasts impenetrable dedicated modules with a permeable central system. The team of Marc Hauser, Noam Chomsky, and Tecumseh Fitch suggests that the unique quality of human cognition is its capacity for recursive thinking; it is recursion that characterizes advanced thinking in language, number, music, social relations, and other realms. Electrophysiological and radiological studies indicate that various brain modules may already be activated in newborns. Neural imaging studies of individuals solving IQ-style problems suggest that certain areas of the brain are most likely to be drawn on for these kinds of problems; and there may be evidence for genes that contribute to unusually high IQ, as there clearly are 14 genes that cause intellectual disability. And our own case studies of unusually high performances suggest a distinction between those who (like musicians or mathematicians) are outstanding in one area, as opposed to those generalists (politicians or business leaders) who display a flat profile of cognitive strengths (Taylor, 2007, p. 13-14).

Some critics claim that intelligences are really what are commonly called gifts or talents (Morgan, 1992; Stage et al., 1998). Gardner agrees, but then would want linguistic and logical-mathematical ability also labeled talents, rather than being elevated for no reason (Gardner, 1993). Others claim that general intelligence such as critical thinking, reflectiveness, or memory does exist, and that this theory fails to acknowledge this important general intelligence (Morgan, 1992). Gardner notes that his reading of the evidence suggests there is not a content independent knowledge base, yet this is still open to debate with no definitive evidence. Over the last fifteen years, many studies have been conducted and empirical evidence continues to mount support for the theory. Certainly, the theory may be falsified, but the evidence suggests that multiple intelligences exist within everyone (Armstrong, 2000; Gardner, 1993; Hoerr, 2000).

There are no direct educational implications that follow from this psychological theory; but if individuals differ in their intellectual profiles, it makes sense to take this fact into account in devising an educational system.

Higher Education

Higher Education, colleges, and institutions are in crisis. A worthwhile postsecondary degree is more important than ever, while college tuition is more expensive than ever before. Due to these circumstances, students are incurring and taking on more historically elevated levels of debt. Over the past three decades, tuition at a four-year institution has doubled, thus doubling the average amount owed by a student loan borrower. Due to this increased cost of higher education, student debt has also grown over the past two decades. Institutions of higher

education are facing increasing pressure to provide education that not only is affordable, but also helps all students succeed.

Four-year institutions are also seeing dropout rates of almost 50%. Increasing completion rates would produce more college graduates. Therefore, numerous institutions are increasing enrollment and access, and placing emphasis on matriculating students through their degrees and curricula. Students who do not graduate are three times more likely to default on their loans. According to the United States Department of Education, in 2015, almost half of the students who began college were not graduating within six years (https://www.ed.gov/news/press-releases/fact-sheet-focusing-higher-education-student-success). With the increase in college tuition and student debt, higher education institutions are under increasing pressure to demonstrate that students are graduating with a degree of increasing value. Post-secondary schools will need to continue to be purposeful with the knowledge, skills, and content they are teaching and assess whether learning occurs. According to Doug Lederman, "the pressure to be more intentional about the outcomes a college or program aims to develop isn't likely to abate soon" (2019).

Total college enrollment increased by 30% from 2010 to 2015 and is projected to further increase by 14% from 2015 to 2026 (National Center for Education Statistics). Hussar & Bailey stated in 2019 that due to the increasing pressure to earn a college degree, projected enrollments are approximately 17.4 million undergraduate students by 2027 in all postsecondary, degree-granting institutions. Sandmann estimated that in 2010, 36% of the students enrolled in four-year colleges and universities were adults aged twenty-five years and older. Traditional students represent only about 15 percent of current undergraduates. They attend four-year colleges and live on campus. The remaining 85 percent, or about 15 million undergraduates, are a diverse

group that includes adult learners, employees who study, low-income students, commuters, and student parents" (Knowles, p. 6). Post-traditional learners need a different teaching design. Traditional teaching methods focus on the classroom level, while learning takes place at the individual student level. Therefore, teachers should learn to bridge this gap in instructional design (Sims, R. R. & Sims, S. J. (1995).

Stakeholders such as parents, employers, legislators, and students are calling for accountability in higher education and demanding additional value to the college education (Reid & Johnston, 1999; Devlin & Samarawickrema, 2010). These stakeholders are demanding quality teaching and improved learning in undergraduate and graduate settings (Austin & McDaniels, 2016). Yet Boysen (2018) noted that teaching and teacher preparation assessments in higher education are different from the stricter standards used in K-12 educational settings. The learning needs of adults are more varied from children "because an adult is in a different position in the life cycle than a child, and because adults' life experiences are greater and more varied than those of children" (Knowles, p. 12). Adults' life experiences not only define who they are as adults, but these life experiences are also a rich resource for learning. Knowles explained, "the resource of highest value in adult education is the learner's experience (p. 6). Experience is the "adult learner's textbook" he continued, (1980, p.7), therefore, adults' learning needs vary from those of children. Institutions whose primary focus is education offer formal educational settings. Groups, agencies, and other institutions that have missions other than education, provide nonformal learning settings. By understanding these perceptions, instructors may better connect with students, motivate learning, and adapt teaching techniques to student needs (Dehlavi, 1987; Buskist et al., 2011). According to Knowles in 1990, "learners are highly diverse in their

experiential backgrounds, pace of learning, readiness to learn, and styles of learning; therefore, learning programs need to be highly individualized" (p. 172).

Meeting the needs of diverse learners is the area with the greatest implications for higher education. The most obvious implication is that faculty might consider teaching their courses/subject matter through the multiple intelligences. How might music, group work, dance, and drawing be incorporated into the assignments or exercises? In addition, thinking in terms of multiple intelligences reinforces the value of faculty members' desire to experiment with innovative approaches such as cooperative, collaborative, or community service learning. These teaching and learning methods appear to develop intelligences formerly not addressed through conventional techniques such as lecturing. Collaborative learning, working in groups to develop knowledge collectively, has the potential to develop interpersonal and intrapersonal intelligences (Kezar, 2001).

College Entrance Requirements

The admissions criteria for higher education need to be re-examined since they tend to identify students with linguistic or logical-mathematical intelligence solely. A few colleges, smaller ones, such as Bates College or Franklin and Marshall, admit students based on portfolios. Also, specialized schools, as in music or art, examine students work rather than standardized tests (Kezar, 2001). Student affairs progress in this realm (closely related to interpersonal, intrapersonal, and bodily kinesthetic intelligences, e.g., leadership programs, multicultural efforts, and sports programs) has often been marginalized (Kezar, A., 2001).

Multiple intelligences should be considered not only in adult education, but also the admissions process, due to this changing landscape of higher education. By changing admissions

processes to tap into multiple intelligences, institutions could also modify placement in honors curricula to include students with musical or intrapersonal intelligence, for example. Even though there are open admissions institutions and talented individuals with drive can indeed pursue some form of postsecondary education, many students with strengths in other than linguistic or logical-mathematical intelligence may not be able to receive an education at elite institutions where only traditional concepts of intelligence are appreciated. This limitation in our admission process limits our potential as a society, according to Kezar (2001). As the higher education landscape, student population, and other trends occur, additional strategies need to be considered in order to reach all students and adult learners.

College and Major Choice

Each year approximately 70% of high school graduates enroll in college courses (BLS). It is an exciting time for these 2.2 million colleges first-year students, but they do face the challenge of choosing an academic major and minor. Prior research suggests 20% to 50% of incoming college first-year students do not have a declared academic major when they start college and about 75% of college students change their major at least once during their college years (Freedman, 2013).

Another research study showed that college students who select an academic major matching their personal interests are more likely to finish their degree plan on time. (Sheehy, 2013). However, the same study concludes that most high school graduates are not choosing academic majors that matches their interests or skills. In fact, the study showed that only 36% of students who chose a college major while still in high school selected a major that fit their personal interests well (Sheehy, 2013). This study recommends students wait until college to

choose an academic major and take some elective courses to find an academic field that interests them.

A widely accepted definition of a "good" major choice is the major best capable of helping the student to achieve their educational and post-education goals. Consequently, we would expect that the match between the students' abilities and interests and the abilities required by the major would be important attributes of perceived "good" majors by undergraduate students (Beggs, et al., 2008). Lent at al. (1994) stated that a student's choice of major is the result of the interaction between person, environment, and behavior. Due to the increasing number of rising college students, this means that more students face the problem of choosing his or her college major. The choice of a college major is a weighty decision that must be made by all college students. Every year millions of young high school graduates enter college. Next, is the stressful, difficult, and daunting decision of selecting an academic major. Undergraduate students face the challenge of deciding an academic major that may well decide their working career for the next 40+ years. This is one of the most important decisions a college student must make.

A study conducted by Liz Freedman of Butler University suggests that all students are unprepared at the time of college entry to choose an academic major and minor (Freedman, 2013). Accordingly, colleges and universities have implemented a vast array of resources for assisting students who are undecided on an academic major and minor. The Freedman study further suggests that higher education institutions should push the decision of a major and minor until a student's sophomore year when the young adult is more prepared to make a wise choice that will affect their entire career path. Another study by The College Board recommends college students take courses that appeal to their personal interests and then seriously think about which

58

courses motivate them the most (College Board). This study suggests college students explore different courses and take some risk in their course choices. By doing so, a course a student never planned to take could end up helping them to decide a major or minor. A study by Cecilia Capuzzi Simon explains there are currently over 1,500 different academic majors in the United States and the number of majors is growing (Simon, 2012). It points out that roughly 24% of the current academic majors, such as homeland security and cyberforensics were just added over the past 10 years. This trend to increase the number of possible majors and minors makes the decision even harder. Further, the study points out that many college students are choosing a double-major or a major/minor combination to give themselves an advantage in the uncertain job market. Some (perhaps many) undergraduate students employ strategies of indecision as opposed to strategies of cognitive decision-making in that they "back into" a major rather than actively choose a major, often by employing heuristics. For example, a student may choose a particular major because "I don't want to sit at a desk all day" or "I don't like math." (Beggs, J. M., Bantham, J. H., & Taylor, S., 2008).

There are many influencing factors that affect the selection of majors by students. These factors include interest in the major, peer pressure, family pressure, academic ability, the major's reputation, job availability, job salary, the major's prestige, employment in public or private sector, and others (Aldosary, S. & Assaf, S., 196). The highest rated determinant, genuine interest in the subject, received a resounding 59% of respondents indicating it strongly influenced their choice of major (Adams, S. H., et al., 1994). Job Characteristics includes the numerous ways that extrinsic and intrinsic rewards of a job have been measured such as financial aspects of the job, autonomy, occupational prestige, and quality of life issues (Beggs, J. M., et al., 2008). The financial aspects of a job can be considered as starting salary, high earnings

potential, benefits, opportunities for advancement, and such. Adams, S. H., Pryor, L. J., & Adams, S. L. (1994) reported that 68.4% of the respondents chose their major because they liked the kind of work it would enable them to do as compared to 7% who picked their major for its earning potential (Collins, M. & Giordani, P., 2004). Most students chose their major based on academic ability in specific subjects. Personal ability is a crucial factor in students' choice of major (Huang). "This information can also help high school counselors, college administrators, college advisors, professors, and parents to guide the young student toward the right decision for their personality, goals, and talents, as well as reduce the number of times students change their academic major or minor." (Stock & Stock, 2018).

Several studies have concluded that parental influence has a strong effect on major choice (Chung, Loeb, and Gonzo, 1996; Keillor, Bush, and Bush, 1995; Newell, Titus, and West, 1996). However, Adams, Pryor, and Adams (1994) reported that only 4% of the respondents indicated parental pressure and 10% indicated the major being like their parent's occupation as strong influences on their decision. One study by Lulu Guo (2009) concluded that parents' professions had a strong influence on children's intelligence, language ability as well as cognitive development, which all have implications toward students' choice of major. Interestingly, business majors appear more affected by their parents' occupation and socioeconomic status than nonbusiness majors (Leppel, et al, 2001). Adams et al. also reported that 9% of respondents indicated the recommendations of friends and relatives and 6% indicated that the recommendations of counselors influenced them strongly when choosing a major. As a comparison, the highest rated determinant, genuine interest in the subject, received a resounding 59% of respondents indicating it strongly influenced their choice of major.

Early college experiences, including signals about skills, fit, and career options, can affect students' willingness to consider certain majors (Kugler et al., 2017). Existing approaches include giving students opportunities to learn about a major's relationship to careers through coursework (Butterfield & Crews, 2012; Keup et al., 2010; J. Wang & Staver, 2001). Results from a study conducted by Malgwi et al (2005), show that interest in the subject area was the most key factor for incoming first-year students, regardless of gender. The research conducted found genuine interest in the field was the determinant that received the highest number of respondents (59%) indicating that it strongly influenced them. Fit and Interest in Subject, included factors such as aptitude for the subject, genuine interest in the field, as well as match between personality and subject, etc. (Adams, S. H., et al., 1994). Beggs found that students stated: "Being able to build upon what I have interests in and building upon my strengths was important to me," "This major seemed like the best match for me. It fit my personality," and "I waited until I was 26 to go back to college, so I was able to use my past job experiences in seeing what interested me" (Beggs, J. M., et al., 2008). Their analysis revealed the following order of importance for all students:

1. Match with Interests

2. Course/Major Attributes

3. Job Characteristics

4. Financial Considerations

5. Psycho/Social Benefits

6. Information Search

In 1999, Turner and Bowen conducted research on the relationship between gender differences and SAT score differences. The researchers concluded that abilities as measured by

the SAT did little to explain gender differences in choices of a nonbusiness majors. "Knowing the main factors that influence how undergraduate college students choose an academic major or minor can help colleges and universities plan their degree offerings and assist college advisors to understand how students make this life-changing decision" *Paul STOCK ()*. Surprisingly, there is relatively little research on the factors that influence a college student's choice of an academic major or minor.

Gender, Ethnicity, and College Major

Along with entering higher education, students of different genders must select their academic major. Within the same school, men and women, students of different socioeconomic backgrounds, and students of different ethnicities sort into different majors (England & Li, 2006; Gradin, 2011; Sloane et al., 2019). Women are less likely than men to earn degrees in STEM (science, technology, engineering, and math) fields (Morgan et al., 2013). Lisa Dickson's research found that women are more likely to major in humanities and social sciences than men and are less likely to choose a major in engineering (2010). England and Li's research supported this conclusion when finding that females are much more likely to major in education and English (2006). In 2015–2016, women earned 84% of bachelor's degrees in health professions, while male students earn 81% of bachelor's degrees in computer and information sciences and 79% of bachelor's degrees in engineering (Aud et al., 2010).

Kanter worked to find explanations for why women and racial and ethnic minorities are unlikely to choose a field in which they will be underrepresented (Kanter, 1993; Lackland, 2001; Solnick, 1995). Their findings for the explanations included social norms about gender and race

(e.g., Chusmir, 1990; Farmer, 1985), the "chilly climate" of some fields (Hall & Sandler, 1982), and stereotype threats (Deemer et al., 2014).

Female students tend to want to be in professions where they perceive they are making a difference. Eccles determined that female students are much more likely than male students to want jobs that "provide direct benefits to society" (2007, p. 209). Women choose their academic major based on their values. Therefore, these individual preferences and values are shaped by the larger cultural and structural processes (Baker, and Orona,). For women, the next most influential factor was aptitude in the subject. However, men were significantly more influenced by the major's potential for career advancement and job opportunities and the level of compensation in the field (Malgwi, C.A., Howe, M. A., & Burnaby, P.A., 2005). Males and females do have similar preferences regarding choices at college but differ in their tastes regarding the workplace. Females mostly care about non-pecuniary outcomes such as gaining approval of parents and enjoying the work, while males value pecuniary outcomes including social status, likelihood of finding a job, and earnings profiles at jobs, (Zafar, Basit).

In the United States, career fields are highly segregated by race, ethnicity, and gender Blau et al., 2013; Gradin et al., 2015; Hegewisch & Hartmann, 2014; Mann & DiPrete, 2013; Queneau, 2009; Tomaskovic-Devey et al., 2006). By reducing the large differences in students' curricular paths and major choices, there would be less occupational segregation (Shaw & Baruti, 2010). Robst suggested in 2007 that college major is predictive of occupational field. Black students are more likely than any other racial/ethnic group to earn business degrees and are the least likely to choose engineering degrees (Aud et al., 2010). Asian students are the least likely to earn degrees in either education or communication (Aud et al., 2010).

Of all racial groups, Asian students are the most likely to receive degrees in biology and biomedical sciences, while Black students are the least likely to choose engineering degrees (Aud et al., 2010). Asian men are also more likely to choose a major in Science and Engineering than white males (Dickson, Lisa. 2010).

Life Impacts and College Major

Choosing a college major represents a major life decision. Research has shown that this decision is the most frequently identified life regret for Americans (Beggs, J. M., Bantham, J. H., & Taylor, S., 2008). St. John, (2000) determined there is no college decision that is more "thought-provoking, gut-wrenching and rest-of-your life oriented — or disoriented — than the choice of a major". Roese and Summerville cited meta-analytical evidence that the most frequently identified life regret for Americans involves their educational choices (2005). More research is needed in this specific arena, as it is incredibly limited.

Within the business school, choice of a specific major is linked to personality traits, values, and interpersonal behavior and is again mediated by gender differences (Giacomino & Akers, 1998; Noel et al., 2003). Although factors have been found to vary somewhat by specific business major choice (Gul, Andrew, Leong, & Ismail, 1989), in general, students appear to be strongly influenced by their interest in the subject, the availability of jobs, their aptitude for the subject, and the earnings potential related to that major (Kim et al., 2002; Mauldin et al., 2000; Pritchard et al., 2004).

Summary

This chapter reviewed the literature on adult learning, the history of the study of intelligence, the development of the concept that people have multiple intelligences, and the

factors affecting choice of major in institutions of higher education. Each of these areas is relevant to the motivation behind this study. Adult learners are an increasing proportion of the college student population. Adult learners are self-directed, experienced, ready to learn, internally motivated, have a need to understand the reason for learning, and want to learn immediately. The most widely used entrance criteria for college admissions are qualitative and quantitative intelligence measures. Intelligence, as demonstrated by using language and the ability to think, reason, test hypotheses, and understand rules, is shared by all humans. As individuals we exhibit intelligence through the level of ability to learn, recognize, and solve problems. Multiple Intelligence theory argues that human intelligence is not a single capacity, but pluralistic abilities to solve a problem, create a product, or find and solve problems that are of value. This theory has implications for accountability, especially related to the assessment of learning outcomes in higher education. Learning outcomes are closely tied to a student's choice of major. Higher education institutions are under increasing pressure to demonstrate that students are graduating with a degree of increasing value. Therefore, post-secondary schools need to be purposeful with the knowledge, skills, and content they are teaching and assess whether learning occurs. The first step in that process is ensuring that a student chooses the "right" major as early as possible.

CHAPTER 3. METHODS

Introduction

Chapter 1 introduced the study by providing the general background information of the topic, statement of the problem, purpose of the study, research questions, and significance of the study, limitations, and definition of terms. Chapter 2 provided a review of literature organized into major sections that was utilized to determine the purpose of this study. Chapter 3 presents a detailed description of the research methods used in this study and outlines five sections: research design, population and sample selection, instrumentation, method of data collection and the plan of analysis for the study.

Research Design

This study explored the potential relationship between multiple intelligence and academic majors declared by undergraduate business students in the largest college at a mid-size public university in the southeast. To determine these relationships, a quantitative study was performed using data collected electronically. A survey research design was determined to be the most effective method for gathering responses. This sample of students was chosen due to the fact they had declared a business major and completed the Multiple Intelligence survey. The survey was administered to participants via email using Qualtrics software after receiving IRB approval. Participants were asked to check each item that reflected themselves. The research questions in this study were explored using a quantitative research design and the data were analyzed to examine relationships between variables. Participants were also asked to respond to academic demographic questions (major, classification, grade point average) as well as demographic questions (race/ethnicity, gender).

Population and Sample

The study consisted of a convenience sample of 1447 undergraduate declared major business students in the Harbert College of Business at Auburn University. The participants reported their age as 19+ years with a minimum of 30 credit hours completed. Due to FERPA and privacy concerns, participant anonymity was ensured through removal of all identifying information. The Principal Investigator was the only person with access to view the data.

Instrumentation

The electronic survey used in this study consisted of two different sections (Appendix 1). These items were used to determine relationships between specific variables. The first section contained five demographic questions where participants were asked to note the following: academic classification, race/ethnicity, gender, academic major, and grade point average. The questions in the first section of the survey asked respondents to indicate which statement best represented their response to each of the five demographic questions. Years pursuing a degree and nationality were not examined in this study.

The next section measured Multiple Intelligence (MI) through Armstrong's 2000 instrument *Multiple Intelligences Inventory for Adults (MIIA).* Armstrong adapted this instrument from Shearer's 1999 inventory *Multiple Intelligences Developmental Assessment Scales (MIDAS).* The *MIIA* (Appendix 2) and *MIDAS* (Appendix 3) both consist of questions that inquire about developed skill, levels of participation, and enthusiasm for a wide variety of activities that are a part of daily life. Responses result in scores for eight scales, representing each of Gardner's eight intelligences. Numerous studies have investigated the reliability and validity of the MIDAS (Shearer & Luzzo, 2009, p.7) finding it to be a psychometrically sound instrument with high internal reliability. The answer choices for the second section were "Agree"

and "Disagree." Participant responses were recoded for ten survey items in each of the eight multiple intelligences. Data from both sections were utilized and analyzed in an effort to answer each of the four research questions.

Data Collection

The research was approved by Auburn University Institutional Review Board (IRB #19-141). Approval forms are displayed in Appendix 4. This study gathered data from this population electronically using the Qualtrics platform taking no more than 15 minutes to complete the entire survey. An invitation was sent to individuals inviting them to participate in the research study electronically. The invitation contained information detailing the study and information regarding the principal investigator and faculty advisor. The students who choose to follow the link provided, accessed the information letter electronically. This information letter (Appendix 5) was utilized as consent for participation. If the letter was declined, the survey was exited, as participation was completely voluntary and there was no consequence for not participating. If the letter was accepted, participants completed the survey electronically with the option to exit the survey at any time. Upon submission, the participant was thanked for their participation.

Data Cleaning

The data was exported from Qualtrics into a comma separated values (CSV) file. This file was imported into Excel (Appendix 6). The following data was removed from the analysis:

- Data for subjects who did not want to be included in the study.

- Data for subjects who did not complete significant portions of the survey.

The following data was cleaned:

- GPA data containing non-numeric values (e.g., NA, not sure, etc.) were converted to null values.

- A GPA of 5.2 was converted to null value

- A GPA entered as "2.8 or 2.9" was converted to 2.85

- A GPA entered as "around 2.6" was converted to 2.6

- A GPA of 0.03 was converted to null value

- A GPA entered as "~2.7" was converted to 2.7

- A GPA entered as "`2.32" was converted to 2.32

The cleaned data was loaded into a Jupyter notebook for processing with the python programming language and pandas' statistical libraries. The cleaned data was scored to determine the predominant intelligence of the subject. In this survey, multiple intelligences could be equally dominant. Consequently, the data was initially partitioned into two sets. One set contained responses from students who had a single highest intelligent score (i.e., one of the multiple intelligences scores was larger than all the other intelligences scores). The second set contained responses from students who had two or more scores that tied for the highest intelligences score.

Due to the statistical techniques used in this study (described in the next chapter), only the first data set for students with a single highest intelligence score could be analyzed. However, exploratory analyses were conducted to identify differences in the two sample populations.

The code used to clean and organize the data is included in Appendix 7.

Research Question	Statistical Analysis	Data Retrieved from Question Set
1. Is there a relationship between a business student's academic major and their multiple intelligence?	Chi-square test of independence Chi-square goodness of fit test	Q5 (Major) Q7-Q93 MIDAS/MIIA
2. Is there a relationship between a business student's gender and their multiple intelligence?	Chi-square test of independence Chi-square goodness of fit test	Q4 (Gender) Q7-Q93 MIDAS/MIIA
3. Is there a relationship between a business student's race/ethnicity and their multiple intelligence?	Chi-square test of independence*	Q3 (Ethnicity) Q7-Q93 MIDAS/MIIA
4. Is there a relationship between a business student's academic classification and their multiple intelligence?	Chi-square test of independence	Q2 (Class) Q7-Q93 MIDAS/MIIA

*There was not enough data to calculate the Chi-square statistic to test Research Q3.

Table 1: Research Question Matrix

Summary

This chapter presented the purpose of the study, stated research questions, detailed the design of the study, described the population and sample, discussed instrumentation of this study, and outlined data collection and analysis methods. Survey and data collection procedures were approved by the Institutional Review Board (IRB). All data were stored securely in online portals. Chapter 4 presents the analysis of the data.

CHAPTER 4: DATA ANALYSIS

Introduction

Chapter 1 introduced the study by providing the general background information of the topic, statement of the problem, purpose of the study, research questions, and significance of the study, limitations, and definition of terms. Chapter 2 provided a review of the literature organized into major sections that were utilized to determine the purpose of this study. Chapter 3 presented a detailed description of the research methods used in this study and outlined five sections: research design, population and sample selection, instrumentation, method of data collection, and the plan of analysis for the study. This chapter presents the findings of this quantitative study based on instruments used to survey the sample population.

Purpose of the Study

The purpose of this study was to examine relationships between multiple intelligence and academic major within a business school setting at a major university in southeast Alabama. Data was also compared across race/ethnicity, gender, and academic classification.

In the Harbert College of Business, undergraduate students declare their major after 30 credit hours. The options include eight different majors: Accounting, Business Administration, Business Analytics, Finance, Information Systems, Management, Marketing, and Supply Chain. Students provide their standardized test scores and high school grade point average as qualifications to be admitted to college. Howard Gardner (1983) posited that there are eight Multiple Intelligences that should also be considered including Linguistic (words and language), Logical-Mathematical (logic and numbers), Musical (music, sound, and rhythm), Bodily-

Kinesthetic (body and movement), Spatial-Visual (images and space), Interpersonal (other people's feelings), Intrapersonal (self-aware), and Naturalist (natural environment).

By analyzing multiple intelligences in business students, this research can aid students in their appraisal of their skills and abilities in relationship to their academics and career path. In addition, the results of this research will help educators and career coaches to articulate the types of intelligences that are specific to majors and careers.

Research Questions

The following research questions were used in this study:

1. Is there a relationship between a business student's academic major and their multiple intelligence?

2. Is there a relationship between a business student's gender and their multiple intelligence?

3. Is there a relationship between a business student's race/ethnicity and their multiple intelligence?

4. Is there a relationship between a business student's academic classification and their multiple intelligence?

The analyses detailed in this chapter are used to directly respond to each of the four research questions based on participant responses. The research questions posited in this study were tested using a Chi-square test for independence. This test requires that an observation appears in only one row and column, so only the subjects who had one intelligence score that was greater than all other intelligence scores for that subject were used. Hereafter, this highest intelligence score is referred to as the student's primary intelligence category.

The chi-square test for independence is used when a data set of size N can be placed in an r x c contingency table, where each observation in N can be classified according to two criteria. Loosely stated, the null hypothesis for the chi-square test says that the rows and columns represent two independent classification schemes. There are r categories (rows) for the first criterion, and c categories (columns) for the second criterion. Each observation in N is classified according to the two criteria and thus ends up being placed in a particular cell in the r x c contingency table. The cell entries represent the number of observations belonging to that cell. For each cell, an expected number of observations in each cell if there is no relationship between the two criteria can be calculated. The Chi-square test statistic is based on the differences between the observed cell values and the expected cell values under an assumption of independence between the criteria. If the criteria are truly independent, then the difference between the observed cell values and the expected cell values will be small. Thus, a large chi-square statistic is indicative that some relationship between the criteria exists. A nominal scale of measurement is all that is required, although higher scales may be used. For more information about the chi-square statistic and how it is used, see Conover (1980).

Most statisticians advise that this test should not be used when

1. the expected number of observations in a cell is less than 5 for 2x2 tables and

2. when the percentage of cells with an expected number of observations less than 5 exceeds 20%for tables larger than 2x2.

Research Question 1

To test Research Question 1, a Chi-square test for the independence of MAJOR and INTELLIGENCE was performed. Only the seven MAJOR identifiers for which there was

adequate data were included. The test that MAJOR is independent of INTELLIGENCE was rejected (p-value = 5.73×10^{-7}, dof = 42, X^2 = 102.49), but the number of cells with an expected value of less than 5 exceeded 20%. Next the Natural Intelligence category was dropped because only one cell had an expected value greater than or equal to 5, and the test was executed again. Again, the test that MAJOR is independent of INTELLIGENCE was rejected (p-value=1.13×10^{-6}, dof=36, X^2=91.11). To examine this further, the Linguistic Intelligence category was dropped because it had many cells with an expected value of less than 5. The test was rerun. Again, the test that MAJOR is independent of INTELLIGENCE was rejected (p-value = 2.18×10^{-6}, dof = 30, X^2 = 79.68). This result indicates there is some relationship between MAJOR and INTELLIGENCE.

To explore each case further, a crosstabulation of the differences in the observed cell values vs the expected cell values for each MAJOR was created. Large differences indicate where the data is not what one would expect if the variables were independent.

	LogMath	Spatial	BodKin	Music	Interper	Intraper
ACCT	-4.31	-1.07	-4.48	6.95	2.67	0.25
BUAL	8.54	0.17	-2.32	-2.63	-1.56	-2.21
FINC	18.65	2.97	-8.50	-7.95	-4.39	-0.77
MNGT	-9.18	-3.31	6.35	4.53	-2.10	3.71
MKTG	-22.89	0.39	13.62	-3.34	9.98	2.24
SCMN	-1.51	1.75	0.22	4.52	-3.89	-1.09
ISMN	10.70	-0.89	-4.88	-2.09	-0.70	-2.14

Table 2: Crosstabulation of Differences (observed – expected) in Major by Intelligence Category

This data is more easily examined by creating a heatmap of the crosstabulation.
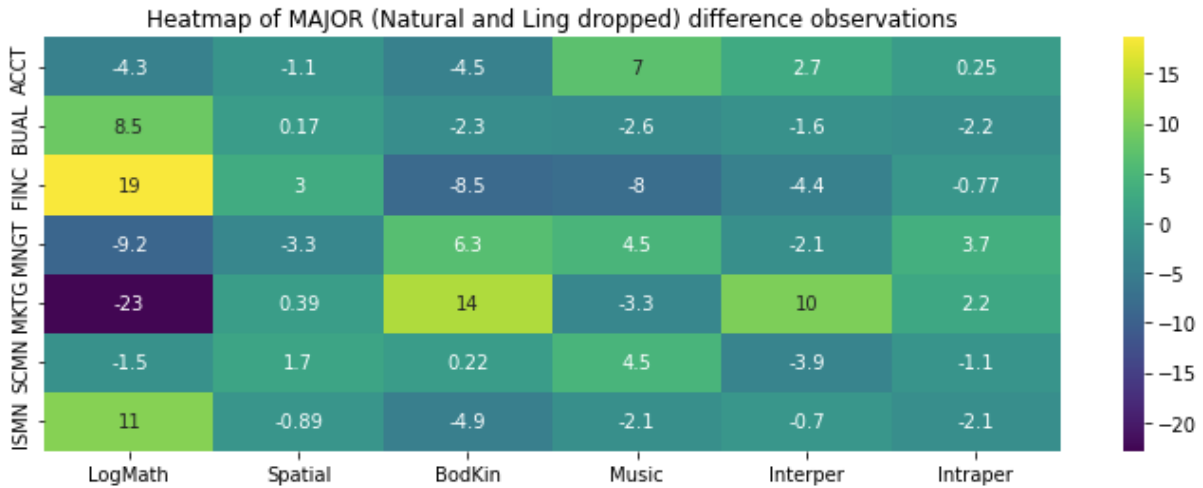
Figure 1: Heatmap of Differences by Major (Natural & Linguistic Intelligences removed)

The heatmap shows a large positive difference in the Logical-Mathematical Intelligence category for Finance majors (positive 19), Information Systems majors (positive 11), and Business Analytics majors (positive 8.5). In other words, there were 19 more Finance majors than one would expect for whom Logical-Mathematical Intelligence was the primary intelligence category. Similarly, there were 11 more Information Systems majors and 8-9 more (the expected value calculation can result in fractional values) Business Analytics majors in this category than one would have expected if no relationship existed.

There is a large negative difference for Marketing majors (negative 23). There was nothing to note in the relationship between Spatial intelligence and academic majors in business. The Bodily-Kinesthetic Intelligence category had a large positive difference for Marketing majors (positive 14) and a large negative one for Finance majors (negative 8.5). The Musical Intelligence category showed a negative difference (negative 8) for Finance majors, while the

Interpersonal Intelligence category shows a large positive difference (positive 10) for Marketing majors. There was nothing to note in the Intrapersonal Intelligence category.

To explore these relationships further, the distributions of data for each business major were examined more closely. Tables were created to examine the distributions of the majors across the intelligences (i.e., the major percentages sum to 100%).

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
ACCT	1.12	20.22	4.49	15.73	29.21	20.22	6.74	2.25

Table 3: Percent of Accounting Majors in each Intelligence Category
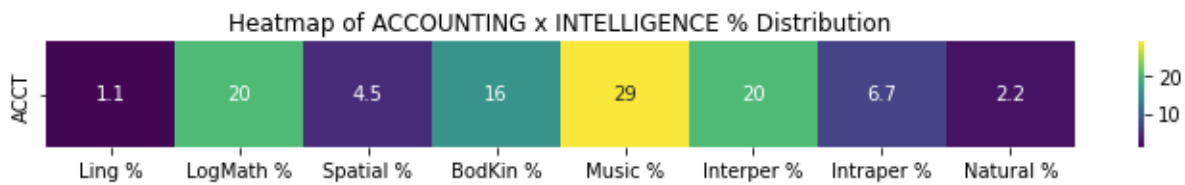
Figure 2: Heatmap of Accounting Major Intelligences Distribution (%)

The strongest intelligence category for Accounting majors is the Music Intelligence category, with slightly over 29% of them scoring in this category for their primary intelligence category. Two other categories where Accounting majors appear strongly are the Logical-Mathematic Intelligence category and the Interpersonal Intelligence category at 20% each. This is unsurprising that the patterns of Musical Intelligence category appear in Accounting majors, as well as also appearing in the Logical-Mathematical Intelligence category, as an ability to find patterns underlies both musical and mathematical aptitudes. Interestingly, Accounting majors also appear strongly in Interpersonal Intelligence category, refuting the stereotype of the introverted Accountant.

If there is no relationship between the choice of Accounting as a major and the intelligence categories, then the number of students in each intelligence category should be more or less the same. Statistically, one would say the observed values should follow a uniform distribution. A Chi-square goodness-of-fit test can be used to test whether the observed values differ enough from what would be expected if they come from a uniform distribution. The Chi-square goodness-of-fit test resulted in a Chi-square value of 23.67, dof = 5, p-value = 0.00025, indicating the observed values are not representative of a uniform distribution. This result indicates there is some relationship between the choice of major and the intelligence categories. This test excluded the Linguistics and Natural Intelligence categories to maintain consistency with the earlier analysis.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
BUAL	3.7	3889	5.56	14.81	14.81	12.96	1.85	7.41

Table 4: Percent of Business Analytics Majors in each Intelligence Category
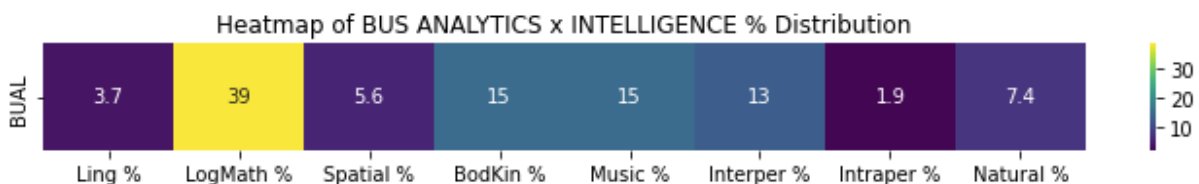
Figure 3: Heatmap of Business Analytics Major Intelligences Distribution (%)

There is a large majority, 39%, of Business Analytics majors whose primary intelligence category is the Logical-Mathematics Intelligence category. This intuitively makes sense, given the nature of Business Analytics students.

If there is no relationship between the choice of Business Analytics as a major and the intelligence categories, then the number of students in each intelligence category should be more

or less the same. The Chi-square goodness-of-fit test resulted in a Chi-square value of 30.5, dof = 5, p-value = 1.1756×10^{-5}, indicating the observed values are not representative of a uniform distribution. This result indicates there is some relationship between the choice of major and the intelligence categories. This test excluded the Linguistics and Natural Intelligence categories to maintain consistency with the earlier analysis.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
FINC	5.86	31.8	6.69	16.32	17.15	14.64	5.86	1.67

Table 5: Percent of Finance Majors in each Intelligence Category
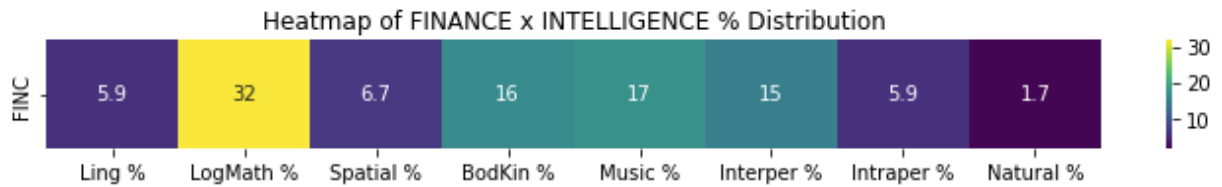
Figure 4: Heatmap of Finance Major Intelligences Distribution (%)

Finance majors also appeared strongly in Logical-Mathematics Intelligence at 32%. This is not surprising, as these students also are talented in mathematics.

If there is no relationship between the choice of Finance as a major and the intelligence categories, then the number of students in each intelligence category should be more or less the same. The Chi-square goodness-of-fit test resulted in a Chi-square value of 68.28, dof = 5, p-value = 2.340×10^{-13}, indicating the observed values are not representative of a uniform distribution. This result indicates there is some relationship between the choice of major and the intelligence categories. This test excluded the Linguistics and Natural Intelligence categories to maintain consistency with the earlier analysis.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
MNGT	4.58	17.56	3.05	25.19	24.43	15.27	9.16	0.76

Table 6: Percent of Management Majors in each Intelligence Category
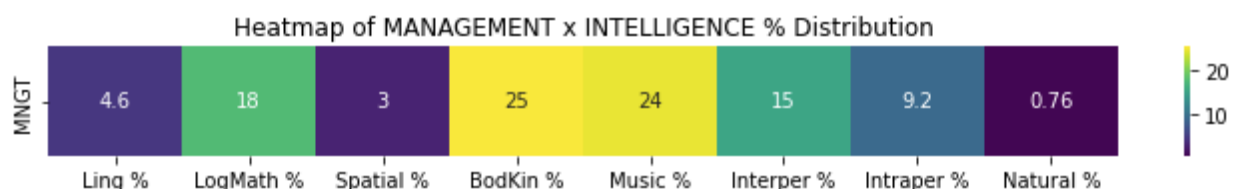
Figure 5: Heatmap of Management Major Intelligences Distribution (%)

Unlike the Finance majors (noted above), the primary intelligence category of management majors covered four Intelligence categories: Logical-Mathematical, Bodily-Kinesthetic, Musical, and Interpersonal. This distribution may result from the lack of a straightforward "management intelligence" category in this instrument.

If there is no relationship between the choice of Management as a major and the intelligence categories, then the number of students in each intelligence category should be more or less the same. The Chi-square goodness-of-fit test resulted in a Chi-square value of 30.94, dof = 5, p-value = 9.646×10^{-8}, indicating the observed values are not representative of a uniform distribution. This result indicates there is some relationship between the choice of major and the intelligence categories. This test excluded the Linguistics and Natural Intelligence categories to maintain consistency with the earlier analysis.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
MKTG	1.99	9.93	5.96	29.8	19.21	23.84	7.95	1.32

Table 7: Percent of Marketing Majors in each Intelligence Category
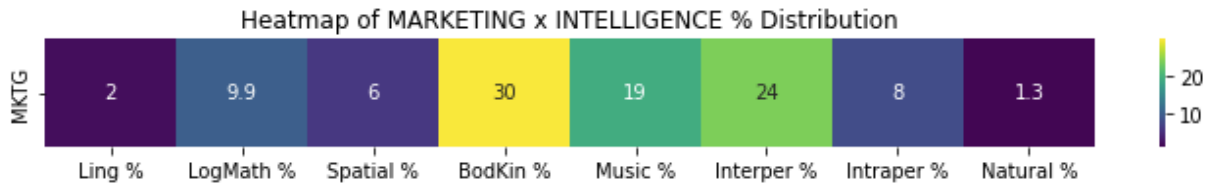
Figure 6: Heatmap of Marketing Major Intelligences Distribution (%)

Most Marketing majors (30%) have the Bodily-Kinesthetic Intelligence category as their primary intelligence category. For students going into sales, this result is not surprising. The low percentages of this major in the Linguistic and Spatial Intelligences is interesting considering the considerable number of students in this major choosing a career in advertising and marketing of products and services. It is also important to note that only 24% of this major have Interpersonal Intelligence category as their primary intelligence category, with careers in marketing, a sizable portion of their day-to-day operations involve people.

If there is no relationship between the choice of Marketing as a major and the intelligence categories, then the number of students in each intelligence category should be more or less the same. The Chi-square goodness-of-fit test resulted in a Chi-square value of 43.53, dof = 5, p-value = 2.879×10^{-8}, indicating the observed values are not representative of a uniform distribution. This result indicates there is some relationship between the choice of major and the intelligence categories. This test excluded the Linguistics and Natural Intelligence categories to maintain consistency with the earlier analysis.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
SCMN	0.9	23.42	7.21	20.72	25.23	13.51	5.41	3.6

Table 8: Percent of Supply Chain Management Majors in each Intelligence Category
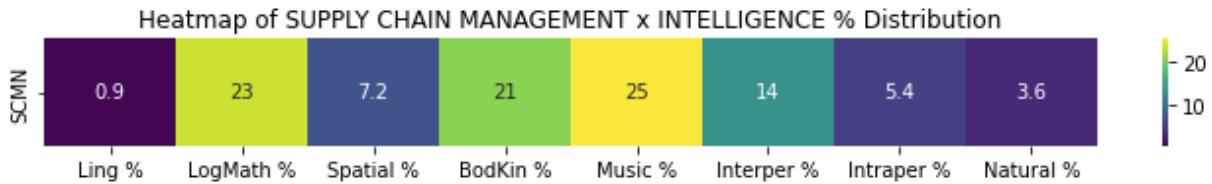
Figure 7: Heatmap of Supply Chain Management Major Intelligences Distribution (%)

Many Supply Chain majors have a primary intelligence category of Musical Intelligence (25%), Logical-Mathematical Intelligence (23%), and Bodily-Kinesthetic (21%). Considering this major involves purchasing, logistics, transportation of product, the patterning in music and Logical-Mathematical intelligence provides for success of these students in this field. Careers in this field also have a great deal of movement (Bodily-Kinesthetic) more than sitting behind a desk.

If there is no relationship between the choice of Supply Chain Management as a major and the intelligence categories, then the number of students in each intelligence category should be more or less the same. The Chi-square goodness-of-fit test resulted in a Chi-square value of 24.98, dof = 5, p-value = 0.0001, indicating the observed values are not representative of a uniform distribution. This result indicates there is some relationship between the choice of major and the intelligence categories. This test excluded the Linguistics and Natural Intelligence categories to maintain consistency with the earlier analysis.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
ISMN	0.0	59.38	3.12	6.25	15.62	15.62	0.0	0.0

Table 9: Percent of Information Systems Majors in each Intelligence Category
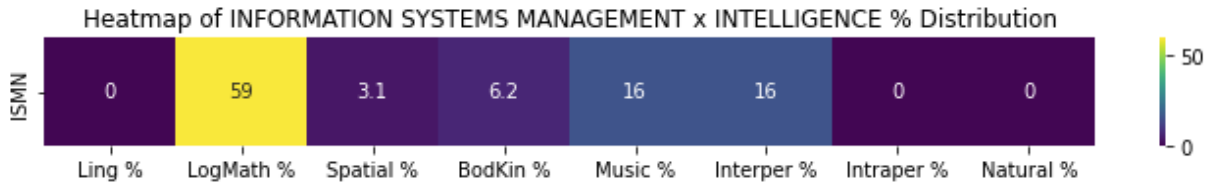
Figure 8: Heatmap of Information Systems Major Intelligences Distribution (%)

A majority of the Information Systems majors (59%) have Logical-Mathematical Intelligence as their primary intelligence category. In addition, this major also scored high in the Musical Intelligence category and the Interpersonal Intelligence category at 16%.

If there is no relationship between the choice of Information Systems Management as a major and the intelligence categories, then the number of students in each intelligence category should be more or less the same. The Chi-square goodness-of-fit test resulted in a Chi-square value of 46.00, dof = 5, p-value = 9.082×10^{-9}, indicating the observed values are not representative of a uniform distribution. This result indicates there is some relationship between the choice of major and the intelligence categories. This test excluded the Linguistics and Natural Intelligence categories to maintain consistency with the earlier analysis.

The percentage of each major in an intelligence category (i.e., the column percentages sum to 100%) was also calculated.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
ACCT	3.70	9.09	8.89	8.54	15.38	13.24	11.76	11.76
BUAL	7.41	10.61	6.67	4.88	4.73	5.15	1.96	23.53
FINC	51.85	38.38	35.56	23.78	24.26	25.74	27.45	23.53
MNGT	22.22	11.62	8.89	20.12	18.93	14.71	23.53	5.88
MKTG	11.11	7.58	20.00	27.44	17.16	26.47	23.53	11.76
SCMN	3.70	13.13	17.18	14.02	16.57	11.03	11.76	23.53
ISMN	0.0	9.6	2.22	1.22	2.96	3.68	0.0	0.0

Table 10: Percent of Majors in each Intelligence Category

Heatmap of MAJOR x INTELLIGENCE (columns sum to 100)

	Ling	LogMath	Spatial	BodKin	Music	Interper	Intraper	Natural
ACCT	3.7	9.1	8.9	8.5	15	13	12	12
BUAL	7.4	11	6.7	4.9	4.7	5.2	2	24
FINC	52	38	36	24	24	26	27	24
MNGT	22	12	8.9	20	19	15	24	5.9
MKTG	11	7.6	20	27	17	26	24	12
SCMN	3.7	13	18	14	17	11	12	24
ISMN	0	9.6	2.2	1.2	3	3.7	0	0
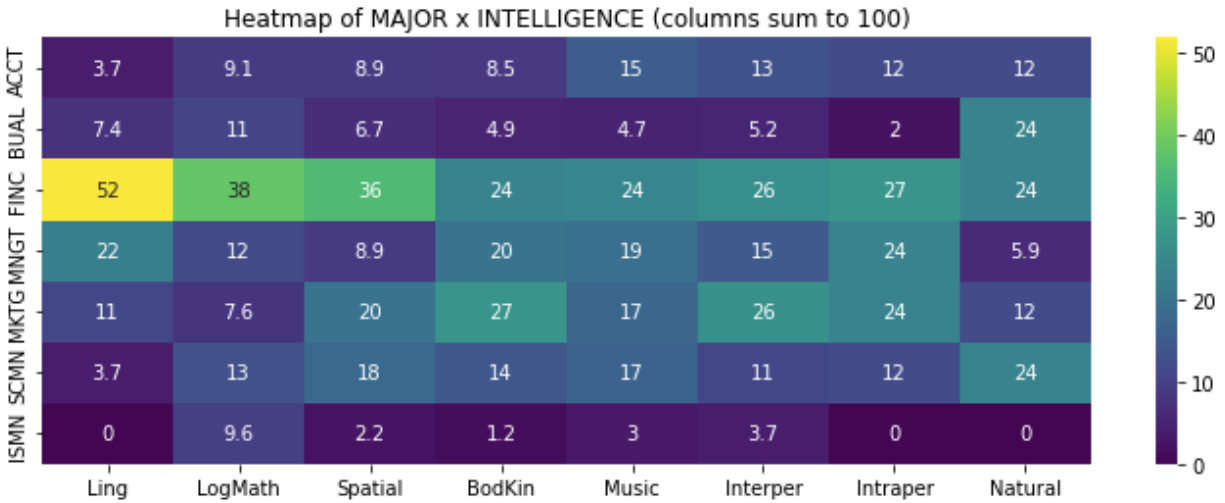
Figure 9: Heatmap of Major x Intelligence

In the Linguistic Intelligence category, 52% of the subjects were Finance majors, while 22% were majoring in Management. Finance majors made up 38% of the subjects in the Logical-Mathematical Intelligence category and 36% in the Spatial Intelligence category. The Bodily-Kinesthetic Intelligence category had large percentages of Marketing and Finance majors, 27% and 24%, respectively.

In the Musical Intelligence category, 24% of the subjects were majoring in Finance, while both Finance and Marketing were 26% of the subjects for whom the Interpersonal Intelligence category was the primary category. The Intrapersonal Intelligence category was made up of 27% Finance majors, 24% Management majors, and 24% Marketing majors. Natural intelligence had Business Analytics, Finance, and Supply Chain Management majors with 24% each.

The percentage of each major in each intelligence category (i.e., all percentages in the table sum to 100%) and the percentage of majors in each intelligence were calculated.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
ACCT	0.12	2.23	0.50	1.73	3.22	2.23	0.74	0.25
BUAL	0.25	2.60	0.37	0.99	0.99	0.87	0.12	0.50
FINC	1.73	9.42	1.98	4.83	5.08	4.34	1.73	0.50
MNGT	0.74	2.85	0.50	4.09	3.97	2.48	1.49	0.12
MKTG	0.37	1.86	1.12	5.58	3.59	4.46	1.49	0.25
SCMN	0.12	3.22	0.99	2.85	3.47	1.86	0.74	0.50
ISMN	0.0	2.35	0.12	0.25	0.62	0.62	0.0	0.0

Table 11: Overall Percent of Majors in each Intelligence Category
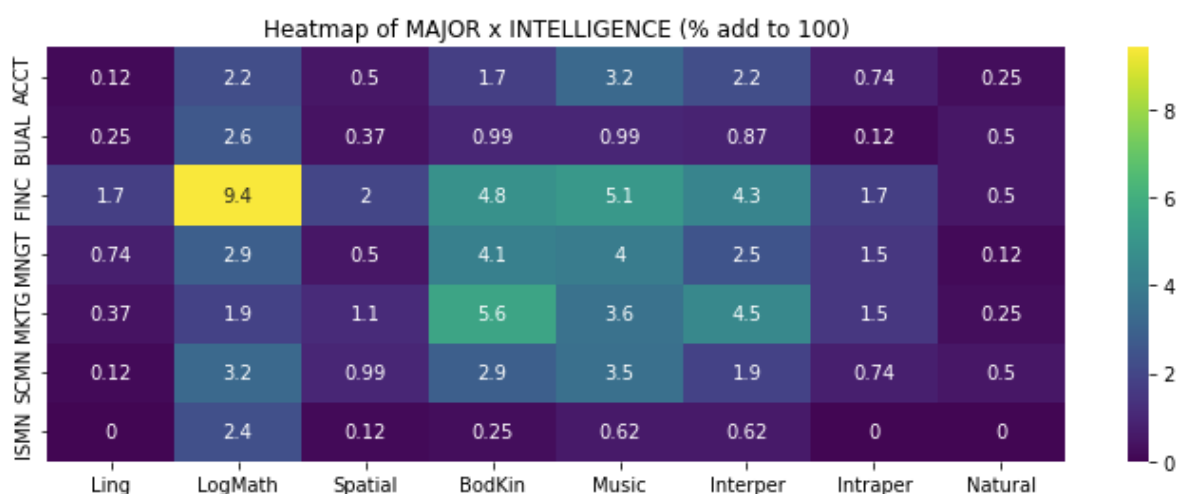
Figure 10: Heatmap of Major x Intelligence (%)

Although subjects were not required to indicate their GPA, the average GPA for each major and intelligence combination was calculated with the data supplied.

	Ling	LogMath	Spatial	BodKin	Music	Interper	Intraper	Natural
ACCT	3.23 (1)	3.10 (13)	2.61 (2)	3.24 (12)	3.11 (19)	3.39 (15)	3.07 (4)	3.36 (2)
BUAL	3.20 (1)	3.15 (13)	3.05 (2)	3.30 (7)	3.47 (7)	3.39 (3)	4.00 (1)	3.12 (2)
FINC	3.17 (12)	3.18 (59)	2.82 (13)	3.09 (30)	3.06 (34)	3.13 (28)	3.16 (10)	3.38 (4)
MNGT	2.98 (4)	3.05 (15)	2.30 (2)	2.78 (25)	2.88 (25)	3.05 (12)	3.00 (8)	3.81 (1)
MKTG	2.86 (3)	3.20 (10)	3.30 (3)	2.97 (27)	2.73 (18)	3.12 (28)	3.04 (10)	1.70 (1)
SCMN	2.80 (1)	2.99 (15)	3.07 (6)	3.04 (13)	2.92 (19)	2.93 (11)	2.79 (6)	3.62 (2)
ISMN	0.0 (0)	3.15 (15)	2.30 (1)	2.80 (1)	3.12 (4)	2.94 (2)	0.0 (0)	0.0 (0)

Table 12: Average GPA (number of subjects) by Major in each Intelligence Category
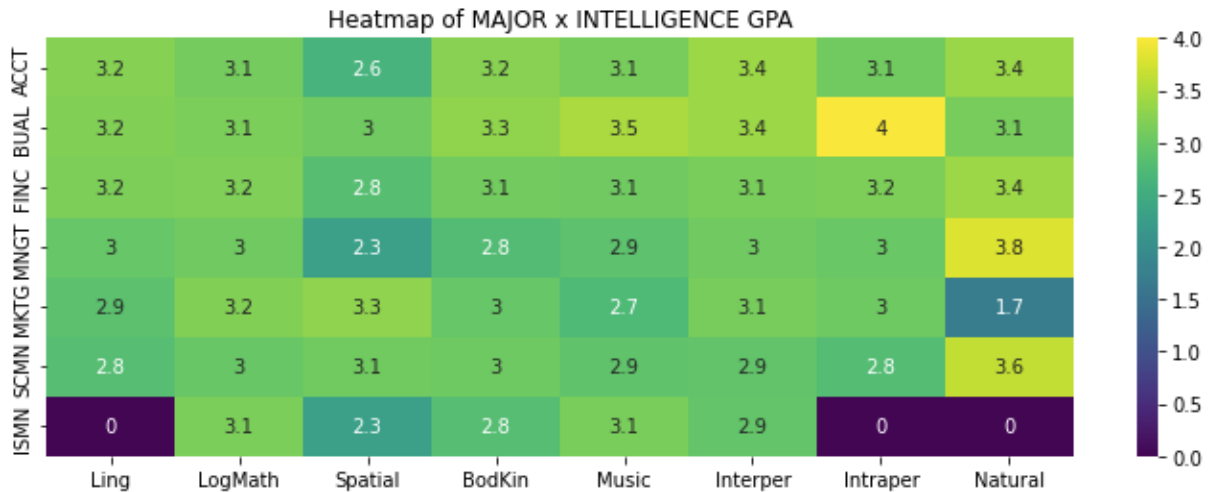
Figure 11: Heatmap of Major GPA x Intelligence

In this case, the table (Table 11) may be easier to interpret than the heatmap. The data indicates that the single Business Analytics major whose primary intelligence category is Interpersonal Intelligence has a 4.0 GPA average. The Management major whose primary intelligence category is the Natural Intelligence category has a GPA of 3.8. Notably, the 59 Finance majors whose primary intelligence category is Logical-Mathematical Intelligence have a solid GPA of 3.18, and the 15 Information Systems majors whose primary intelligence category is Logical-Mathematical also have a respectable 3.15 GPA. Due to the lack of data from all subjects, firm conclusions cannot be drawn.

Research Question 2

A crosstabulation was run to determine the number of observations in each cell. To test Research Question 2, a Chi-square test for the independence of GENDER and INTELLIGENCE was performed. Due to few data points for subjects who did not identify as either Male or Female, only males and females were analyzed. The test that GENDER is

independent of INTELLIGENCE was rejected (p-value = 0.032, dof = 7, X^2 = 15.32). There is

some relationship between GENDER and INTELLIGENCE.

To explore this result further, a heatmap of the differences in the observed cell values vs

the expected cell values was produced. The differences show where the data is not what one

would expect if the variables were independent.

	Ling	LogMath	Spatial	BodKin	Music	Interper	Intraper	Natural
Male	1.75	16.46	2.52	-2.08	-0.30	-9.03	-8.09	-1.23
Female	-1.75	-16.46	-2.52	2.08	0.30	9.03	8.09	1.23

Table 13: Crosstabulation of Differences (observed – expected) Gender by Intelligence
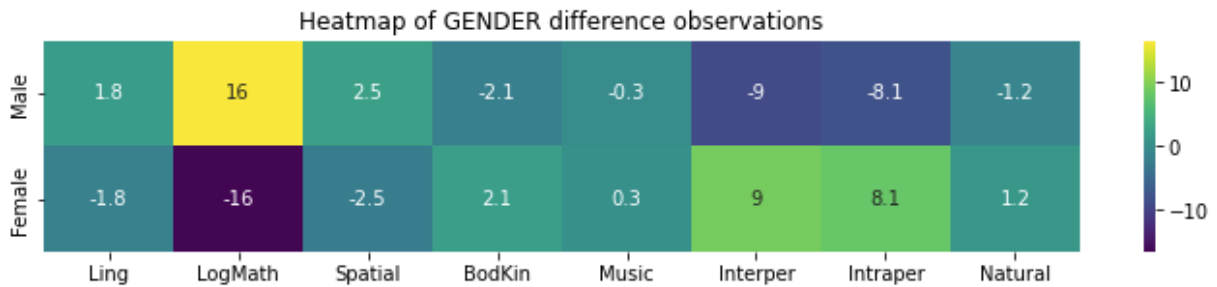
Category

Figure 12: Heatmap of Gender Difference Observations

The Logical-Mathematical Intelligence category shows 16 more males and 16 fewer

females than would be expected if no relationship exists. Similarly, the Interpersonal and

Intrapersonal Intelligence categories have 9 and 8 fewer males, and 9 and 8 more females.

To explore these relationships further, the distributions of data were examined more

closely. Tables were created to examine the distributions of the genders across intelligences (i.e.,

the gender percentages sum to 100%).

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
Male	3.73	28.01	6.02	19.92	21.16	14.73	4.56	1.87

Table 14: Percent of Males in each Intelligence Category
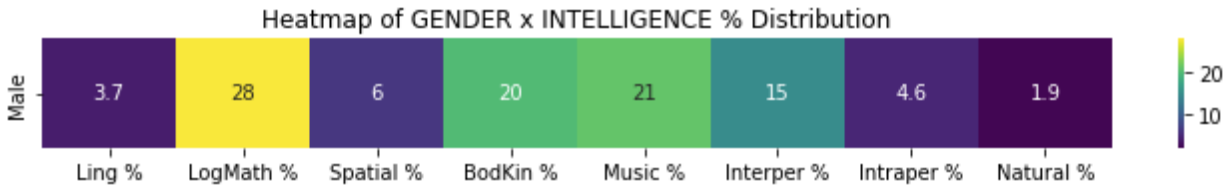
Figure 13: Heatmap of Gender (Male) x Intelligence (%)

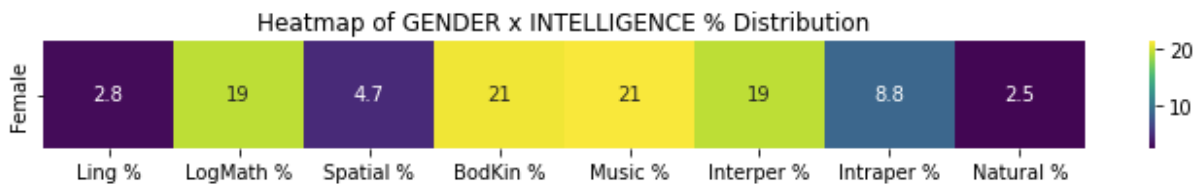The largest distributions of males were in the Logical-Mathematical Intelligence category with 28.01%, followed by the Musical Intelligence category at 21.16%, and the Bodily-Kinesthetic Intelligence category at 19.92%.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
Female	2.82	19.44	4.7	21.0	21.32	19.44	8.78	2.51

Table 15: Percent of Females in each Intelligence Category

Figure 14: Heatmap of Gender (Female) x Intelligence (%)

The largest number of females were in the Musical Intelligence category with 21.32%, followed by the Bodily-Kinesthetic Intelligence category at 21.00%, and the Logical-Mathematical Intelligence category at 19.44%. Both males and females skew toward the same three intelligence categories, but in a different order and with the female intelligences ranked closely together.

If there is no relationship between the gender and the intelligence categories, then the number of students in each intelligence category should be more or less the same. The Chi-

square goodness-of-fit test for male gender resulted in a Chi-square value of 258.52, dof = 7, p-value = 4.263×10^{-52}, indicating the observed values are not representative of a uniform distribution. This result indicates there is some relationship between male gender and the intelligence categories. Similarly, the Chi-square goodness-of-fit test for female gender resulted in a Chi-square value of 131.28, dof = 7, p-value = 3.39×10^{-25}, indicating the observed values are not representative of a uniform distribution. This result indicates there is some relationship between female gender and the intelligence categories.

As was done with the data for the MAJOR, the percentage of each gender in an intelligence category (i.e., the column percentages sum to 100%) was also calculated.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
Male	66.67	68.18	64.44	58.9	60.0	52.59	43.14	52.94
Female	33.33	31.31	33.33	41.1	40.0	45.93	54.90	47.06
Non-binary	0.0	0.51	2.22	0.0	0.0	0.74	0.0	0.0
Prefer NA	0.0	0.0	0.0	0.0	0.0	0.74	1.96	0.0

Table 16: Percent of All Genders in each Intelligence Category
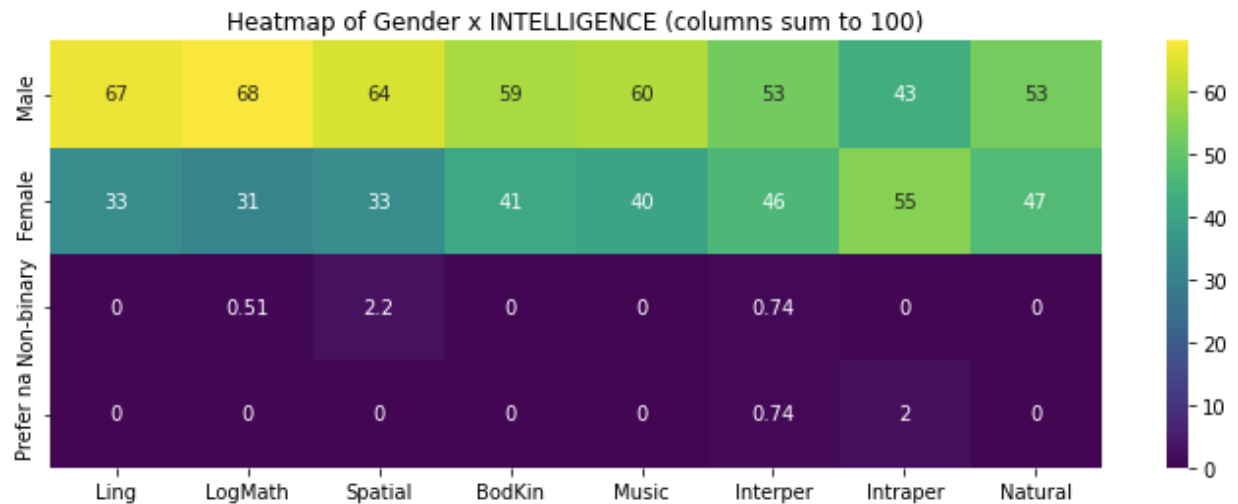
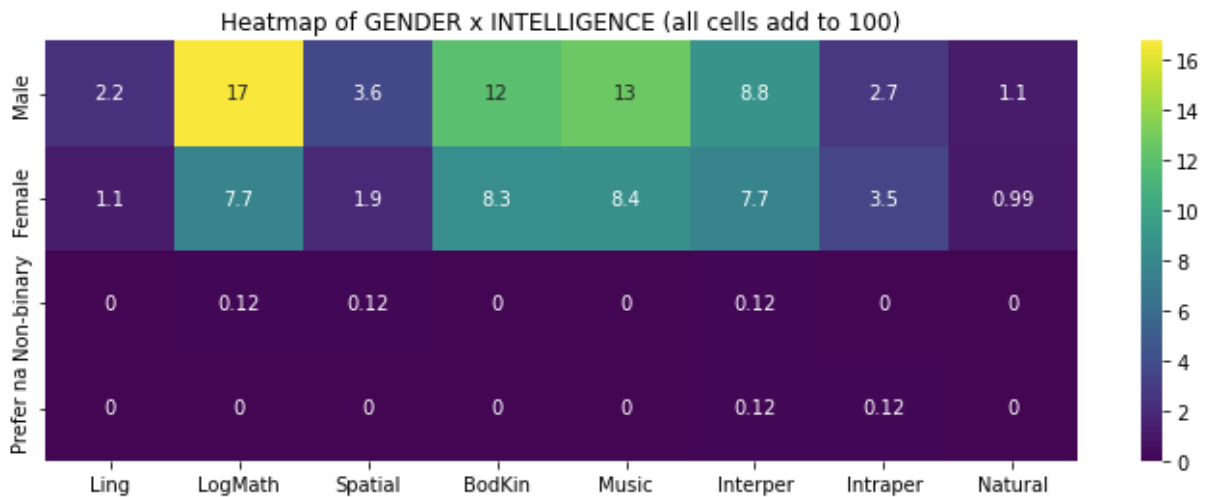**Figure 15: Heatmap of All Genders x Intelligence (%)**

Males dominate the Logical-Mathematical Intelligence category with 68%, the Linguistic Intelligence category with 67%, and the Spatial Intelligence category with 64%. Females are the majority in the Intrapersonal Intelligence category with 55%, the Natural Intelligence category with 47%, and the Interpersonal Intelligence category with 46%.

The percentage of each gender in each intelligence (i.e., all percentages in the table sum to 100%) and the percentage of majors in each intelligence were calculated.

	Ling%	LogMath%	Spatial%	BodKin%	Music%	Interper%	Intraper%	Natural%
Male	2.23	16.75	3.60	11.91	12.66	8.81	2.73	1.12
Female	1.12	7.69	1.86	8.31	8.44	7.69	3.47	0.99
Non-binary	0.0	0.12	0.12	0.0	0.0	0.12	0.0	0.0
Prefer NA	0.0	0.0	0.0	0.0	0.0	0.12	0.12	0.0

**Table 17: Overall Percent of Gender in each Intelligence Category**

Figure 16: Heatmap of All Genders x Intelligence

The average GPA for each gender and intelligence combination was calculated.

	Ling	LogMath	Spatial	BodKin	Music	Interper	Intraper	Natural
Male	2.95 (66)	3.12 (56)	3.18 (16)	3.00 (15)	3.06 (96)	2.95 (81)	3.28 (6)	2.71 (19)

Female	3.10 (48)	3.16 (43)	2.97 (22)	3.26 (7)	3.30 (44)	3.07 (46)	3.26 (6)	3.15 (9)

Table 18: Average GPA (number of subjects) by Gender in each Intelligence Category
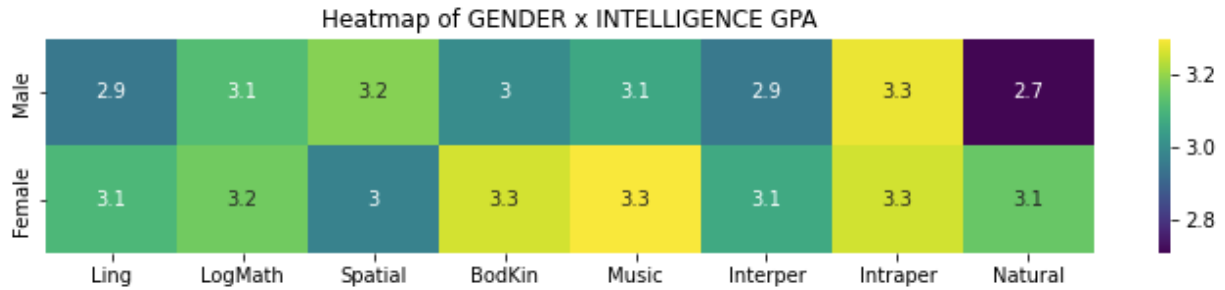
Figure 17: Heatmap of Average GPA by Gender in each Intelligence Category

Males whose primary intelligence category was the Intrapersonal Intelligence category had an average GPA of 3.3. Those whose primary intelligence category was the Spatial Intelligence category have a 3.2 GPA average. Females whose primary intelligence category was Bodily-Kinesthetic, Musical, or Intrapersonal had an average GPA of 3.3, followed by a 3.2 average GPA for females whose primary intelligence category is Logical-Mathematical.

Research Question 3

Before testing Research Question 3, a crosstabulation was run to determine the number of observations in each cell.

	Ling	LogMath	Spatial	BodKin	Music	Interper	Intraper	Natural
Far/Amer	0	6	1	5	7	3	6	0
Asia/Amer	9	33	11	12	17	2	10	7
Hispanic	0	4	2	1	6	3	1	0
Multi	0	2	2	0	0	1	0	0
Native Amer	0	0	0	0	0	1	0	0
Pac Island	0	1	0	0	0	0	0	0
White	16	149	28	142	137	124	33	9

None Indicated	0	0	0	0	2	1	0	0
Declined	2	4	1	4	1	1	1	1

Table 19: Crosstabulation of Ethnicity by Intelligence Category

The data is so overwhelmingly concentrated in one ethnicity that 75% of expected values were less than 5 (54 out of 72 values), far exceeding the recommended threshold of 20%. This data could not be tested for a relationship.

Research Question 4

Before testing Research Question 4, a crosstabulation was run to determine the number of observations in each cell. Twenty-one percent of the cells contain fewer than 5 data points, technically exceeding the recommended upper bound of 20%. However, a Chi-square test was performed to explore the data.

	Ling	LogMath	Spatial	BodKin	Music	Interper	Intraper	Natural
Freshman	2	14	3	13	7	11	2	3
Sophomore	13	86	20	81	75	73	22	7
Junior	4	57	9	46	50	36	18	4
Senior	8	42	13	24	38	16	9	3

Table 20: Crosstabulation of Class by Intelligence Category

The test that CLASS is independent of INTELLIGENCE could not be rejected (p-value = 0.31, dof = 21, X^2 = 23.75).

Data Exploration of Multiple Intelligences

Several analyses were run to look at single intelligence versus multiple intelligences. A chi-square analysis was performed to determine whether the occurrence of single or multiple intelligence maximum scores was related to gender. No significant difference was found (p-value

= 0.315, dof = 1, X^2 = 1.01). In other words, whether a subject had only one maximum

intelligence score or many was unrelated to the subject's gender.

A similar analysis was performed to explore any relationship between major and the

occurrence of multiple maximum intelligences. Again, no significant difference was found (p-

value = 0.219, dof = 6, X^2 = 8.27). In other words, whether a subject had only one maximum

intelligence score or many was unrelated to the subject's major choice.

Finally, the same analysis was performed to explore any relationship between the

subject's class and multiple maximum intelligences. As with the other analyses, no relationship

was found (p-value=0.558, dof = 3, X^2 = 2.07). In other words, whether a subject had only one

maximum intelligence score or many was unrelated to the subject's classification.

CHAPTER 5. DISCUSSION AND CONCLUSIONS

Introduction

Chapter 1 introduced the study by providing the general background information of the topic, statement of the problem, purpose of the study, research questions, and significance of the study, limitations, and definition of terms. Chapter 2 provided a review of literature organized into major sections that was utilized to determine the purpose of this study. Chapter 3 presented a detailed description of the research methods used in this study and outlined five sections: research design, population and sample selection, instrumentation, method of data collection and the plan of analysis for the study. Chapter 4 detailed the findings of this quantitative study based on instruments used to survey the sample population. The analysis detailed in that chapter was used to directly respond to each of the four research questions based on participant responses. This chapter, Chapter 5, summarizes the study, discusses implications within the limitations of this research, and recommends areas for future research.

Purpose of the Study

The purpose of this study was to examine relationships between multiple intelligence and academic major within a business school setting at a major university in Southeast Alabama. Data were compared across race/ethnicity, gender, and academic classification.

By analyzing multiple intelligences in business students, this research can aid students in their appraisal of their skills and abilities in relationship to their academics and career path. In addition, this research will help educators and career coaches to articulate the types of intelligences that are specific to majors and careers.

Research Questions

The following research questions were examined in this study:

1. Is there a relationship between a business student's academic major and their multiple intelligence? Result: A relationship was found between students' academic major and primary intelligence category.

2. Is there a relationship between a business student's gender and their multiple intelligence? Result: A relationship was found between students' gender and primary intelligence category.

3. Is there a relationship between a business student's race/ethnicity and their multiple intelligence? Result: There was not enough variation in the data to test this relationship.

4. Is there a relationship between a business student's academic classification and their multiple intelligence? Result: No relationship was found between students' academic classification and their primary intelligence category.

Limitations

This study is not without limitations. A convenience sample was used. Data was collected from only business students instead of the entire student population which includes engineering, liberal arts, education, and other majors. In addition, data was only collected from students in a business school at a single university in the southeastern United States.

Due to the statistical method used the study only examined a single, primary intelligence category. This approach may not reflect the full impact of Gardner's *multiple* intelligence categories. Bias in the data collected stems from the fact that students are admitted to the university based on SAT and ACT scores which reflect Logical and Mathematical intelligence capability. Another potential Post analysis, other important variables were identified for which data was not collected (see future research section below).

Contributions of the Study

This study contributes to the body of work that tests Gardner's theory. Some of the results from this study appear to confirm Gardner's ideas. For example, the primary intelligence category for many finance, business analytics, and information systems management majors was Logical-Mathematical. Interestingly, the primary intelligence category for many accounting majors was musical intelligence. This suggests that the patterns in musical transfer to accounting as well. With respect to gender, more males had Logical Mathematical as their primary intelligence category than females, however, more females had Interpersonal and Intrapersonal intelligences as their primary intelligence category. These results suggest that a deeper examination of Gardner's Multiple Intelligence categories is warranted.

Recommendations

This study captures a point in the time that students are on campus. It does not consider how they got to this point. An interesting study would capture data related to how many times the students has changed majors, whether the student has changed colleges, whether the student took a gap year, socio economic data, whether the student is nontraditional, whether the student is first generation, and other variables that reflect life experiences.

In this study, students were not required to specify their GPA. Hence it was impossible to determine whether the relationships found have a significant impact on performance as measured by GPA. Consequently, replicating the study requiring GPA data could provide additional insights.

This study could be extended to include graduates to capture data on employment outcome and satisfaction. This could provide insights regarding academic major and primary intelligence category alignment on career outcomes and success.

Conclusion

There is a relationship between some majors and Gardner's intelligence categories. There is also a relationship between gender and Gardner's intelligence categories. The data was inadequate to determine a relationship between ethnicity and Gardner's intelligence categories. There is no relationship between academic class and Gardner's intelligence categories.

This study examined the various multiple intelligence levels of undergraduate students pursuing a post-secondary degree. The results of this research can provide insight into different types of intelligence in order to increase flexibility in teaching methods and adult learning while still providing a high-quality education. Factoring in the increasing cost of a post-secondary degree, there is a growing importance of providing a quality student experience and understanding of various learning methods in the higher education classroom. The current study seeks to expand the body of knowledge of multiple intelligences in order to add additional information and layers of student understanding of material. By expanding the research in multiple intelligences, educators will be able to consider more than just a learner's IQ. By understanding multiple intelligences, instructors may be able to better to adapt instruction, teaching techniques, and motivation of their learners. Higher Education Administration may gain valuable insight into varying ways students learn and process information, resulting in teaching enhancement methods in the post-secondary environment. Further, this research may aid in the development of continuing education for faculty and instructors in teaching methods.

References

Assistance, S. F. (2012). Advisory committee on student financial assistance.

Armstrong, T. (1999). *Seven kinds of smart: Identifying and developing your multiple intelligences*. Penguin.

Armstrong, T. (2018). *Multiple intelligences in the classroom* (4th ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

Baker, R., & Orona, G. A. (2020). Gender and racial differences in awareness and consideration of curricular programs: Exploring a multistage model of major choice. *AERA Open*, *6*(3), 2332858420937023.

Ballou, J., & Lavrakas, P. J. (2008). Encyclopedia of survey research methods. *2,* 509. Los Angeles: Sage.

Balsamo, M., Lauriola, M., & Saggino, A. (2012). Personality and college major choice: Which come first?. *Psychology*, *3*(05), 399.

Balsamo, M., Lauriola, M., & Saggino, A. (2013). Work values and college major choice. *Learning and Individual Differences*, *24*, 110-116.

Barbatis, P. (2010). Underprepared, Ethnically Diverse Community College Students: Factors Contributing to Persistence. *Journal of developmental education*, *33*(3), 16.

Barrington, E. (2004). Teaching to student diversity in higher education: How multiple intelligence theory can help. *Teaching in higher education*, *9*(4), 421-434.

Beggs, J. M., Bantham, J. H., & Taylor, S. (2008). Distinguishing the factors influencing college students' choice of major. *College Student Journal*, *42*(2), 381-395.

Belenky, M. F., Clinchy, B. M., Goldberger, N. R., & Tarule, J. M. (1986). *Women's ways of knowing: The development of self, voice, and mind* (Vol. 15). New York: Basic books.

Binet. A., & Simon, T. (1916). *The development of intelligence in children*. Baltimore, Williams
& Wilkins. (Reprinted 1973, New York: Arno Press; 1983, Salem, NH: Ayer Company).

Binet, A. (1916). New methods for the diagnosis of the intellectual level of subnormals. In E. S.
Kite (Trans.), *The development of intelligence in children.* Vineland, NJ: Publications of
the Training School at Vineland. (Originally published 1905 in *L'Année Psychologique*,
12, 191-244.

Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom. 1991
ASHE-ERIC higher education reports*. ERIC Clearinghouse on Higher Education, The
George Washington University, One Dupont Circle, Suite 630, Washington, DC 20036-
1183.

Bryson, L. (1936). *Adult education*. New York American Book Company.

Buskist, W., Benson, T., & Sikorski, J. F. (2005). The call to teach. *Journal of social and clinical
psychology*, *24*(1), 111-122.

Buskist, W., & Groccia, J. E. (2011). Evidence-based teaching: Now and in the future. *New
directions for teaching and learning*, *2011*(128), 105-111.

Buskist, W., & Keeley, J. W. (2018). Searching for universal principles of excellence in college
and university teaching. *New Directions for Teaching and Learning*, *2018*(156), 95-105.

Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate
education. *AAHE bulletin*, *3*, 7.

Cohen, A. (1996). *The shaping of American higher education.* San Francisco: Jossey Bass.

Conaway, W. (2009). *Andragogy: Does one size fit all? A study to determine the applicability of
andragogical principles to adult learners of all ages* (Doctoral dissertation, Walden
University).

Conti, G. J. (1985). The relationship between teaching style and adult student learning. *Adult Education Quarterly*, *35*(4), 220-228.

Conner, M. L. (1997). Andragogy and pedagogy. *Ageless learner*, *2004*, 01-18.

Cooper, M. K., Henschke, J. A., & Education, A. (2001). Andragogy: The foundation for its theory, research and practice linkage. In *International Unit of the American Association for Adult and Continuing Education Conference, and the Commission of Professors of Adult Education, Baltimore, MD. Retrieved March* (Vol. 3, p. 2004).

Cross, K.P. (1981). *Adults as learners*. San Francisco: Jossey-Bass.

De Gioannis, E. (2022). Implicit gender-science stereotypes and college-major intentions of italian adolescents. *Social Psychology of Education*, *25*(5), 1093-1112.

Deming, D. J., & Walters, C. R. (2018). The impact of state budget cuts on US postsecondary attainment. *Draft, Harvard University*, 1567-1633.

Demir, M., Burton, S., & Dunbar, N. (2019). Professor–student rapport and perceived autonomy support as predictors of course and student outcomes. *Teaching of Psychology*, *46*(1), 22-33.

Denice, P. A. (2021). Choosing and changing course: Postsecondary students and the process of selecting a major field of study. *Sociological Perspectives*, *64*(1), 82-108.

Dickson, L. (2010). Race and gender differences in college major choice. *The Annals of the American Academy of Political and Social Science*, *627*(1), 108-124.

Eckel, P., Hill, B., Green, M., & Mallon, B. (1999). Reports from the Road: Insights on Institutional Change. On Change: An Occasional Paper Series of the ACE Project on Leadership and Institutional Transformation.

Eisner, E. W. (2004). Multiple intelligences: Its tensions and possibilities. *Teachers College Record*, *106*(1), 31-39.

Fancher, R.E. & Rutherford, A. (2016). *Pioneers of psychology*. New York: W.W. Norton.

Fleming, N. D., & Mills, C. (1992). Helping students understand how they learn. *The teaching professor*, *7*(4), 44-63.

Forrest, S. (2004). Learning and teaching: the reciprocal link. *The Journal of Continuing Education in Nursing*, *35*(2), 74-79.

Furnham, A., Tang, T. L. P., Lester, D., O'Connor, R., & Montgomery, R. (2002). Estimates of ten multiple intelligences: Sex and national differences in the perception of oneself and famous people. *European psychologist*, *7*(4), 245.

Galbraith, M. W. (1990). Adult learning methods. *Florida: Krieger Publishing Company*.

Gall, M. D., Borg, W. R., & Gall, J. P. (1996). *Educational research: An introduction*. Longman Publishing.

Galotti, K. M., Ciner, E., Altenbaumer, H. E., Geerts, H. J., Rupp, A., & Woulfe, J. (2006). Decision-making styles in a real-life decision: Choosing a college major. *Personality and Individual Differences*, *41*(4), 629-639.

Galton, F. (1869). *Hereditary genius*. D. Appleton.

Gardner, H. (1983). *Frames of mind : The theory of multiple intelligences.* New York : Basic Books.

Gardner, H. (1993). *Multiple intelligences: The theory in practice*. Basic books.

Gardner, H. (2000). *Intelligence reframed: Multiple intelligences for the 21st century*. Hachette UK.

Gardner, H. (2003). Multiple intelligences after twenty years. *American Educational Research Association, Chicago, Illinois*, *21*(617), 1-15.

Gardner, H., & Hatch, T. (1989). Educational implications of the theory of multiple intelligences. *Educational researcher*, *18*(8), 4-10.

Gardner, H. (2017). Taking a multiple intelligences (MI) perspective. *Behavioral and Brain Sciences*, *40*.

Gardner, H., & Hatch, T. (1990). Multiple Intelligences Go to School: Educational Implications of the Theory of Multiple Intelligences. Technical Report No. 4.

Gati, I. (1990). Why, when, and how to take into account the uncertainty involved in career decisions. *Journal of counseling psychology*, *37*(3), 277.

Gati, I., Krausz, M., & Osipow, S. H. (1996). A taxonomy of difficulties in career decision making. *Journal of counseling psychology*, *43*(4), 510.

Gati, I., Fassa, N., & Houminer, D. (1995). Applying decision theory to career counseling practice: The sequential elimination approach. *The Career Development Quarterly*, *43*(3), 211-220.

Goddu, K. (2012). Meeting the challenge: Teaching strategies for adult learners. *Kappa Delta Pi Record*, *48*(4), 169-173.

Griggs, L., Barney, S., Brown-Sederberg, J., Collins, E., Keith, S., & Iannacci, L. (2009). Varying pedagogy to address student multiple intelligences. *Human Architecture*, *7*(1), 55-60.

Guo, L. (2009). The effects of parent' profession on children's choice of profession. *Journal of Jiyan Vocational and Technical College, 8*(4), 82-84.

Gutierrez, D., Perri, K., & Quackenbush, A. (2006). Exploring the multiple intelligences of community college students enrolled in online courses. *Journal of College Teaching & Learning (TLC)*, *3*(11).

Haley, M. H. (2004). Learner-centered instruction and the theory of multiple intelligences with second language learners. *Teachers College Record*, *106*(1), 163-180.

Havinghurst, R. J. (1973). *Social roles, work, leisure, and education.* New York: David McKay Co.

Havinghurst. R.J. (1952). *Human development and education*. New York: David McKay Co.

Havinghurst. R.J. (1961). *Developmental tasks and education.* New York: David McKay Co.

Havinghurst, R.J. (1973). *The psychology of adult development and aging.* , (pp. 598-618). Washington, DC, US: American Psychological Association, vi, 719 pp. http://dx.doi.org/10.1037/10044-019

Hebel, S. (2010). State cuts are pushing public colleges into peril. *The Chronicle of Higher Education*, 1.

Hiemstra, R., & Sisco, B. (1990). *Individualizing Instruction. Making Learning Personal, Empowering, and Successful*. San Francisco: Jossey-Bass.

Hinrichs, P. L. (2015). Racial and ethnic differences in college major choice. *Economic Trends*, (20150331).

Hoerr, T. R. (2000). *Becoming a multiple intelligences school*. ASCD.

Houle, C. O. (1961). The inquiring mind. Oklahoma Research Center for Continuing Professional and Higher Education. *University of Oklahoma*.

Houle, C.O. (1961). *The inquiring mind.* Madison, WI: University of Wisconsin Press.

Huang, B., Guo, C., Zhang, J., & Shen, S. (2015). The effect of parental and personal influence on students' choice of college major. *INCITE Conference: Columbia University.*

Jacobs, R. L., & Hawley, J. D. (2009). The emergence of 'workforce development': Definition, conceptual boundaries and implications. *International handbook of education for the changing world of work: Bridging academic and vocational learning*, 2537-2552.

Kahu, E. R. (2013). Framing student engagement in higher education. *Studies in higher education*, *38*(5), 758-773.

Karmelita, C. (2020). Advising adult learners during the transition to college. *NACADA Journal*, *40*(1), 64-79.

Kawalilak, C., & Groen, J. (2014). *Pathways of adult learning: Professional and education narratives*. Canadian Scholars' Press.

Kezar, A. (2001). Theory of multiple intelligences: Implications for higher education. *Innovative Higher Education*, *26*, 141-154.

Knowles, M. (2002). Malcolm Knowles, informal adult education, self-direction and andragogy. *The encyclopedia of informal education*.

Knowles, M. S. (1950). *Informal adult education.* New York: Association Press.

Knowles, M. S. (1970). *The modern practice of adult education*. (Vol. 41). New York: New York Association Press.

Knowles, M. (1980). *The modem practice of adult education: From pedagogy to andragogy*. New York: Cambridge.

Knowles, M. S. (1984). *Andragogy in action: Applying modern principles of adult education.* San Francisco: Jossey-Bass Publishers, p.6.

Knowles, M. (1990). *The adult learner: A neglected species*. Houston, TX: Gulf Publishing.

Knowles, M. S., Holton III, E. F., & Swanson, R. A. (2014). The andragogical process model for

    learning. In *The Adult Learner* (pp. 65-85). London: Routledge

Knowles, M. (2002). Malcolm Knowles, informal adult education, self-direction and

    andragogy. *The encyclopedia of informal education*.

Kuh, G. D. (2003). What we're learning about student engagement from NSSE: Benchmarks for

    effective educational practices. *Change: The magazine of higher learning*, *35*(2), 24-32.

Lavrakas, P. J. (2008). Encyclopedia of survey research methods. San Francisco: Sage

    Publications.

Lederman, D. (2019). Professors' slow, steady acceptance of online learning: A survey. *Inside*

    Higher Ed, *30*.

Lee, W. C. V. (2009). Choosing a college major: Factors that might influence the way students

    make decisions.

Leech, N. L., Barret, K. C., & Morgan, G. A. (2005). SPSS for Intermediated Statistics.

    Mahwah, New Jersey: Lawrence Erlbaum Associates.

Leppel, K. (2001). The impact of major on college persistence among freshmen. *Higher*

    Education, *41*, 327-342.

Leppel, K., Williams, M. L., & Waldauer, C. (2001). The impact of parental occupation and

    socioeconomic status on choice of college major. *Journal of Family and Economic*

    issues, *22*, 373-394.

Lindeman, E. C. (1961). *The meaning of adult education in the United States*. New York: Harvest

    House.

Loori, A. A. (2005). Multiple intelligences: A comparative study between the preferences of males

    and females. *Social Behavior and Personality: an international journal*, *33*(1), 77-88.

Love, P. G., & Love, A. G. (1995). *Enhancing Student Learning: Intellectual, Social, and Emotional Integration. ASHE-ERIC Higher Education Report No. 4*. ERIC Clearinghouse on Higher Education, One Dupont Circle, NW, Suite 630, Washington, DC 20036-1183.

Ma, Y. (2009). Family socioeconomic status, parental involvement, and college major choices—gender, race/ethnic, and nativity patterns. *Sociological Perspectives*, *52*(2), 211-234.

Mackintosh, N. J. (2011). *IQ and Human Intelligence*. New York: Oxford University Press.

Madkour, M., & Mohamed, R. A. A. M. (2016). Identifying College Students' Multiple Intelligences to Enhance Motivation and Language Proficiency. *English Language Teaching*, *9*(6), 92-107.

Magolda, M. B. B. (1992). *Knowing and reasoning in college: Gender-related patterns in students' intellectual development*. San Francisco: Jossey-Bass.

Malgwi, C. A., Howe, M. A., & Burnaby, P. A. (2005). Influences on students' choice of college major. *Journal of education for business*, *80*(5), 275-282.

Marcus, J. (2018). Switching majors is adding time and tuition to the already high cost of college. *The Hechinger Report*.

Maslow, A. H. (1970). *Motivation and personality. (2nd ed.)*. New York: HarperCollins.

McClellan, J.A., & Conti, G. J. (2008). Identifying the multiple intelligences of your students. *Journal of Adult Education*, *37*(1), 13-32.

McFarlane, D. A. (2011). Multiple Intelligences: The Most Effective Platform for Global 21st Century Educational and Instructional Methodologies. *College Quarterly*, *14*(2), n2.

Merriam, S.B. (1996). Updating our knowledge of adult learning. *Journal of Continuing Education in the Health Professions*, *16*(3), 136-143.

Merriam, S.B., & Bierema, L. L. (2013). *Adult learning: Linking theory and practice*. San Francisco: John Wiley & Sons.

Merriam, S. B., & Caffarella, R. S. (1999). *Learning in adulthood*. San Francisco: John Wiley & Sons.

Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (2007). *Learning in adulthood* (3rd ed.). San Francisco: Jossey-Bass.

Merriam, S.B. & Brockett, R.G. (2007). *The profession and practice of adult education: An introduction.* San Francisco: Jossey-Bass.

Merriam, S. B., & Baumgartner, L. M. (2020). *Learning in adulthood: A comprehensive guide*. John Wiley & Sons.

Michell, J. (2012). Alfred Binet and the concept of heterogeneous orders. *Frontiers in psychology*, *3*, 261.

Moody, M. B. (2020). *Factors influencing students' choice of an institution of higher education* (Doctoral dissertation, Clemson University).

Moran, S., Kornhaber, M., & Gardner, H. (2006). Orchestrating multiple intelligences. *Educational leadership*, *64*(1), 22.

Morgan, H. (1996). An analysis of Gardner's theory of multiple intelligence. *Roeper Review*, *18*(4), 263-269.

Morgan, S. L., Gelbgiser, D., & Weeden, K. A. (2013). Feeding the pipeline: Gender, occupational plans, and college major selection. *Social science research*, *42*(4), 989-1005.

Much, K., Wagener, A. M., Breitkreutz, H. L., & Hellenbrand, M. (2014). Working with the millennial generation: Challenges facing 21st-century students from the perspective of university staff. *Journal of College Counseling*, *17*(1), 37-47.

Oxendine, D. B. (2016). Gender, Race, and College Major: Do They Predict Modern Racism?. *Journal of Social Science Studies*, *3*(2), 90.

Ozuah, P. O. (2016). First, there was pedagogy and then came andragogy. *Einstein journal of Biology and Medicine*, *21*(2), 83-87.

Peterson, C., Park, N., & Seligman, M. E. (2005). Orientations to happiness and life satisfaction: The full life versus the empty life. *Journal of happiness studies*, *6*, 25-41.

Pike, G. R. (2006). Vocational preferences and college expectations: An extension of Holland's principle of self-selection. *Research in Higher Education*, *47*, 591-612.

Porter, S. R., & Umbach, P. D. (2006). College major choice: An analysis of person–environment fit. *Research in higher education*, *47*, 429-449.

Quadlin, N. (2020). From major preferences to major choices: Gender and logics of major choice. *Sociology of Education*, *93*(2), 91-109.

Rathus, S. A. (2012). *Psychology: Concepts and connections*. Australia: Wadsworth, Cengage Learning. P. 294

REALM: *Study on European Terminology in Adult Learning for a common language and common understanding and monitoring of the sector* (July, 2010), p. 6.

Rogers, C. (1983). *Freedom to learn for the 80s.* Columbus, OH : Charles E. Merrill.

Romsa, K., Bremer, K. L., Lewis, J., & Romsa, B. (2017). The evolution of student-faculty interactions: what matters to millennial college students?. *College Student Affairs Journal*, *35*(2), 85-99.

Rosnow, R. L., Skleder, A. A., Jaeger, M. E., & Rind, B. (1994). Intelligence and the epistemics of interpersonal acumen: Testing some implications of Gardner's theory. *Intelligence*, *19*(1), 93-116.

Sandmann, L. R. (2010). Adults in four-year colleges and universities: Moving from the margins to the mainstream?. *Handbook of adult and continuing education*, 221-230.

Shearer, B. C. (1996). The MIDAS: A professional manual. United States.

Shearer, B. (2004). Multiple intelligences theory after 20 years. *Teachers college record*, *106*(1), 2-16.

Shearer, C. B. (1997). Reliability, Validity and Utility of a Multiple Intelligences Assessment for Career Planning. Paper presented at the Annual Meeting of the American Psychological Association. (105th, Chicago, IL, August 15-19).

Shearer, C. B., & Luzzo, D. A. (2009). Exploring the application of multiple intelligences theory to career counseling. *The Career Development Quarterly*, *58*(1), 3-13.

Shearer, C. B. (2007). *The MIDAS : Professional manual* (Rev. Ed.). Kent, OH : MI Research and Consulting.

Shook, C. L. (2019). Choosing Information Systems as a Major: Factors that Influence Selection. *Graduate Theses and Dissertations* Retrieved from https://scholarworks.uark.edu/etd/3367

Sims, R. R., & Sims, S. J. (Eds.). (1995). *The importance of learning styles: Understanding the implications for learning, course design, and education* (No. 64). Greenwood Publishing Group.

Skinner, B. F. (1971). *Beyond freedom and dignity.* New York : Knopf.

Sloane, C. M., Hurst, E. G., & Black, D. A. (2021). College majors, occupations, and the gender wage gap. *Journal of Economic Perspectives*, *35*(4), 223-248.

Smith, M. K. (2002). Malcolm Knowles, informal adult education, self-direction and andragogy. *The Encyclopedia of Informal Education* (pp. 1-8).

Smittle, P. (2003). Principles for effective teaching. *Journal of Developmental Education*, *26*(3), 10-16.

Soares, L. (2013). *Post-traditional learners and the transformation of postsecondary education: A manifesto for college leaders* (pp. 1-18). Washington, DC: American Council on Education.

Sorensen, K., & Mas, J. M. (2015). A roadmap for the development of Labor Market Information Systems. *FHI*, *360*.

Spearman, C. (1904). "General intelligence", objectively determined and measured. American Journal of Psychology, 15, 201-292.

Spight, D. B. (2020). Early declaration of a college major and its relationship to persistence. *NACADA Journal*, *40*(1), 94-109.

St. John, E. P., Hu, S., Simmons, A., Carter, D. F., & Weber, J. (2004). What difference does a major make? The influence of college major field on persistence by African American and White students. *Research in higher education*, *45*, 209-232.

Stage, F., Muller, P., Kinzie, J., & Simmons, A. (1998). Creating learning centered classrooms: What does learning theory have to say?, 26(4). Washington, DC: ASHE-ERIC

Sternberg, R. J. (1999). The theory of successful intelligence. *Review of General psychology*, *3*(4), 292-316.

Sternberg, R. J. (2003). A broad view of intelligence: the theory of successful intelligence. *Consulting Psychology Journal: Practice and Research*, *55*(3), 139.

Stock, P., & Stock, E. (2018). Factors that influence a college student's choice of an academic major and minor. *Journal of Scholastic Inquiry: Business*, *9*(1), 56-78.

Strauss, V. (2013). Howard Gardner: 'Multiple intelligences' are not 'learning styles'. *The Washington Post*, *16*.

Tan, J. P., McGough, R., & Valerio, A. (2010). Workforce development in developing countries: A framework for benchmarking. *Human Development Network, World Bank, Washington, DC*.

Taylor, R. (2007). *The effects of a multiple intelligence self-assessment intervention on adolescents' career decision self-efficacy* (Doctoral dissertation, Walden University).

Tennant, M. (2019). *Psychology and adult learning: The role of theory in informing practice*. New York: Routledge.

Tennant, M. (2003). The psychology of adult teaching and learning. *Adult and Continuing Education: Adult education-viewed from the disciplines*, 108.

Terman, L. M. (1911). The Binet-Simon scale for measuring intelligence: Impressions gained by its application upon four hundred non-selected children. *The psychological clinic*, *5*(7), 199.

Thompson, S. V. (1990). Visual imagery: A discussion. *Educational Psychology*, *10*(2), 141-167.

Thorndike, E. L., Bregman, E. O., Tilton, J. W., & Woodyard, E.(1928). *Adult Learning.* New York: Macmillan.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago, IL: The University of Chicago Press.

Tinto, V. (2012). *Completing college: Rethinking institutional action*. University of Chicago Press.

Tough, A. (2008). About Professor Allen Tough. Retrieved January 23, 2018 from: http://allentough.com/about/index.html.

Tough, A. (1971). The adult's learning projects: A fresh approach to theory and practice in adult learning. *Research in Education, 1,* 50.

Trochim, W. (2006). Internal validity. *Web Center for Social Research Methods.* Retrieved December 10, 2017 from : https://www.socialresearchmethods.net/kb/intval.php.

Turner, P., & Thompson, E. (2014). College retention initiatives meeting the needs of millennial freshman students. *College student journal*, *48*(1), 94-104.

US Department of Education. (2015). Fact sheet: Focusing higher education on student success. *[Fact Sheet]*.

Visser, B. A., Ashton, M. C., & Vernon, P. A. (2006). Beyond g: Putting multiple intelligences theory to the test. *Intelligence*, *34*(5), 487-502.

Waterhouse, L. (2006). Inadequate evidence for multiple intelligences, Mozart effect, and emotional intelligence theories. *Educational psychologist*, *41*(4), 247-255.

Wiersma, W., & Jurs, S. G. (2005). Research methods in education (8 th). *Boston, MA*.

White, J. (2005). Howard Gardner: The myth of multiple intelligences.

Willinsky, J. (2002). Democracy and education: The missing link may be ours. *Harvard Educational Review*, *72*(3), 367-392.

Wlodkowski, R. J. (2003). Fostering motivation in professional development programs. *New directions for adult and continuing education*, *2003*(98), 39-48.

Wlodkowski, R. J. (1999). Motivation and diversity: A framework for teaching. *New directions for teaching and learning*, *1999*(78), 5-16.

Wlodkowski, R. J. (1997). Motivation with a mission: Understanding motivation and culture in workshop design. *New directions for adult and continuing education*, *76*, 19-31.

Wright, C. (2018). *Choose wisely: A study of college major choice and major switching*. The Pardee RAND Graduate School.

Zafar, B. (2009). College Major Choice and the Gender Gap. Staff Report No. 364. *Federal Reserve Bank of New York*.

Zepke, N., & Leach, L. (2010). Improving student engagement: Ten proposals for action. *Active learning in higher education*, *11*(3), 167-177.