Exploring Learning Styles of University Students Involved in Entrepreneurial Activities

by

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Abstract

This study explored the learning styles of a sample population of students attending a land-grant university in the Southern region of the United States who were participating in entrepreneurial activities in parallel with their pursuit of an undergraduate or graduate degree. Data for analysis were collected using a demographic survey and the Kolb Learning Styles Inventory Version 3.2. Data were collected by learning style, gender, ethnicity, age, and year of study. In addition, the demographics of the study population were compared to the enrolled student population at the university studied. The Kolb Learning Style Inventory characteristics of the study population were also compared to two earlier Kolb Learning Style Inventory studies with different study populations.

The study results suggested that faculty and staff at the university studied who interact with the study population can expect the primary learning style of those student entrepreneurs to span the full range of the nine Kolb learning styles. Compared to the enrolled population at the university studied, the sample population of student entrepreneurs had fewer Female students than Male students. The largest number of the study population's ethnic groups were White students, followed by Asian or Pacific Islanders, followed by Black or African American students, followed by Hispanic or Latino students, followed by American Indian or Alaskan Native students.

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List of Abbreviations

AC   Abstract Conceptualization

AE   Active Experimentation

ASI   Adaptive Style Inventory

CE   Concrete Experience

ELT   Experiential Learning Theory

ERP   Educator Role Profile

IRB   Institutional Review Board for the Protection of Human Subjects in Research

KLSI   Kolb Learning Style Inventory

LSI   Learning Style Inventory

LSP   Learning Skills Profile

LSQ   Learning Styles Questionnaire

MBTI   Myers-Briggs Type Indicator

RO   Reflective Observation

SPSS   IBM Statistical Package for Social Sciences (Version 27)

CHAPTER I

OVERVIEW OF THE STUDY

Introduction

College and university students involved in entrepreneurial activities participate in a broad range of educational activities. These activities include academic coursework, experiential learning projects, communications skills training, coaching, mentoring, and business idea competitions. Failure to adequately understand the learning styles of student entrepreneurs by educators, and other parties involved in the learning process may result in missed opportunities to enhance effectiveness and efficiency in entrepreneurial education and learning in colleges and universities.

This study explored the learning styles of a sample population of students attending a land-grant university in the Southern region of the United States. The students studied were participating in entrepreneurial activities in parallel with their pursuit of an undergraduate or graduate degree. Learning styles research provides a mechanism for educators to explore the ways in which students learn. Research supports the theory that we all learn in different ways and that the acquisition of knowledge by students is enhanced when they are taught with an understanding of their learning styles. The findings of this study present information that may be helpful in improving entrepreneurial education and learning for both educators and students at the university where the study was conducted. The results of the study may also encourage entrepreneurship faculty at colleges and universities in other geographic regions to undertake similar studies to understand the learning styles of the types of entrepreneurial-minded students who study at their institutions.

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New Business Starts and Entrepreneurship Drive Economic Development

Over a broad span of years, new business starts have been viewed by researchers,

business professionals, as well as U.S., state, and local governments as playing an important role

in the United States economy. United States Census Bureau data for the period 2012 through

2021 (See Figure 1) show a continuing and growing number of new business venture formations.

New business formations are generally viewed as one measure of economic growth and job

creation in the United States. The U.S. Census Bureau reported 4.4 million applications to start

new businesses filed in 2020, a 24 percent increase over the previous year. Growth continued in

2021 with a 23 percent increase, 5.4 million new business application filings.

Figure 1

Monthly Business Formations (2012 – 2021)
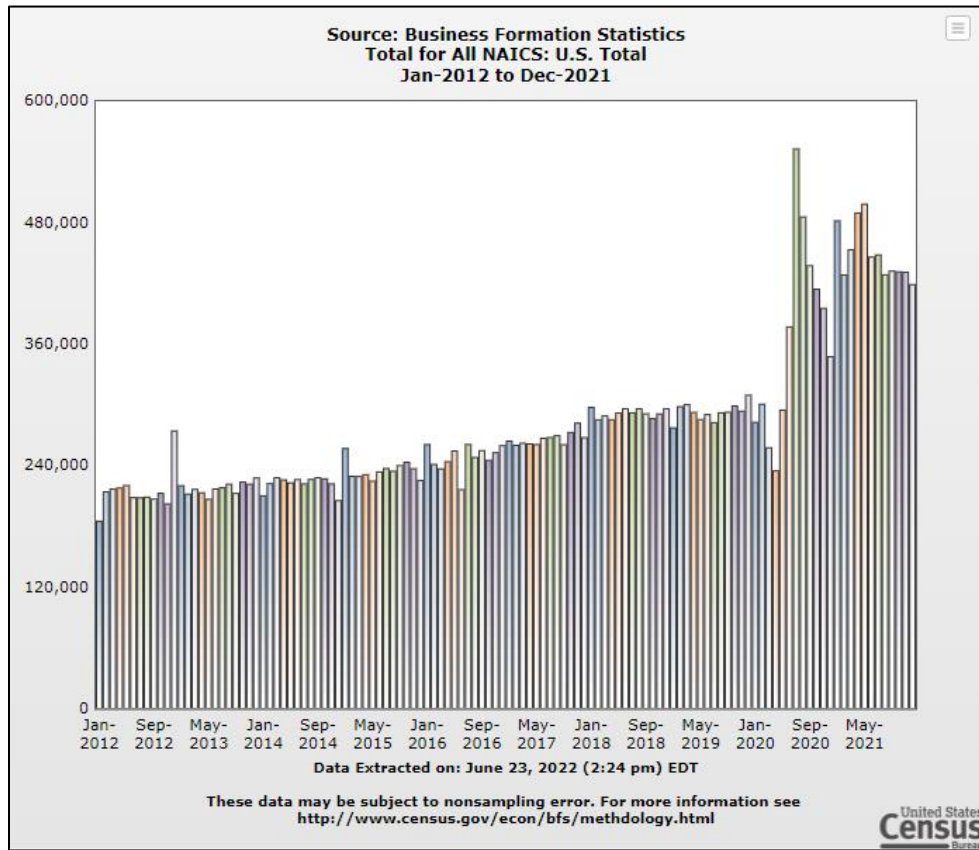
The Economist (2022, January) cited the United States Census data and observed that America's entrepreneurial boom continued even in the presence of the COVID-19 pandemic. In addition to innovation from the formation of new business ventures (startups), Boyles (2022) discussed how established companies in today's competitive environment also rely heavily on innovation and entrepreneurial thinking. Boyles pointed out the need for business leaders to constantly look for new ways to be creative and foster unique and novel ideas.

Innovative solutions developed by entrepreneurial-minded women and men in startups and established companies have been regarded for decades as an instrumental contributor to driving economic growth and societal change. Ahlstrom (2017) argued that the goal of a business was to develop innovative products and services which facilitate the company's success and growth, generate economic growth, and deliver important benefits to society. He believed that steady economic growth played a major role in producing increases in per capita income and that small changes in economic growth could yield large differences in per capita income over time, particularly at the base of the societal pyramid. He argued that firms, through innovation and growth, were doing significant good for society. Ahlstrom suggested that individuals with entrepreneurial skills contributed to advancing society by identifying and acting upon new business opportunities. McKinley (2022) observed that there was a tendency when thinking about innovation to celebrate the culture of Silicon Valley and the high-tech firms located there. The contributions of startups such as Google (now Alphabet), Amazon, Tesla, SpaceX, Facebook (now Meta), and others have been widely reported. These new business ventures, which have been referred to as Unicorns or Gazelles, drove significant economic growth, created jobs, and contributed to societal well-being, but they only represented a small percentage of the millions of new ventures started in that same period. The combination of large and small startup successes

has been an important contributor to job creation and economic development in the United States.

The Academic Challenge – Improve Entrepreneurial Learning Effectiveness

How do these comments relate to the roles academic institutions play in educating entrepreneurial-minded students? Because of the potential impact entrepreneurial-minded students can have on society, improving their learning experience becomes a desirable educational outcome. Moussa (2015) suggested that understanding the various learning techniques (learning styles) preferred by students would allow educators to enhance teaching and the overall learning process. Kuratko (2005) stated that "Entrepreneurship has emerged over the past two decades as arguably the most potent economic force the world has ever experienced. With that expansion has come a similar increase in the field of entrepreneurship education" (p. 577). Aldrich and Ruef (2018) wrote on the importance of a scholarly focus on business starts and the mundane aspects of new business ventures. Their view served to reinforce Ahlstrom's argument that a large number of small changes could yield large differences over time. Newmann (2021) provided a systematic review of the impact of entrepreneurship on economic, social, and environmental welfare over the past 25 years. He concluded that entrepreneurship and innovation were contributors to macroeconomic development and suggested a roadmap for future research targeting shortcomings in the existing academic literature on the topic.

Focusing on the belief that universities are expected to contribute to entrepreneurial research, teaching, and transfer of technology, Laukkanen (2000) explored alternative strategies in university-based entrepreneurial education by conceptualizing the university as a regional evolution mechanism.

Hawk and Shah (2007) discussed the use of learning style instruments as a method to enhance student learning. They suggested that the emergence of numerous learning models, such as Kolb, Gregorc, Felder-Silverman, VARK, Dunn and Dunn, and others over the past several decades, brought increasing attention to the view that students learn and process information in many different ways, and that one approach to teaching and learning does not work for every student or even most students. Scholars and researchers such as, Akinboye and Pihe, (2014), Kolb (2006, 2013, 2019), Riding and Rayner, (2013), Vermut, (1994), Wei et al. (2021), and others, have contributed to the theories and discussion on the different ways that students learn and process information.

While there are data available on the learning styles of various populations surveyed across the United States and other parts of the world, knowledge gaps exist in understanding the learning styles of university students who participate in entrepreneurial activities while pursuing an academic degree at the individual university, state, and regional levels.

Purpose and Potential Value of the Study

This study was designed to add to the body of knowledge on the learning styles of undergraduate and graduate students involved in entrepreneurial activities at a land grant university in the Southern region of the United States. The purpose of the study was to explore and compare the learning styles of students in this higher education setting who were participating in various entrepreneurial activities in parallel with the pursuit of an academic degree. The findings of the study may present information helpful to the university's faculty and staff in improving entrepreneurial education and learning for entrepreneurial-minded students. The study may add to the body of scholarly research related to the learning styles of college and university students participating in entrepreneurial activities. The results of the study may also

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encourage entrepreneurship faculty at colleges and universities in other geographic regions to undertake studies to explore the learning styles of the types of entrepreneurial-minded students who study at their institutions.

Research Questions

The study was designed to explore the following research questions:

1. What are the relationships among the learning style preferences of the entrepreneurial student population studied (as measured by the Kolb Learning Style Inventory Version 3.2) and the learning style preferences of the general population published in the Kolb Learning Style Inventory Technical Specifications documents, Versions 3.1, 3.2, and 4.0?

2. What are the relationships by gender identity among the learning styles of the entrepreneurial student population studied as measured by the Kolb Learning Style Inventory Version 3.2?

3. What are the relationships by ethnicity among the learning styles of the entrepreneurial student population studied as measured by the Kolb Learning Style Inventory Version 3.2?

4. How did the entrepreneurial student population studied compare by gender and ethnicity to the overall university enrollment by gender and ethnicity?

Significance of the Study

Individuals with entrepreneurial skills contribute to advancing society by identifying and acting upon new business opportunities. When successful, these new businesses drive economic growth, create jobs, and contribute to societal well-being. The findings of the study may provide information that could be helpful in improving the effectiveness of university-level entrepreneurial education at the university where the study was conducted.

Conceptual Framework

The study was guided by the following assumptions: (1) That college and university educators can make a relevant contribution to preparing students who are involved in entrepreneurial activities to be successful in their post-graduation endeavors; (2) By understanding the learning styles of their students and incorporating that knowledge into their educational approaches, college, and university educators can improve their effectiveness; (3) That the self-reporting Kolb Learning Style Inventory Version 3.2 is a valid and reliable instrument to utilize in a study of this nature; (4) That the potential benefits to society were worth the time and effort involved in conducting this study - that the view was worth the climb.

Study Design

The information for this study was collected in a series of one-time interactions with a convenience sample of university students involved in entrepreneurial activities while pursuing an academic degree. The participants were 18 years of age or older and each participating student signed an Institutional Review Board (IRB)-approved Informed Consent document (See Appendix A). An IRB-approved demographic questionnaire and the Kolb Version 3.2 Learning Style instrument were utilized to collect age, gender, year of academic study, academic major, and learning-style information. The IBM Statistical Package for Social Sciences Version 27 (SPSS) was utilized to aid in analyzing the information collected. The research study was designed to be inductive in nature, providing the reader with specific information on the study.

Possible Limitations and Delimitations

Results from the self-reporting Kolb Learning Style Inventory may be subject to biases because some, or all, participants were not able to assess themselves accurately and reported what they believed were socially acceptable answers rather than truthful answers. Since the study

analyzed the learning styles of a convenience sample of university students engaged in entrepreneurial activities while pursuing an academic degree at an R1-rated university located in the Southern region of the United States, the data collected were a convenience sample and most likely not representative of students attending other colleges and universities. The findings of the study should not be generalized across students participating in entrepreneurial activities in colleges and universities located in different geographic regions because of their differing student population characteristics and demographics.

Definition of Terms

The following definitions were used in the study:

Adult Education – The process that is used by adults for their self-development and learning, alone and with others (Knowles, 1980).

Adult Educator – One who has some responsibility for helping adults learn (Knowles, 1980).

Andragogy – The art and science of helping adults learn (Knowles, 1980).

Cognitive – Concerned with the psychological processes of perception, memory, thinking, and learning.

Cognitive Style – A person's characteristic mode of perceiving, thinking, remembering, and problem-solving, which may differ in preferred learning environment, degree of structure, and preferred mode of learning.

Differ or Differing – Not the same, dissimilar.

Dominant – Prevailing over all others.

Educational Activities – The activities related to imparting or acquiring knowledge or skill.

Entrepreneur – An individual who creates a new business venture, bearing most of the risk, and enjoying most of the rewards. These individuals possess the skills, risk tolerance, and initiative

necessary to anticipate marketplace needs and bring new products and services to market, which generate value for individuals, companies, society, and the planet.

Entrepreneurial Activities – The enterprising human action in pursuit of the generation of value through the creation of new products or services which meet the needs of individuals, companies, society, or the planet. Entrepreneurial activities include but are not limited to formal and informal educational activities, participation in skills training workshops, participation in business idea competitions, participation in incubator or accelerator programs, self-study, planning, market research, product development, marketing, sales, product and services support, data analysis, personnel recruiting, and fund-raising activities.

Entrepreneurship – The act of planning, starting, and running a business, or starting and running a new business within an existing organization or company. The products or services may, or may not, be new or unique but must, in some manner, meet a societal need and create value.

Haptic – Perceiving through physical contact

Holistic – Perceiving a whole object or focusing on the organic nature of a system.

Inductive – Reasoning from particular facts to a general conclusion.

Kinaesthetic – Perceiving through an awareness of body movement(s).

Kolb Learning Style Profiles - The learning style profiles as described in the Kolb Learning Style Inventory Version 3.2 or Version 4.0 (2011, 2013).

Learning – The acquisition of knowledge or skills through experience, self-study, or by being taught.

Learning Style(s) – The ways that different people learn. An individual's preferred method, or methods, to absorb, comprehend, and retain information. The variety of ways people take in, store, and retrieve information.

Learning Style(s) Instruments – Tools and techniques designed to assist learners and educators in determining what learning style, or learning styles, they have.

Learning Style(s) Profiles – The learning style profiles as described for a particular learning styles instrument.

Metacognition – Awareness and conscious use of the psychological processes involved in perception, memory, thinking, and learning.

Pedagogy – The art and science of teaching students (Knowles, 1980).

Perception – Interpreting and understanding information received through the senses.

Primary Learning Style – A learning style used by an individual more frequently than other learning styles as measured by the learning style instrument utilized.

Psychometric – Concerned with psychological measurement.

Reliability – Consistency of the learning style inventory results.

SPSS – The IBM Statistical Package for the Social Sciences (Version 27) – a statistical analysis program.

Student – A person engaged in study in the pursuit of learning. One who seeks knowledge from teachers, books, experience, experimentation, or other means of learning.

Student Entrepreneur – An individual studying or engaged in the innovative use, and combination of resources to explore and pursue opportunities through the creation of a for-profit organization or a non-profit organization while the individual is a student in good standing at an accredited, college, or university-level academic institution.

Tactile – Perceiving through the sense of touch.

University Student – An individual attending an accredited college or university who is considered by that college or university to be a student in good standing.

University Student Entrepreneur – A student in good standing, enrolled in a college or university who is pursuing an academic degree at the same time she or he is engaged in activities related to starting a new business venture, participating in a business idea or business plan competition, and/or enrolled in entrepreneurship courses.

Validity – The extent to which the learning style inventory results can be generalized.

Organization of the Study

The study was structured into five chapters organized as follows: Chapter I, Introduction to the study; Chapter II, a review of related literature; Chapter III, the methods used to conduct the research; Chapter IV, findings of the study; and Chapter V, a summary of the findings and suggested ideas for future research.

CHAPTER II
REVIEW OF RELATED LITERATURE

Purpose of the Study

This study was designed to add to the body of knowledge on the learning styles of undergraduate and graduate students involved in entrepreneurial activities at a land grant university in the Southern region of the United States. The purpose of the study was to explore and compare the learning styles of students in this higher education setting who were participating in various entrepreneurial activities in parallel with the pursuit of an academic degree.

Research Questions

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Introduction

The study explored the learning styles of a sample population of students attending a land-grant university in the Southern region of the United States. The students were participating in entrepreneurial activities in parallel with their pursuit of an undergraduate or graduate degree. Learning styles research provides a mechanism for educators to explore the ways in which students learn. Research supports the theory that we all learn in different ways and that the acquisition of knowledge by students is enhanced when they are taught with an understanding of their learning styles. The findings of this study present information that may be helpful in improving entrepreneurial education and learning for both educators and students at the university where the study was conducted. The results of the study may also encourage entrepreneurship faculty at colleges and universities in other geographic regions to undertake similar studies to understand the learning styles of the types of entrepreneurial-minded students who study at their institutions.

Chapter One provided a perspective on the importance of entrepreneurship and innovation in the United States, new venture starts, the challenge to educators, purpose of the study, research questions, significance of the study, study design, possible limitations, a definition of terms, and the organization of the study. The Kolb Learning Style Inventory instrument (Version 3.2) was completed by students participating in the study to provide information that was used to explore the participants' learning styles. In addition, participants completed an IRB-approved demographic information questionnaire to provide information to

explore differences in the participants' learning styles based on gender, ethnicity, field of study, and year of study.

Chapter Two provides a review of the academic literature related to adult learners, adult learning styles, and learning styles instruments.

Learning Style Theories, Models, and Instruments

The learning process is generally viewed as a complex topic that is not fully understood. Kolb (1984) suggested that individual styles of learning were complex and not easily reducible into simple typologies. Coffield et al., (2004) described learning styles as an area of apparent appeal with a host of conceptual and empirical problems that were not unified. This level of complexity and lack of unifying theories may be a contributing factor to the extensive body of academic literature which exists on learning styles as researchers strive to better understand and describe the learning process. Moussa (2015) commented that the learning process was an important field of study for researchers to focus on in order to better understand how individuals learn and the implications for educators. DeBello (1990, p. 203), discussed eleven major learning style models and stated, "There are nearly as many definitions of learning styles as there are theorists." Coffield et al., (2004) identified 71 learning style models and characterized 13 as major models theoretically important in the field as a whole; widespread in use either commercially, or academically; and which had an influence on other learning style models.

The purpose of this literature review was to explore different models and instruments related to the learning styles field of study and to discuss the rationale for the learning styles instrument that was selected for this study. The approach taken with the review was to: (1) briefly discuss cognitive style and learning style terminology, (2) identify foundation scholars in the field, (3) discuss various taxonomies of learning style models, (4) review a range of learning

style instruments, and (5) discuss the structure and framework of the Kolb Learning Style Inventory (Version 3.2).

Cognitive Style and Learning Style Terminology

The terms "learning styles" and "cognitive styles" have, on occasion, been used interchangeably in theoretical accounts on the topic of learning styles. Hartley (1998) described cognitive styles as the way in which individuals approach cognitive tasks and suggested that learning styles are the ways in which individuals approach different learning tasks. Hartley described the term learning style as the application of cognitive style in a learning situation. He also discussed a third term, learning strategies, as the strategies adopted when studying. Hartley suggested that learning styles might be more automatic than learning strategies. Cassidy (2004) suggested there is general acceptance that an individual's choice, or inclination, on how to approach a learning situation (a person's learning style) has an impact on performance and achievement of learning outcomes.

Foundational Scholars

Research on learning styles was predated by philosophical dialog related to experiential learning styles as far back as the fourth century BCE. For example, in the Nicomachean Ethics, Aristotle wrote "For the things we have to learn before we can do them, we learn by doing them" (Ameriks and Clarke, 2000; Broadie and Rowe, 2002; Reeve, 1992; Ross, 1956).

Theoretical and empirical research on learning styles has generally been recognized as beginning in the late nineteenth century and early twentieth century in the United Kingdom, the United States, and Western Europe. Kolb and Kolb (2013) recognized the work of a number of prominent scholars for their role in theories of human learning and development – notably John Dewey, Kurt Lewin, Jean Piaget, Lev Vygotsky, William James, Carl Jung, Paulo Frieire, Carl

Rogers, and Mary Parker Follett. While research in learning styles has been conducted across a wide range of disciplines, many of the central concepts and theories have originated from scholars in the field of psychology.

Knowles (1970, 1980) published a seminal work entitled The Modern Practice of Adult Education from Pedagogy to Adragogy. In that work, Knowles suggested that adult development and learning (andragogy) differed significantly from the approach that was used to develop and teach children (pedagogy). Knowles described pedagogy as a model where the learner was dependent on another person, the educator, to select and deliver subject material which was deemed to be useful to the learner at some point later in life. Knowles described andragogy as a model where the adult learner was self-directed and involved in the decision-making aspects of their learning. In addition, Knowles described the adult learner as a person who often incorporated life experiences into the learning process, was ready to learn, had a perceived use for the knowledge, and a specific set of outcomes in mind that she or he wanted to achieve (See Table 1).

Table 1
Comparison of Pedagogy and Andragogy

	Pedagogy	Andragogy
The Learner	Dependent learning	Primarily self-directed learning
The Learner's Experiences	Of little value	A resource for learning
Readiness to Learn	The person learns what society expects them to learn	People learn what the need to know and wish to know
Orientation to Learning	Focused on the acquisition of subject matter information	Learning incorporates life experiences
Use of Information	At some point later in life	Near-term

Note. Adapted from Pallapu (2008)

Taxonomy of Learning Style Models

Scholars have published papers that group various cognitive and learning style theories and models into categories. Four examples are Cassidy (2004), Coffield et al., (2004), DeBello (1990), and Rayner and Riding (1997).

Cassidy Taxonomy of Learning Style Models (2004)

Cassidy (2004) discussed 23 different learning style models and categorized them across three learning style dimensions: (1) Curry's (1983) organization of learning style theories and constructs (onion metaphor), which described a model based on multiple layers of learning and information processing; (2) Riding and Cheema's (1991) wholist-analytic theory, which grouped cognitive styles into two principal groups; and (3) the Rayner and Riding (1997), Riding and Rayner (2013), framework to categorize cognitive styles and learning styles.

Cassidy's goal was not to converge upon an ideal model of learning style but rather to inform through description and comparison. Cassidy intended his study to be a resource for researchers and professionals who desired a broad appreciation of the topic of learning styles (See Table 2, which follows). Cassidy concluded his discussion by suggesting that there was a need to embark from within on a program to rationalize and provide guidance for ongoing research and practitioner work with the goal of developing a unifying conceptual and empirical framework of learning style.

Table 2

Cassidy's Taxonomy of Learning Style Models

Table 1. Taxonomy of learning style models

Model	Curry (1987)				Riding and Cheema (1991)	Rayner and Riding (1997)		
	Instructional preference	Social interaction	Information processing	Cognitive personality	Wholist–analytic	Personality centred	Cognitive centred	Learning centred
Witkin (1962) Field-dependence/independence				●	●		●	
Kagan (1965) Impulsivity–reflexivity				●	●		●	
Holzman and Klein (1954) Leveller–sharpener				●	●		●	
Pask (1972) Holist–serialist				●	●		●	
Pavio (1971) Verbaliser–visualiser				●			●	
Gregorc (1982) Style delineator				●	●		●	
Kauffmann (1979) Assimilator–explorer				●	●		●	
Kirton (1994) Adaption–innovation				●	●		●	
Allinson and Hayes (1996) Intuition–analysis				●	●		●	
Kolb (1984) ELM			●					●
Honey and Mumford (1992) LSQ			●					●
Vermunt (1994) LSI			●					●
Entwistle & Tait (1995) Surface–deep			●					●
Biggs et al. (2001) SPQ			●					●
Schmeck et al. (1991) ILP			●					●
Hunt, Butler, Noy, and Rosser (1978) Conceptual level			●					●
Dunn, Dunn, and Price (1989) LSI	●	●						●
Reichmann and Grasha (1974) Styles of learning interaction model		●						●
Ramirez and Castenada (1974) Child rating form	●			●				●
Reinert (1976) ELSIE				●				●
Hill (1976) Cognitive Style Interest Inventory				●				●
Letteri (1980) Learner types				●				●
Keefe and Monks (1986) Learning style profile	●	●		●				●

Note. From Cassidy, S. (2004). Learning Styles: An overview of theories, models, and measures. *Educational Psychology*, *24*(4), 419–444.

Curry's (1983, 1987) model proposed an empirically testable structure encompassing learning style concepts with established psychometric standards. The structure utilized a four-layer onion metaphor with the four layers described as follows: The fourth and outermost layer was instructional preference (choice of the environment in which to learn). For example, a preference for attending lectures versus small group learning situations. The third layer was social interaction preference during learning. For example, how students perceived the value of a highly interactive course versus a lecture-centric course. The second layer was the intellectual approach to information processing (assimilating information). For example, processing generalizations followed by details, or detailed examples followed by generalized principles. The first and innermost layer was the cognitive personality style. This was described as a relatively permanent personality dimension apparent only when an individual's behavior is observed across multiple different learning situations. For example, reflective or impulsive time to closure in the data gathering phase of problem-solving.

Riding and Cheema's (1991) model proposed two fundamental dimensions to characterize cognitive and learning styles to represent the way information is processed and depicted: (1) "holistic-analytic" (processing information as a whole or broken down into component parts), and (2) "verbaliser-imager" (the degree to which individuals represent information as words or as images) and developed a tool to assess a person's style across the two dimensions.

Rayner and Riding (1997) considered learning styles in the context of three dimensions: (1) personality-centered, (2) cognitive-centered, and (3) learning-centered approaches.

Coffield et al., (2004) Families of Learning Styles

Coffield et al., (2004) examined 13 models of learning styles and made recommendations

for students, teachers, trainers, managers, and researchers on which models to choose. The

learning style models were organized into five families (See Table 3).

Table 3

Cofield et al. Families of Learning Styles

Learning styles and preferences are largely constitutionally based	Learning styles reflect deep-seated features of the cognitive structure	Learning styles are one component of a relatively stable personality type	Learning styles are flexibly stable learning preferences	Move on from learning styles to learning approaches, strategies, orientations, and conceptions of learning
Dunn and Dunn Gregorc	Riding	Apter Jackson Myers-Briggs	Allinson & Hayes Hermann Honey & Mumford Kolb	Entwistle Sternberg Vermut

Note. Adapted from Coffield et al. (2004)

Coffield et al's study reinforced the observation that researchers have a significant

number of learning style models and instruments to consider. In addition to the 13 models

studied, 40 additional models and instruments were listed in the study but were not examined.

DeBello (1990) Taxonomy of Learning Style Models

Predating the Cassidy (2004) taxonomy, and Coffield et al., (2004) study, De Bello (1990) examined the efforts of recognized theorists in the field of learning styles who developed and established reputations over a number of years. He explored 11 major learning style models from the vantage point of single or dual variables on a bipolar continuum, or those with a multidimensional approach encompassing cognitive, affective, and psychological characteristics. De Bello selected models for a number of differing reasons: (a) because they represented a historical perspective, (b) they influenced others, (c) they reflected individual practitioners' attempts to identify style, (d) they related to concurrent issues in education, (e) were research-oriented, or (f) were widely known in the field. The 11 learning styles models De Bello described were:

Dunn and Dunn (1978) for their multidimensional model of learning styles with five stimuli groups encompassing environmental, emotional, sociological, physiological, and psychological areas.

National Association of Secondary School Principals (NASSP) Learning Style Profile which was a single learning style instrument that assessed a broad spectrum of research-based learning style characteristics. Letteri's (1980) perspective relating learning styles to information processing was adopted as the basis for conceptualization of NASSP's learning styles model. The model encompassed physiological, environmental, cognitive, affective domains as well as an information processing perspective. The NASSP model had a great deal of similarity to the Dunn and Dunn model.

Hill (1976) for his theory that learning style was the unique way in which an individual searched for meaning. Hill's work has been viewed as a precursor to work that seeks to identify cultural patterns in learning styles. Hill's Cognitive Style Interest Inventory has been considered to be a

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somewhat complex attempt at a comprehensive diagnostic prescriptive approach to learning style.

Letteri's Cognitive Styles Delineators (1980) characterized learning as information processing – the storage and retrieval of information. In Letteri's model, there were six phases of information processing that ranged from perception reception to long-term memory. Letteri's instrument represented cognitive learning styles on a bipolar continuum at one extreme that tended to correlate with being highly analytic and at the other extreme with being highly global and impulsive.

Ramirez and Castaneda (1974) defined learning style in terms of the cognitive style dimension of field dependence/independence and cultural differences. Ramirez referred to the behaviors resulting from style predispositions as being bi-cognitive and bicultural. Ramiriz focused much of his work on minority populations in California and the Southwest. Ramirez was concerned that a naïve understanding of the role of cultural values caused the formation of stereotypes. The Ramirez model, while directed toward multiethnic concerns, stressed that learning styles were all about individual rather than stereotypical group styles.

Reinert's Edmonds Learning Style Identification Exercise (ELSIE) (1976) was developed as a way of easily identifying the learning style reactions of students to an auditory stimulus. The purpose of ELSIE was to give practical help to the classroom teacher interested in providing more effective counseling for students. The basic concept was that students should have their initial contact with new material by means of their most effective perception.

Schmek's Inventory of Learning Processes (1977) was based on his belief that cognitive and personality studies were not definitive and that learning styles as a construct would be more useful. Scmeck's perspective was that learning style is a predisposition on the part of learners to

adopt a particular learning strategy regardless of the specific demands of the learning task. Schmeck viewed information processing as a continuum – on one extreme, shallow/repetitive and on the other extreme, deep, and elaborative processing.

Hunt's Paragraph Completion Method (1971) was based on a description of students in terms of their need for structure. Learners with a low conceptual level were concrete and impulsive with a poor tolerance for frustration and required a great deal of structure in the academic setting. Students at a higher conceptual level were referred to as independent and were described as inquiring, self-assertive, questioning, requiring less structure, and in need of alternatives. Hunt suggested that student styles could be changed while also suggesting that teaching should focus on the student's strengths.

Kolb's Experiential Learning Framework (1984) was based on a framework of learning styles that described a learning cycle of how adult experience could be translated into concepts, which were then used as guides in the pursuit of new experiences. Kolb described four dominant types of learning styles: (1) Converger: where the person's dominant learning abilities were abstract conceptualization and active experimentation - *experiencing*, (2) Diverger: where the person was best at concrete experiences and reflective observation - *reflecting*, (3) Assimilator: where the person's dominant learning abilities were abstract conceptualization and reflective observation - *conceptualizing* and (4) Accommodator where the person's learning abilities were concrete experience and active experimentation – *doing*. Kolb also applied his experiential learning model to adult organizational systems and management training (Note. the evolution of the Kolb Learning style Inventory through the year 2013 is discussed later in this literature review).

Gregorc Style Delineator (1977, 1985) was based on a model where learning style consisted of distinctive observable behaviors which provided clues to the functioning of an individual's mind

and how that individual related to the world. Gregorc suggested that individuals learned in combinations of dualities, specifically, perception and ordering. Gregorc identified four distinct learning patterns in his model: (1) acquiring knowledge through step-by-step instruction, (2) the trial-and-error approach, (3) learning in a rational and sequential manner, and (4) discussions and activities that involve attention to and interpreting human behavior. Gregorc's assessment instrument was similar in format and design to Kolb's learning styles instrument. Gregorc emphasized the matching of instructional materials and methods to meet the range of individual preferences. He also emphasized that students should be encouraged to strengthen areas of learning styles non-preferences.

McCarthy's 4 Mat System Model (1990) of learning styles was based on Kolb's theory. McCarthy proposed that all learners move continually between abstract conceptualization and concrete experience while learning. She suggested a four-step model with the following attributes: (1) Innovatives – curious, aware, and perceptive; (2) Analytics – critical, fact-seeking, and philosophizing; (3) Common-Sense People – hands-on, practical, oriented toward the present; (4) Dynamics – risk-takers, adaptive, inventive, and enthusiastic. McCarthy's theory also incorporated a spiral process of learning through a right-brain, structured activity designed for motivational stimulation combined with a left-brain goal of achieving mastery of a concept. The learner was then asked to make right-brain choices of alternatives and apply them to real-world situations. McCarthy's theory was that this method taught students through their style strengths 25 percent of the time and challenged them 75 percent of the time.

De Bello concluded his discussion of learning style models with the suggestion that the decision on what model to use in a particular educational setting should be based on three

considerations: First, was the model and instrument reliable and valid? Second, was there widespread practitioner use? Third, was there extensive research behind the model? De Bello went on to suggest that treating every student in the classroom the same way was not responsive to their individual learning styles and that programs based on learning styles could increase student achievement.

Rayner and Riding Taxonomy of Cognitive Styles and Learning Styles (1997)

Rayner and Riding (1997) writing on the categorization of cognitive styles and learning styles adopted a working definition of style which suggested that cognitive style was a person's typical or habitual mode of problem-solving, thinking, perceiving, and remembering – a cognition-centered approach. Their categorization of cognitive styles included eight different models. Rayner and Riding characterized learning styles, or a learning-centered approach, as being distinguished by three major features: (1) a greater interest in the impact of individual differences, (2) the development of new constructs and concepts of learning, and (3) the presentation of an assessment instrument for the exposition of theory. Twelve different learning styles models and instruments were discussed. Rayner and Riding suggested that with each period of new interest and research activity, a further proliferation of models, terms, and meanings took place. (1997, p. 21). Because of the number of theories and models available, educators have been faced with a wide range of learning styles instruments to choose from. Rayner and Riding (1991, p. 23) suggested that "further work is required if the idea of learning style and learning strategy is to be clarified so that a definition of learning style and the identification of the most style-relevant characteristics in learners and instructional settings might be realized."

Learning Style Instruments

Closely associated with learning style models are instruments to identify an individual's dominant (primary) and subordinate learning styles for both the learner, and the educator. A broad range of instruments have been utilized to study learning styles over the past five decades and include the following:

Barsch Learning Style Inventory - Provided insights into learning through different sensory channels (visual, auditory, tactile, and kinesthetic), (Barsch, 2011). The instrument and scoring information were available online at no charge from multiple sources including https://tcsg.edu/wp-content/uploads/2020/04/Learning-Style-Assessments-Resource-Packet.doc.

Canfield's Learning Styles Inventory - Provided insights into four basic learning domains (conditions, areas of interest, mode of learning, and expectation for course grade), (Canfield 1988). The instrument and scoring information were available online at no charge from https://www.tecweb.org/styles/canfield1.html.

Felder-Silverman Index of Learning Styles - Provided insights into learning style preferences on four dimensions (active/reflexive, sensing/intuitive, visual/verbal, and sequential/global), (Graf and Viola, 2006). An online version of the instrument was available at no charge from https://www.andrews.edu/services/ctcenter/prevention/index-of-learning-styles.html#:~:text=The%20Index%20of%20Learning%20Styles,Silverman.

Grasha-Riechmann Student Learning Style Scales - Provided insights into the integration of learning styles, teaching styles, and classroom processes (Grasha, 1995). The instrument and scoring information were available online at no charge from https://www.angelfire.com/ny3/toddsvballpage/Cognitive/GR.pdf.

Gregorc Style Delineator - Provided insights into a learner's cognitive styles (classified as concrete sequential, concrete random, abstract sequential, and abstract random), and measured perception and ordering (Gregorc, 1982; Terry, 2002). The instrument was based on a mediation ability theory which states that the human mind has channels through which it receives and expresses information most efficiently and effectively. The outward appearance of an individual's mediation abilities is termed style. The instrument was available for a fee from Anthony F. Gregorc, PhD by using the following URL: https://www.anthonyfgregorc.com.

Group Emotional Intelligence Instrument - Provided insights into the role of group dynamics in group performance and effectiveness, (Hamme, 2003).

Honey and Mumford Learning Style Questionnaire - Provided insights into learning styles or preferences across four dimensions (activist, theorist, pragmatist, and reflector), (Honey, 2006). The instrument was available at no charge from https://www.mint-hr.com/mumford.html.

Kiersey Temperament Sorter - Provided insights into four temperament types to help people better understand themselves and others (artesian, guardian, idealist, and rational), (Robbins and Ross, 2020). Additional information was available at https://www.keirsey.com/.

Kolb Learning Styles Inventory (the instrument selected for this study) - Provided insights into learning in educational settings and everyday life across four basic phases (experiencing, reflecting, thinking, doing) and nine learning styles (experiencing, imagining, reflecting, analyzing, thinking, deciding, acting, initiating, and balancing), (Kolb and Kolb, 2013). A paper version (3.2) and an online version (4.0) were available for a fee from Korn Ferry and David A. Kolb, Experience Based Learning Systems https://www.kornferry.com/contact.

Learning Tactics Inventory - Provided insights into an individual's learning ability and learning behavior by addressing two questions: (1) Why do some individuals learn from the opportunities

of the workplace while others fail? and (2) Can individuals improve their ability to learn from experience? (Dalton, 2016). The Learning Tactics Inventory was available for a fee from Creative Leadership at https://www.ccl.org/wp-content/uploads/2016/08/learning-tactics-inventory-fact-sheet-center-for-creative-leadership.pdf.

Memletics Learning Style Questionnaire - Provided insights into mental fitness as the core enabler of better learning and better memory (measures preference for logical, visual, verbal, aural, physical, or solitary learning styles), (Hill, Tomkinson et al., 2016). An online version of the Memletics Learning Styles Questionnaire was available from https://www.ccl.org/wp-content/uploads/2016/08/learning-tactics-inventory-fact-sheet-center-for-creative-leadership.pdf.

Miville-Guzman Universality Diversity Scale - Provided insight into students' interest in diverse activities, the impact of diversity on personal development, and degree of comfort with diverse individuals, (Miville, et al 1999). A copy of the Miville-Guzman Universality Diversity Scale (short form) was available from https://www.washburn.edu/academics/general-education-files/MGUDS.pdf.

Multiple Intelligences Assessment - Provided insights into different types of intelligence (linguistic, mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic), (Morgan, 1996). An online version of the instrument was available at https://www.literacynet.org/mi/assessment/findyourstrengths.html.

Myers-Briggs Type Indicator – (Myers and Briggs, 2021) A self-reported inventory designed to identify a person's personality type (extroversion/introversion, sensing/intuition, thinking/feeling, or judging/perceiving). One of the goals of the instrument and the Myers & Briggs Foundation was to make the theory of psychological types described by C. G. Jung

understandable and useful in people's lives. Information on the instrument was available at https://www.myersbriggs.org/.

NAASP Learning Styles Profile - A cognitive model adopted by the National Association of Secondary School Principals with 23 independent scales representing four higher order factors (analytic skill, spatial skill, discrimination skill, and categorization skill), (Keefe et al, 1985, 1986).

Non-Verbal Immediacy Scale - Measured individual differences in expression of non-verbal behavior to signal positive feelings towards another person, (Kalat et al., 2018). An online version of the instrument was available at https://openpsychometrics.org/tests/NIS/.

Perceptual Modality Preference Survey - Provided insight into perceptual learning styles (visual, print, aural, haptic, interactive, kinesthetic, or olfactory), (Cherry, 1982). An online version of the instrument was available at https://learningstylescesarbazo.weebly.com/perceptual-modality-preference-survey.html.

Self-Directed Learning Readiness Scale - Provided insights into evaluating perception of skills and attitudes associated with self-directed learning, (Guglielmino et al., 1987). Information on obtaining the Self-Directed Learning Readiness Scale was available from Guglielmino & Associates, LLC at https://www.lpasdlrs.com/.

Tests of Adult Basic Education - Provided insight into a person's skill level and aptitudes (reading, math, English). Information on obtaining the instrument was available at https://tabetest.com/.

True Colors Personality Test - Provided insights into core motives (power, intimacy, peace, or fun), (Cooper, 2009). An online version of the instrument was available at no charge at https://www.hancockcollege.edu/careers/docs/PersonalityAssessment.pdf.

VARK Learning Styles Questionnaire - Provided insights into modalities of student learning (visual, auditory, reading/writing, or kinesthetic), (Marcy, 2001). An online version of the instrument was available online at no charge at https://vark-learn.com/the-vark-questionnaire/.

Vermont Inventory of Learning Styles - Provided insights into how students study and perceive their learning styles (meaning-directed, reproduction-directed, application-directed, or uni-directed), (Vermunt, 1994, 1998). A copy of the instrument was found at https://canalce.uab.cat/img/pafiu/ILS-HE%20English.pdf.

Research within the last 20 years continues to produce new ideas and measurement instruments. Representative examples of more recent instruments, or versions of instruments, include the Kolb Version 3.2 and 4.0 Learning Style Inventories (2019), the Barsch Learning Style Inventory (2011), the Learning Tactics Inventory (Dalton, 2016), and investigating the opportunity development process in entrepreneurship training.

Model Selection Criteria

Faced with multiple theories, models, and instruments to choose from for the study, this researcher made the decision to follow DeBello's (1990) guidance on which model and instrument to use in a research study. DeBello suggested basing a selection on three considerations: (1) was the model and instrument reliable and valid, (2) was there widespread practitioner use, and (3) was there extensive research behind the model?

The Kolb Learning Style Inventory instrument was selected for the study based on the model and instrument's fit with DeBello's three suggested considerations:

1. Reliability and Validity – Detailed reliability and validity data were available. Kolb's Version 3.1 and 3.2 Technical Specifications (2013, pp. 47-62) provided detailed

information on reliability and validity studies as did the Kolb Version 4.0 Guide (pp. 51-75). A summary of that information is provided in Chapter III of this study.

2. Practitioner Usage - Kolb's Version 4.0 Guide (2013, p. 48) provided scores and results for a normative group of N = 10,423. In addition, Korn Ferry provided easy access to Version 4.0 (online version), and Version 3.2 (paper version) of the KLSI instrument.

3. Research Behind the Model – There have been five versions of the Kolb Learning Style Inventory published over the past 51 years, beginning with Version 1 in 1971. Kolb and Kolb have openly shared information with other interested researchers about the Kolb Learning Style Inventory, the instrument's scoring, and technical characteristics related to the instrument. This open sharing has contributed to the continuous evolution of the instrument and its underlying theory.

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Process and Structure of the Kolb Learning Style Inventory (LSI)

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The Kolb Learning Style Inventory (Kolb and Kolb, 2013, 2015, 2019) was designed to help individuals understand how they learned in educational settings and in every-day life. Kolb and Kolb suggested that learning can be described as a cycle consisting of four basic phases or styles, and that understanding those styles would help an individual learn, solve problems, and work with others.

The Kolb (2015) model suggested that an individual takes in experience in the following ways: by concrete experience or abstract conceptualization, and by reflective observation or active experimentation. Kolb further suggested that when an individual used both the concrete experience and abstract conceptualization modes as well as the reflective observation and active experimentation modes, the individual expanded his or her potential to learn and that potential to learn was enhanced by cycling through all four phases. Kolb (2019, p. 5) made the statement

"Ideally, using a well-rounded learning process, you would cycle through all four phases." Kolb (2015, 2019) described the four phases of the learning cycle as follows:

- Concrete Experience (CE), learning by experience: learning from specific experiences, relating to people, being sensitive to feelings and people

- Reflective Observation (RO), learning by reflecting: observing carefully before making judgments, viewing issues from different perspectives, looking for the meaning of things

- Abstract Conceptualization (AC), learning by thinking: analyzing ideas logically, planning systematically, acting on an intellectual understanding of a situation

- Active Experimentation (AE), learning by doing: showing the ability to get things done, taking risks, influencing people and events through action

Participants were able to learn the style in which they took in experience (by concrete experience or abstract conceptualization), as well as how they dealt with experience (by reflective observation or active experimentation).

In addition to describing the four phases of the learning cycle, Kolb (2011, 2015, 2019) described nine common learning styles: Initiating – initiating action to deal with experiences and situations, Experiencing – finding meaning from deep involvement in experiences, Imagining – imagining possibilities by observing and reflecting, Reflecting – connecting experiences and ideas through reflection, Analyzing – integrating ideas through reflection, Thinking – involvement in abstract and logical reasoning, Deciding – using theories to decide on solutions and courses of action, Acting – goal-directed action that integrates people and tasks, Balancing – weighing pros and cons of acting versus reflecting and thinking.

Completing and Scoring the Kolb Learning Styles Instrument

Survey participants were asked to self-report their answers to 12 sentences that described learning. Participants were asked to rank four different endings to each sentence according to how well the participant thought each ending described how they learned. The participant's responses were then scored by calculating their numerical scores for the four learning styles: CE - concrete experience (learning by experiencing), RO - reflective observation (learning by reflecting), AC - abstract conceptualization (learning by thinking), and AE - active experimentation (learning by doing). Participants' scores were then plotted on the horizontal axis of the instrument's diagram with AE on the left and RO on the right, and the vertical axis of that same diagram with their CE score at the top and their AC score at the bottom. By connecting the dots corresponding to the four scores, a kite-shaped pattern could be created on the diagram which indicated the degree to which the participant relied on each of the four different learning modes, and which the participant tended to prefer in a learning situation. A conceptual example of the kite-like shape is shown in Figure 2, which follows. The closer the arms of the kite shape were to the outer edge of the circle, the more the participant tended to operate from that position on the learning cycle.

Figure 2

Conceptual Example - Recording a Participant's Scores on the Kolb Learning Cycle

Example:

CE
Concrete
Experience
(Experiencing)

AE
Active
Experimentation
(Doing)

RO
Reflective
Observation
(Reflecting)

AC
Abstract
Conceptualization
(Thinking)

Assessing a Participant's Different Learning Modes

A participant's orientation toward concrete experience indicated that the person focused

on being involved in experiences and dealing with situations in a personal way. The person

emphasized feeling as opposed to thinking. People with concrete experience orientation enjoyed

and were good at relating to others. People with an orientation toward reflective observation

indicated that the person focused on understanding the meaning of ideas and situations by

observing and describing them. They emphasized understanding as opposed to practical

application. People with an orientation toward abstract conceptualization focused on using logic, ideas, and concepts. They emphasized thinking as opposed to feeling. People with an orientation toward active experimentation focused on actively influencing people and changing situations. They emphasized practical application as opposed to reflective understanding. People with an active experimentation orientation enjoyed and were good at getting things done (Kolb 2015, p. 105).

Understanding a Participant's Preferred Learning Styles

To understand a participant's preferred learning styles, participants' scores were evaluated to determine their particular learning style preference across nine different learning styles. Kolb described the nine learning styles as follows (Kolb 2015, p. 145): (1) The initiating style – characterized by the ability to initiate action to deal with experiences and situations. It involved active experimentation and concrete experience. (2) The experiencing style – characterized by the ability to find meaning from deep involvement in experience. It drew on concrete experience while balancing active experimentation and reflective observation. (3) The imagining style – characterized by the ability to imagine possibilities by observing and reflecting on experiences. It combined the learning steps of concrete experience and reflective observation. (4) The reflecting style – characterized by the ability to connect experience and ideas through sustained reflection. It drew on reflective observation while balancing concrete experience and abstract conceptualization. (5) The analyzing style – characterized by the ability to integrate and systematize ideas through reflection. It combined reflective observation and abstract conceptualization. (6) The thinking style – characterized by the capacity for disciplined involvement in abstract and logical reasoning. It drew on abstract conceptualization while balancing active experimentation and reflective observation. (7) The deciding style -

characterized by the ability to use theories and models to decide on problem solutions and courses of action. It combined abstract conceptualization and active experimentation. (8) The acting style – characterized by a strong motivation for goal-directed action that integrated people and tasks. It drew on active experimentation while balancing concrete experience and abstract conceptualization. (9) The balancing style – characterized by the ability to adapt weighing the pros and cons of acting versus reflecting and experiencing versus thinking. It balanced concrete experience, abstract conceptualization, active experimentation, and reflective observation. Figure 3, which follows, shows a conceptual diagram of the "kite shapes" for the nine learning styles.

Figure 3

The Nine Kolb Learning Styles
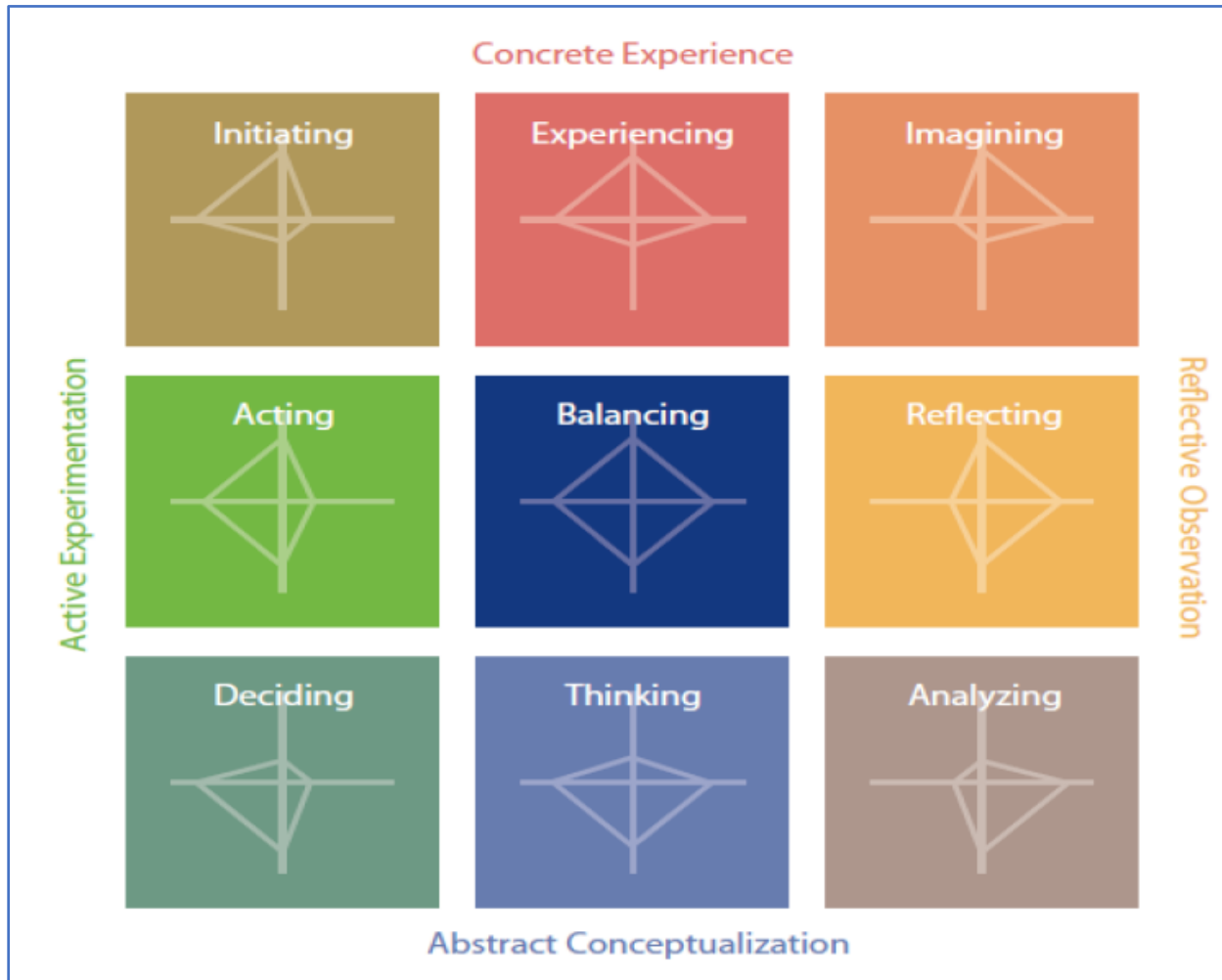
Reprinted with permission, Alice Y. Kolb, David A. Kolb Experience Based Learning Systems, Inc., and Korn-Ferry, 2021

Characteristics of the Kolb Learning Styles

As a result of an individual's background, life experiences, and present environment, most individuals have developed learning styles that emphasize some learning styles over others. Kolb (2019) suggested that an individual's learning style indicated how she or he went about

learning and noted that each style shared some characteristics with those adjacent in the grid. Kolb suggested several approaches an individual could consider to develop her or his learning style. They were: (1) to value diversity in learning styles and associate with people with different learning styles from theirs, (2) to try to become a more flexible learner by choosing to use the learning style opposite to their own preference, (3) improve the fit between their learning style and the tasks they face, and (4) look for safe ways to practice new skills.

Reliability and Validity of the Kolb Learning Styles Inventory

D. Kolb and A. Kolb (2013, pp. 51-76) in their comprehensive guide to the theory, psychometrics, research on validity, and educational applications discussed their studies on the reliability of the Kolb Learning Styles Inventory (internal consistency and test-retest reliability) as well as the validity of the Kolb Learning Styles Inventory instrument (internal validity evidence and external validity evidence). The Kolb Learning Styles Inventory, Version 3.2, was created in 2013 to incorporate the nine learning styles typology of the online Kolb Learning Styles Inventory (Version 4.0) in a paper version. Kolb and Kolb utilized a relatively large data set (N = 10,423) in their studies of the reliability and validity of their learning styles instrument. The Kolb Learning Styles Inventory is accepted by many educators and scholars as a reliable and valid instrument to utilize in self-assessment studies of the experiential learning styles of adult learners.

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Counter Views on the Value of Experiential Learning

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Not all researchers have a favorable view on experiential learning theory and learning style instruments. Buckmann and Schwille (1983) argued against education based on experiential learning and suggested that the purpose of formal education was to overcome the biases from ongoing life experience. Eisentstein and Hutchinson (2006, p. 256)) concluded that "managers

and consumers should increase their use of objective analyses and decrease reliance on experience or intuition." Brehmer (1980) suggested that experience-based experts are often no better than novices at making clinical judgments. Brehmer also suggested that people had a number of biases that prevented them from using the information that experience provided. March (2010, p. 47) commented "Experience is rooted in a complicated causal system that can [only] be described adequately by a description that is too complex for the human mind." He stated that "… the lessons derived from experiential learning are rife with unjustified conclusions, superstitious associations, misleading correlations, tautological generalizations, and systematic biases" (2010, p. 107). Kolb (2015, Introduction Section) suggested that counterviews on the value of experiential learning characterized experiential learners as "blindly groping their way through daily experiences while academic knowledge is created by extraordinary persons who are presumably immune to the biases of learning from ordinary experience" was a flawed view as well. Kolb suggested that the biases attributed to experiential learning apply in the scientific laboratory in addition to the biases attributed to experiential learning.

Research Related to Learning Styles of University Students

An analysis of the information contained in a sample of literature related to the learning styles of college and university students indicated that the number of research studies conducted by researchers at colleges and universities located outside the United States was more than two times the number of research studies conducted by researchers at colleges and universities located in the United States. An analysis of the sample suggested that an opportunity existed to add to the number of studies on the learning styles of college and university students in the United States. Furthermore, the analysis indicated that there appeared to be an opportunity to add

to the body of published scholarly information on the learning styles of student-entrepreneurs attending universities in various geographical regions of the United States

Examples of research related to the learning styles of university students and the particular learning style instrument utilized in the study include:

Using the Kolb LSI - Learning styles and satisfaction with educational activities of Saudi Heath Science University students (Al Shaikh et al., 2019) - The Kolb Learning Styles Inventory Version 3.1 was utilized in a study of medical students. A total of 359 students participated in the study. The study did not find a predominant learning style among health science students.

Using Felder and Silverman - Learning styles in relation to gender, field of study, and academic achievement for Bahraini University students (Alumran, 2008) - The study utilized the Felder and Silverman model. Men and women were found to have different learning styles. Men were found to be more kinesthetic, tactual, and visual. women were found to be more conforming and more self, parent, or teacher-motivated than men.

Using the Kolb LSI - Learning styles of first-year undergraduate nursing and midwifery students: a cross-sectional survey utilizing the Kolb Learning Style Inventory (D'Amore et al., 2011) – The study utilized the Kolb Learning Styles Inventory. A total of 345 Australian university students (90.9% women and 9.1% men) participated in the study. The study showed a large distribution of learning type styles.

Using VARK - The VARK Learning Styles among university students of business schools (Espinoza-Poves et al., 2019) – Students of the business school of a private university (Univerisdad San Ignacio de Loyola, Peru) were studied. The VARK learning styles instrument was applied to 218 students. An analysis of the results suggested that 25.5% of students had a multimodal learning style and that age was significantly associated with learning styles.

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Using the Kolb LSI - Learning and personal attributes of university students in predicting and classifying the learning styles: Kolb's nine region versus four-region learning styles (Gogus et al., 2016) – Participants were the undergraduate students from an international university in Istanbul, Turkey. The study included 418 students. Demographic information on the students was collected and the Kolb Learning Styles Inventory LSI-2 (1985) was used to examine students' individual learning preferences. An analysis of the study results suggested that the primary learning styles of the participants were clustered more in the lower quadrants of both the four-region and the nine-region Kolb learning style grids.

Using Dunn and Dunn and Kolb LSI - Teaching to students' learning styles: approaches that work (Hein et al., 1999) – Participants were students from American University/Purdue University in Washington, DC/West Lafayette, Indiana. The Dunn and Dunn Learning Style Model was employed as well as the Kolb Learning Style Model. 120 students participated in the study where the elements of the two learning style models were compared and contrasted. An analysis of the findings of the study suggested that the learning style assessment tool used was not as critical as the actual assessment of learning styles.

Using Honey & Mumford - University students' learning styles and their ability to solve mathematical problems (Jaberi, 2015) – Participants were students from the University of Petra, Amman, Jordan. To collect the data for analysis the researcher administered the Honey & Mumford (1992) Learning Style Inventory and the Mathematical Problem-Solving Test to 85 students. The study concluded that students' ability to solve mathematical problems varied depending on their learning style. The activist-reflector style was the most frequently preferred learning style, which showed better performance in solving mathematical problems than other styles.

Using the Kolb LSI - A longitudinal study of undergraduate accounting students' learning style preferences at two UK universities (Marriott, 2002) – Participants were students from the Business School of the University of Glamorgan, UK. The paper presented the results of a study of 662 students enrolled in an undergraduate accounting program. The Kolb Learning Style Inventory was utilized in the study. The accommodator learning style was the most popular preference over the period analyzed. An analysis of the results suggested that the students' learning style preferences changed over their period of university attendance.

Using the Kolb LSI - Perception of experiential learning in a graduate practicum internship (Meyer, 2021) – Participants in the study were students from Fielding Graduate University in Santa Barbara, California. The Kolb 4.0 Learning Style Inventory was utilized in the study and was administered to 25 students. An analysis of the results of the study suggested that learning style had no bearing on the perception of impact from an internship practicum.

Using the Kolb LSI - Transitions in students' learning styles (Nulty and Barrett, 1996) – 672 participants from a sample of students attending their Brisbane, Australia universities were studied utilizing the Kolb Learning Styles Inventory. An analysis of the results of the study suggested that first year students adopted similar learning styles irrespective of discipline, and that third-year students adopted different learning styles for different disciplines.

Using the Kolb LSI - A survey of gender and learning styles (Philbin et al., 1995). The purpose of this study conducted at the University of New Mexico was to investigate differences in learning styles between men and women. 72 subjects of various ethnic groups participated in the study. The revised Kolb Learning Styles Inventory (1985) was utilized to identify each participant's learning styles. An analysis of the results suggested that there is a significant difference in learning styles between the genders.

Using the Kolb LSI - Implementing Kolb's learning styles into online distance education (Richmond and Cummings, 2005) – The purpose of this paper was to investigate the application of Kolb's experiential learning to online distance education. The authors had three main objectives: (1) present Kolb's research and theories and justify its use in online education, (2) provide a critical evaluating of learning style research in online learning environments, and (3) demonstrate how to consider student learning styles in online distance education.

Using Vermunt and Van Rijswijk - Gender and gender identity differences in learning styles (Severiens et al., 1997) – Participants in this study were students in the Graduate School of Teaching and Learning, University of Amsterdam, The Netherlands. 432 students participated in the survey. An analysis of the study results suggested that gender identity explained more variance in the use of learning styles compared to gender, and that gender differences in learning styles did not vary across teachers. The instruments utilized were the Vermunt and Van Rijswijk Inventory of Learning Styles and the Dutch Sex Role Inventory (NSRV).

Using the Kolb LSI - The relationship between learning styles and problem-solving skills among college students (Sirin and Guzel, 2006) – Participants in this study were students from Marmara University, Istanbul, Turkey. Data for the study were collected using the Kolb Learning Styles Inventory and the Problem-Solving Inventory. The sample of the study consisted of 330 students. An analysis of the results of the study suggested that learning styles differed based on students' subject matter in high school and university entrance exam scores.

Using Felder and Silverman - The pattern of learning styles among second year students in Business management and hospitality programs at one of the vocational colleges in Norther Zone, Malaysia (Tee et al., 2015) – The purpose of the study was to explore the learning styles of 60 students from the Vocational College in Northern Zone, Malaysia. The Felder and Silverman

Index of Learning Styles was utilized in the study. An analysis of the results of the study suggested that the students were more dominant in the visual style. The authors suggested that college lecturers should align their teaching approaches with the dominant learning styles for each dimension among students.

Using VARK - Gender differences in learning style preferences among undergraduate physiology students (Wehrwein et al., 2007) – This study explored gender differences in learning style preferences among 48 undergraduate students at Wayne State University, Detroit, Michigan. The participants' learning style preferences were assessed using the VARK questionnaire. An analysis of the results of the study indicated gender differences in learning style preferences. Female students preferred unimodal information presentation, whereas males preferred multimodal learning.

Using the Kolb LSI - Disparity of learning styles and higher order thinking skills among technical students (Yee et al.l, 2015) – The purpose of this research was to analyze the disparity of learning styles among technical student from universities in Malaysia. 375 students from four technical universities were selected to participate. The Kolb Learning Styles Inventory and a set of questionnaires were used as research instruments. An analysis of the results suggested that the most dominant learning style among technical students is Doer. The analysis also indicated that none of the students perceived their thinking skills level to be high.

Using Memletics and Gardner's Multiple Intelligence Theory - Using learning styles to personalize online learning (Zajac, 2009) – The purpose of this paper was to present the results of research on the data necessary to prepare personalized content for e-learning courses, and to show how individual learning styles could be linked to creating and tailoring online courses. Data from 220 students from the computer sciences department of the Pedagogical University,

Krakow, Poland were utilized in the study. The research utilized a questionnaire based on Gardner's multiple intelligence theory and the Memletics learning styles inventory.

Summary

As various scholars have observed, there are a significant number of learning style philosophies, theories, models, and instruments for researchers to choose from, and multiple taxonomies to organize them. D. Kolb (1984) suggested that individual styles of learning were complex and not easily reducible into simple typologies. Coffield et al. (2004) argued that a host of conceptual and empirical problems came with the appeal of learning styles research. Curry (1990, p. 54) observed on the state of play of research into learning styles that "researchers and users alike will continue groping like the five blind men in the fable about the elephant, each with a part of the whole but none with full understanding."

The level of complexity involved in understanding the learning process appears to be a contributing factor to the extensive body of academic literature which exists on learning styles as researchers strive to better understand and describe the learning process. There does not appear to be any unifying theory or model to reduce the level of complexity in understanding the learning process of adults. The goal of this review of academic literature related to adult learners was not to converge on a single learning styles model but rather to explore the range of models and instruments available to learning styles researchers. The choice of which model and instrument to use is for the researcher to make.

CHAPTER III
RESEARCH METHODS

Introduction

Ongoing research on the learning styles of students is an important element in helping educators and course designers improve their effectiveness. Because learning styles can impact the learning process, improving our understanding of the various aspects of learning styles may help students achieve their academic goals and aid educators in more effectively preparing students for their roles in society after graduation.

Chapter I provided a perspective on entrepreneurship in the United States, the resulting academic challenge, purpose of the study, research questions, significance of the study, study design, possible limitations, and a definition of terms. Chapter II provided a review of the relevant academic literature related to adult learners, learning styles, and learning styles instruments. This chapter describes the design of the study, the sample population, instrumentation, reliability, and validity of the Kolb Learning Style Inventory instrument as well as procedures and analysis.

Purpose of the Study

The purpose of the study was to explore and compare the learning style profiles of college and university students involved in entrepreneurial activities while pursuing an academic degree at an R1-rated public university in the Southern region of the United States.

Research Questions

The study was designed to explore the following research questions:

1. What are the relationships among the learning style preferences of the entrepreneurial student population studied (as measured by the Kolb Learning Style Inventory Version

3.2) and the learning style preferences of the general population published in the Kolb

Learning Style Inventory Technical Specifications documents, Versions 3.1, 3.2, and 4.0?

2. What are the relationships by gender identity among the learning styles of the

    entrepreneurial student population studied as measured by the Kolb Learning Style

    Inventory Version 3.2?

3. What are the relationships by ethnicity among the learning styles of the entrepreneurial

    student population studied as measured by the Kolb Learning Style Inventory Version

    3.2?

4. How did the entrepreneurial student population studied compare by gender and ethnicity

    to the overall university enrollment by gender and ethnicity?

Study Design

This study was conducted after obtaining permission from the Institutional Review Board

for use of human subjects for research at the university studied. A quasi-experimental, ex post

facto research design was used to explore the learning styles of students engaged in

entrepreneurial activities while pursuing an academic degree at an R1-rated university in the

Southern region of the United States. Entrepreneurship faculty members were contacted and

asked to allow the researcher to visit their classes or facilities and administer the surveys.

Participation in the research project was voluntary, and there were no incentives for contributing

to the study. An IRB-approved Informed Consent Letter (See Appendix A) was signed by

participating students and all surveys were administered in person in a paper and pencil format to

allow the student's demographic survey information (See Appendix B) to be combined with their

KLSI Version 3.2 responses (See Appendix C). The online version of the KLSI (Version 4.0)

was considered and rejected since the desired demographic information questions could not be

included. The Kolb Learning Styles Inventory, Version 3.2, was created in 2013 to incorporate the nine learning styles typology of the online Kolb Learning Styles Inventory (Version 4.0) in a paper version. Because the survey was completed using a paper and pencil format, the researcher was responsible for scoring the instrument and the demographic information and entering the results into SPSS. All information obtained in connection with this study remained anonymous to protect the privacy of the participants. The study and its design were approved by the University Institutional Review Board (See Appendix D). The research study was designed to be inductive in nature, providing the reviewer with descriptive information on the study.

Sample

The sample included 209 participants aged between 18 and 51 ($M = 21.966$, $SD = 2.792$) who were involved in entrepreneurial activities while pursuing an undergraduate or graduate degree at the R1-rated university in the Southern region of the United States where the study was conducted. Entrepreneurial activities included one or more of the following activities: attending entrepreneurship classes, participating in the university's new venture accelerator program, or competing in one of the university's business idea competitions. Seventy-two-point two percent of the participants self-identified as Male (n = 151), 26.8 percent of the participants self-identified as Female (n = 56), and .5 percent of the participants self-identified as Non-Binary (n = 2). Eighty-four-point two percent of the participants self-identified as White (n = 176), 2.4 percent as Black or African American (n = 5), 1.9 percent as Hispanic or Latino (n = 4), .5 percent as American Indian or Alaskan Native (n = 1), 10.5 percent as Asian or Pacific Islander (n = 22), and .5 percent as Other (n = 1). Of the population studied, 3.3 percent self-identified as Sophomores (n = 7), 23.0 percent as Juniors (n = 48), 70.8 percent as Seniors (n = 148), and 2.9 percent as Graduate Students (n = 6).

Instrumentation

To conduct the research study, a Demographic Survey (See Appendix B) and the Kolb Learning Style Inventory Workbook Version 3.2 (See Appendix C) were utilized to collect the data that were analyzed in the study. SPSS (Version 27) was utilized to provide descriptive statistics, and to assist in the analysis of the information the students self-reported.

Faced with the decision of what model and instrument to select for this study, the researcher chose to follow the advice given by DeBello (1990) and one other subjective consideration. After considering several learning styles theories and instruments, the researcher selected the Kolb learning style model and instrument based on these factors: (1) the extensive research conducted by D. Kolb and A. Kolb over a long period of time, (2) availability of detailed reliability and validity data, (3) practitioner usage over a long period of time, and as a fourth factor, not included in DeBello's advice, (4) the Kolb's willingness to openly share with interested parties information about the model's underlying theory, detailed technical workbooks for KLSI Versions 3.2 and 4.0, as well as access to the instrument for scholarly research. Coffield et al. (2004) suggested criteria that could also support the selection of the Kolb Learning Style Inventory: theoretical importance in the field as a whole; widespread use, either commercially or academically; and its influence on other learning style models. In addition, the Kolb Learning style Inventory was one of the learning styles models Coffield et al. described as influential and popular (Note. Coffield et al. also described as influential and popular the Dunn and Dunn learning styles model and Honey and Mumford's Learning Styles Questionnaire). The Kolb Learning Style model and instrument related to DeBello's (2019) three suggested considerations in the following manner:
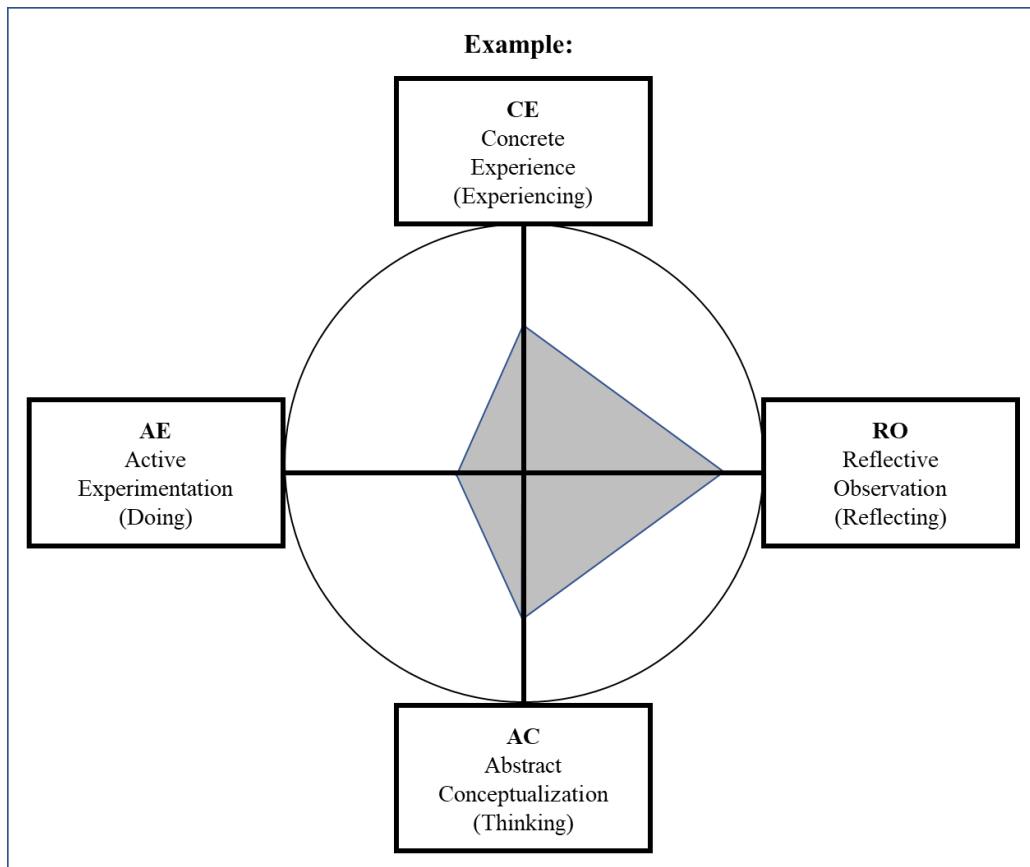
1. Reliability and Validity - KLSI Version 3.1 and 3.2 Technical Specifications (2013, pp. 47-62) provided detailed information on reliability and validity studies as does the KLSI Version 4.0 Guide (2013, pp. 51-75).

2. Practitioner Usage – KLSI Version 3.1 and 3.2 Technical Specifications (2013, p. 44) provided scores and results for a normative group of $N = 6,977$ and the Kolb's Version 4.0 Guide (2013, p. 48) provided scores and results for a normative group of $N = 10,423$.

3. Research Behind the Model – The Kolb Learning Style Inventory is based on experiential learning theory (Kolb 1984) and was designed to help individuals identify the way they learn from experience. There have been five versions of the Learning Style Inventory published over the past 51 years, beginning with Version 1 in 1971. Kolb and Kolb have openly shared information about the inventory, the instrument's scoring, and technical characteristics with other interested researchers, resulting in continuous improvement of the instrument and its underlying theory. The publicly available KLSI Technical Specifications (2013) were designed to adhere to the standard for educational and psychological testing developed by the American Educational Research Association, The American Psychological Association, and the National Council on Measurement in Education (Eignor, 2013).

Survey participants were asked to self-report their answers to 12 sentences that described learning. Participants were asked to rank four different endings to each sentence according to how well the participant thought each ending described how they learned. The participants' responses were then scored by calculating their numerical scores for the four learning styles: CE - concrete experience (learning by experiencing), RO - reflective observation (learning by reflecting), AC - abstract conceptualization (learning by thinking), and AE - active

experimentation (learning by doing). Participants' scores could then be plotted on the horizontal axis of the instrument's diagram with AE on the left and RO on the right, and the vertical axis of that same diagram with their CE score at the top and their AC score at the bottom. By connecting the dots corresponding to the four scores, a kite-shaped pattern could be created on the diagram which indicated the degree to which the participant relied on each of the four different learning modes, and which the participant tended to prefer in a learning situation. A conceptual example of the kite-like shape that is created is shown in Figure 2. The closer the arms of the kite shape were to the outer edge of the circle, the more the participant tended to operate from that position on the learning cycle.

Figure 2

Conceptual Example - Recording a Participant's Scores on the Kolb Learning Cycle

Assessing a Participant's Different Learning Modes

A participant's orientation toward concrete experience indicated that the person focused on being involved in experiences and dealing with situations in a personal way. The person emphasized feeling as opposed to thinking. People with concrete experience orientation enjoyed and were good at relating to others. People with an orientation toward reflective observation indicated that the person focused on understanding the meaning of ideas and situations by observing and describing them. They emphasized understanding as opposed to practical application. People with an orientation toward abstract conceptualization focused on using logic, ideas, and concepts. They emphasized thinking as opposed to feeling. People with an orientation toward active experimentation focused on actively influencing people and changing situations. They emphasized practical application as opposed to reflective understanding. People with an active experimentation orientation enjoyed and were good at getting things done (Kolb 2015, p. 105).

Understanding a Participant's Preferred Learning Styles

To understand a participant's preferred learning styles, participants' scores were evaluated to determine their particular learning style preference across nine different learning styles. Kolb described the nine learning styles as follows (Kolb 2015, p. 145):

(1) The initiating style – is characterized by the ability to initiate action to deal with experiences and situations. It involved active experimentation and concrete experience. (2) The experiencing style – is characterized by the ability to find meaning from deep involvement in experience. It drew on concrete experience while balancing active experimentation and reflective observation. (3) The imagining style – is characterized by the ability to imagine possibilities by observing and reflecting on experiences. It combined the learning steps of concrete experience and reflective

observation. (4) The reflecting style – is characterized by the ability to connect experience and ideas through sustained reflection. It drew on reflective observation while balancing concrete experience and abstract conceptualization. (5) The analyzing style – is characterized by the ability to integrate and systematize ideas through reflection. It combined reflective observation and abstract conceptualization. (6) The thinking style – is characterized by the capacity for disciplined involvement in abstract and logical reasoning. It drew on abstract conceptualization while balancing active experimentation and reflective observation. (7) The deciding style – is characterized by the ability to use theories and models to decide on problem solutions and courses of action. It combined abstract conceptualization and active experimentation. (8) The acting style – is characterized by a strong motivation for goal-directed action that integrated people and tasks. It drew on active experimentation while balancing concrete experience and abstract conceptualization. (9) The balancing style – is characterized by the ability to adapt weighing the pros and cons of acting versus reflecting and experiencing versus thinking. It balanced concrete experience, abstract conceptualization, active experimentation, and reflective observation.

Figure 3, which follows, shows a conceptual diagram of the "kite shapes" for the nine learning styles.

Figure 3

The Nine Kolb Learning Styles

As a result of our backgrounds, life experiences, and present environments, most people have developed learning styles that emphasize some learning styles over others. Kolb (2019) suggested that an individual's learning style indicated how he or she went about learning and noted that each style shared some characteristics with those adjacent in the grid. Kolb suggested several approaches an individual could consider to develop his or her learning style. They were: (1) to value diversity in learning styles and associate with people with different learning styles

from yours, (2) to try to become a more flexible learner by choosing to use the learning style

opposite to your own preference, (3) improve the fit between your learning style and the tasks

you face, and (4) look for safe ways to practice new skills.

<center>**Reliability and Validity**</center>

D. Kolb and A. Kolb (2013, pp. 51-76) in their comprehensive guide to the theory,

psychometrics, research on validity, and educational applications discussed their studies on the

reliability of the Kolb Learning Styles Inventory (internal consistency reliability and test-retest

reliability) as well as the validity of the Kolb Learning Styles Inventory instrument (internal

validity evidence and external validity evidence). The Kolb Learning Styles Inventory, Version

3.2, was created in 2013 to incorporate the nine learning styles typology of the online Kolb

Learning Styles Inventory (Version 4.0) in a paper version.

Internal Consistency Reliability

Internal consistency reliability for the KLSI 4.0 (and KLSI 3.2, which is a paper version

of KLSI 4.0) was reported as maintaining the high scale reliability of the KLSI 3.1 with an

average scale reliability (Cronbach Alpha) = .81 (4.0) versus .80 (3.1). for the total normative

group (N = 10,423) with the following values: CE = .83, RO = .83, AC = .83, AE = .76. Table 4,

which follows, shows the Cronbach's alpha coefficients for seven different studies of the

randomized KLSI 3.1 across studies of liberal arts college students, psychology undergraduates,

and business students.

Table 4

Internal Consistency Alphas for the Scale Scores of the KLSI 3.1

Source	N	CE	RO	AC	AE	AC-CE	AE - RO
Online V4.0 Sample (2013)	5023	.77	.81	.84	.80	.82	.82
Kayes (2005)	221	.81	.78	.83	.84	.77	.84
Wierstra & DeJong (2002)	101	.81	.78	.83	.84	.83	.82
Veres et.al. (1991)	711	.56	.67	.71	.52	--	--
	1042	.67	.67	.74	.58	--	--
Ruble & Stout (1990, 1991)	323	.72	.75	.72	.73	--	--
	403	.67	.78	.78	.78	--	--

Note. From The Kolb Learning Style Inventory 4.0 Comprehensive Guide to the Theory, Psychometrics, Research on Validity, and Educational Applications (2013)

Test-Retest Reliability

Two test-retest reliability studies of the randomized format KLSI 3.1 have been published. Veres et al. (1991) as well as Ruble and Stout (1991). Veres et al. administered the LSI to a group of students and business employees three times at eight-week intervals and reported test-retest correlations well above .9 in all cases. Ruble and Stout (1991) administered the LSI twice to undergraduate and graduate business students and found test-retest reliabilities that averaged .54 for the six LSI scales. A Kappa coefficient of .36 indicated that 47% of students changed their learning style classification on re-test.

Kolb and Kolb (2013) rated the test-retest correlation coefficients from excellent to moderate and suggested that the discrepancy between the studies was difficult to explain. Kolb

and Kolb hypothesized that learning style might be situational, varying in response to environmental demands. Kolb and Kolb hypothesized that changes in style might be the result of discontinuous intervening experiences between test and retest or individuals' ability to adapt their style to changing environmental demands Mainemelis, Boyatzis and Kolb 2002; Jones, Reichard, and Mokhtari 2003).

External Validity Evidence

Age

Kolb and Kolb (2013) reported that previous research with the LSI showed a linear increase in preference for learning by abstraction (the AC-CE dimension) with age. The AE-RO dimension held relatively constant through the adult years with a movement toward action in the over 65 age group.

Gender

Kolb and Kolb reported that research with previous LSI versions showed that males were more abstract than females on the AC-CE scale and no significant gender differences on the AE-RO dimension (Kob 1976b, 1985b, Kolb & Kolb 2005b). Kolb and Kolb reported that results from the KLSI 4.0 normative sample showed similar results (See Table 5).

Table 5

KLSI 4.0 Scores on AC-CE and AE-RO by Gender

Abstract – Concrete		Active - Reflective	
Male	Female	Male	Female
11.6	7	5.4	5.8

Note. From The Kolb Learning Style Inventory 4.0 Comprehensive Guide to the Theory, Psychometrics, Research on Validity, and Educational Applications (2013)

Kolb and Kolb cautioned that gender results needed to be interpreted carefully since educational specialization and career choice often interacted with gender differences making it difficult to determine how much variance in LSI scores can be attributed to gender alone and how much was a function of the person's educational background and career. Kolb and Kolb (2013) reported that results from the Kolb Learning Style Inventory online user normative sub-sample showed similar results to earlier research on the relationship between learning style and educational specialization.

Educational Level and Specialization

Research relating educational level to learning style in the LSI normative sample (Kolb 1976b) showed a linear relationship between the amount of education and abstractness. Data from the KLSI 4.0 normative sample showed the same linear relationship between abstractness and highest degree obtained (from elementary through graduate degrees). Differences among groups on the AE-RO dimension were smaller indicating relatively little influence of educational level on orientation toward action or reflection. Previous research with the LSI showed that student learning style distributions differed significantly by academic field (Kolb and Kolb, 2013). Kolb and Kolb reported that results from the KLSI 4.0 normative group showed similar results.

Culture

Kolb and Kolb (2013) reported that a number of comparative studies using KLSI found significant differences in the learning style preferences among the samples from different countries. Joy and Kolb (2009) examined the role that culture played in the way individuals learn using the KLSI 3.1. The study examined the relative influence of culture across 533 respondents born in and residing in seven nations.

Data Collection

Prospective participants were verbally briefed on the purpose of the survey and informed that all information obtained in connection with this study would remain anonymous. The contents of the IRB-approved Informed Consent Document (See Appendix A) were explained, and the prospective participants were given the opportunity to ask any questions they might have.

Students who elected to participate in the survey were asked to sign and return the Informed Consent Document and complete the demographic questionnaire. The Kolb Learning Style Inventory input sheet was explained, and participating students were asked to complete and return the Kolb Learning Style Inventory input sheet and the demographic questionnaire. The participants' self-reported information was entered by the researcher into the SPSS (Version 27) model that was utilized to aid in creating descriptive statistics, and the analysis of the data collected. Informed Consent Documents, demographic questionnaires, and Kolb Learning Style Inventory input sheets were stored in a manner that protected the anonymity of the information provided by the participants.

Data Analysis

To address the research questions for this study, data were analyzed using descriptive statistics. The Chi-Square test was used to compare observed results with expected results for the comparison of the study population demographics to the university's enrolled student population demographics. The enrolled student population demographics were treated as the expected results. Analysis of Variance (ANOVA) was used (when the dependent variables were continuous) as a procedure for determining whether the differences between the mean scores of various groups on a dependent variable were statistically significant.

Summary

This chapter described the purpose and design of the study. The sample data were collected and protected in compliance with the Institutional Review Board policies related to this study.

Analysis of the data collected are presented in Chapter IV.

CHAPTER IV
RESEARCH RESULTS

Introduction

This chapter presents the results from analyzing the data collected relative to the research questions. The demographic profile of the sample population and the information collected from the Kolb Learning Style Inventory (Version 3.2) is discussed. To aid in the analysis, the Statistical Program for Social Sciences (SPSS Version 27) software was used.

Purpose of the Study

The purpose of this study was to explore and compare the learning style profiles of college and university students involved in entrepreneurial activities while pursuing an academic degree at an R1-rated public university in the Southern region of the United States.

Research Questions

The study was designed to explore the following research questions:

1. What are the relationships among the learning style preferences of the entrepreneurial student population studied (as measured by the Kolb Learning Style Inventory Version 3.2) and the learning style preferences of the general population published in the Kolb Learning Style Inventory Technical Specifications documents, Versions 3.1, 3.2, and 4.0?

2. What are the relationships by gender identity among the learning styles of the entrepreneurial student population studied as measured by the Kolb Learning Style Inventory Version 3.2?

3. What are the relationships by ethnicity among the learning styles of the entrepreneurial student population studied as measured by the Kolb Learning Style Inventory Version 3.2?

4. How did the entrepreneurial student population studied compare by gender and ethnicity to the overall university enrollment by gender and ethnicity?

Analysis of Results

Descriptive Statistics and Chi Square Results for the Relationship of the Study Population by Gender and Ethnicity Compared to the University Enrollment by Gender and Ethnicity

Using the university enrollment by gender and ethnicity as the expected distribution for the study population by gender and ethnicity, Table 6 shows the relationship of the study population by gender and ethnicity to the overall student enrollment by gender and ethnicity.

Table 6

Comparison of the study population by ethnicity and gender to the overall student enrollment

		Gender				
	University Enrollment (2021)[a]			Study Population		
Ethnicity	Total	Male	Female	Total	Male	Female
Totals	31,526	15,681	15,845	209[b]	151	56
	100%	49.7%	50.3%	100%	72.2%	26.8%
White	27,755	13,896	13,859	176	128	46
	88.0%	88.6%	87.5%	84.2%	84.8%	82.1%
Black/African American	1,680	751	929	5	2	3
	5.3%	4.8%	5.9%	2.4%	1.3%	5.4%
Hispanic/Latino	1,211	593	618	4	3	1
	3.8%	3.8%	3.9%	1.9%	2.0%	1.8%
American Indian or Alaskan Native	82	41	41	1	0	1
	0.3%	0.3%	0.3%	0.5%	0%	1.8%
Asian or Pacific Islander	798	400	398	22	18	4
	2.5%	2.6%	2.5%	10.5%	11.9%	7.1%
Other	-	-	-	1	0	1
				.5%	0%	1.8%

a. University enrollment information was obtained from
https://auburn.edu/administration/ir/factbook/enrollment-demographics/total-enrollment/by-demographics.html
b. Two non-binary gender responses (.5%) were reported in the study population ($N = 209$). Both reported their ethnicity as white.

The comparison by gender and ethnicity of the university enrollment to the study

population, indicated that the percentage of Male students (72.2%, n = 151) and Female students

(26.8%, n = 56) involved in entrepreneurial activities differed from the percentage of Male

students (49.7%, n = 15,681) versus Female students (50.3%, n = 15,845) enrolled at the

university.

The percentage of Black or African American students, Hispanic or Latino students, and

American Indian or Alaskan Native students involved in entrepreneurial activities appeared to

differ from the percentage of Black or African American students, Hispanic or Latino students,

and American Indian or Alaskan Native students (both Male and Female) enrolled at the

university. Care should be exercised in drawing any conclusions since the number of participants

in these cells of the study were low ($N = 5$ or less) in the three categories (Black or African

American Students, Hispanic or Latino Students, and American Indian or Alaskan Native

Students).

The percentage of White students involved in entrepreneurial activities (84.2%) differed

from the percentage of White students enrolled at the university level (88.0%). The percentage of

Asian or Pacific Islander students involved in entrepreneurial activities (.5%) differed from the

percentage of Male and Female Asian or Pacific Islander students enrolled at the university level

(.3%).

The Chi-Square test was utilized to compare the study population by gender and ethnicity

to the university enrollment by gender and ethnicity to determine if any of the differences shown

in Table 6 were statistically significant.

The Chi-Square test result for gender identity indicated significant differences between

the study population and the student population enrolled at the university ($\chi^2_{2,209} = 231.771$).

Male study population students were over-represented (study population = 151, expected population = 104, *SR* = 47). Female students were under-represented (study population = 56, expected population = 105, *SR* = -49).

The Chi-Square test result for ethnicity indicated significant differences between the study population and the student population enrolled at the university ($\chi^2_{5,209}$ = 105.483). White students were under-represented (study population = 176, expected population = 184, *SR* = -8). Black or African American students were under-represented (study population = 5, expected population = 11.1, *SR* = -4). Hispanic or Latino students were under-represented (study population = 4, expected population = 8, *SR* -4), however, as mentioned earlier, and shown in Table 6, the sample size in these cells was less than five. The sample size for American Indian or Alaskan Native was also less than five (one student in the study population compared to an expected value of 0.5, *SR* = 0.5).

Asian or Pacific Islander students were significantly over-represented (study population = 22, expected population = 5.3, *SR* = 16.7).

One respondent in the study population (*N* = 209) reported ethnicity as Other, which was not a category in the university report on enrollment by ethnicity.

Descriptive Statistics for the Distribution of the Study Participants by Age

The distribution by age of the study population ranged from 19 years to 51 years, had a positive skew and deviated from normality with leptokurtic kurtosis (*N* = 208, Mean = 21.966, *SD* = 2.793, Skewness = 6.864, Kurtosis = 61.597).

Kolb and Kolb (2013) reported that previous research with the LSI showed a linear increase in preference for learning by abstraction (the AC-CE dimension) with age. The AE-RO dimension held relatively constant through the adult years.

Table 7 shows the frequency count by age of the study population.

Table 7

Frequency Count by Age of the Study Poplulation (N = 209)

Age	N	Percent
19	4	1.9
20	16	7.7
21	83	39.7
22	66	31.6
23	24	11.5
24	6	2.9
25	4	1.9
27	1	0.5
34	1	0.5
35	2	1.0
51	1	0.5
Missing	1	0.5

Figure 4 shows in bar chart format the distribution of the study participants by age.

Figure 4

Distribution of the Study Participants by Age
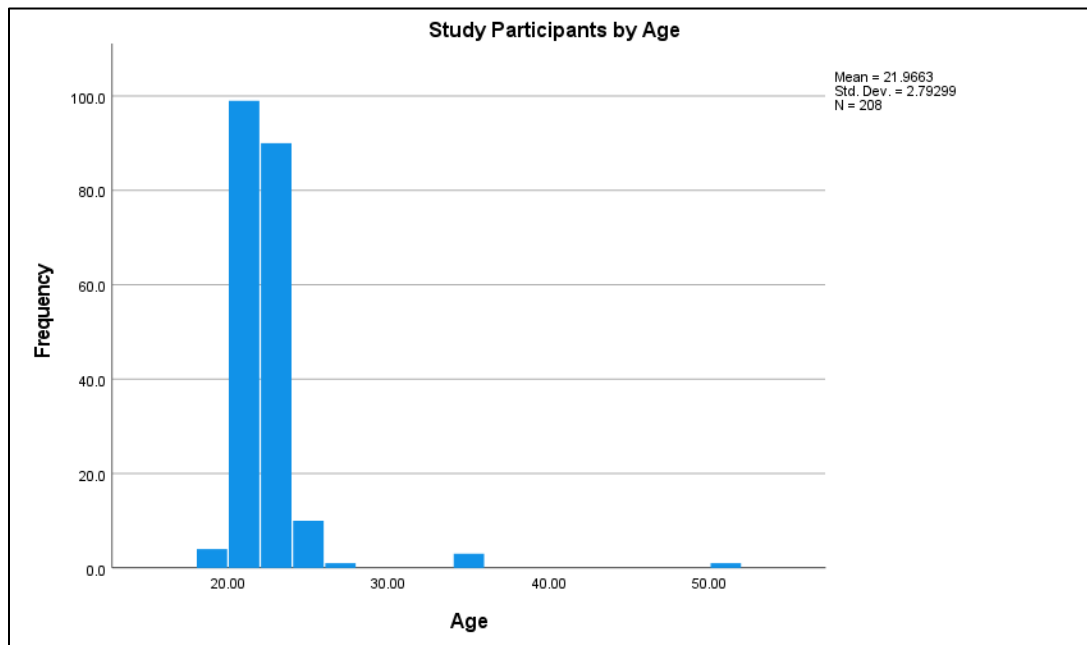
Descriptive Statistics for the Distribution of the Study Participants by Year of Study

The distribution by year-of-study of the study population ranged from sophomores to graduate students and had a negative skew and deviated from normality. Table 8 shows the distribution of the study population by year-of-study.

Table 8

Distribution of Study Participants by Year-of-Study

	N	Percent
First-Year	0	0
Sophomore	7	3.3
Junior	48	23.0
Senior	148	70.8
Graduate	6	2.9

Figure 5 shows in bar chart format the distribution of the study participants by year-of-study.

Figure 5

Distribution of Study Participants by Year-of-Study
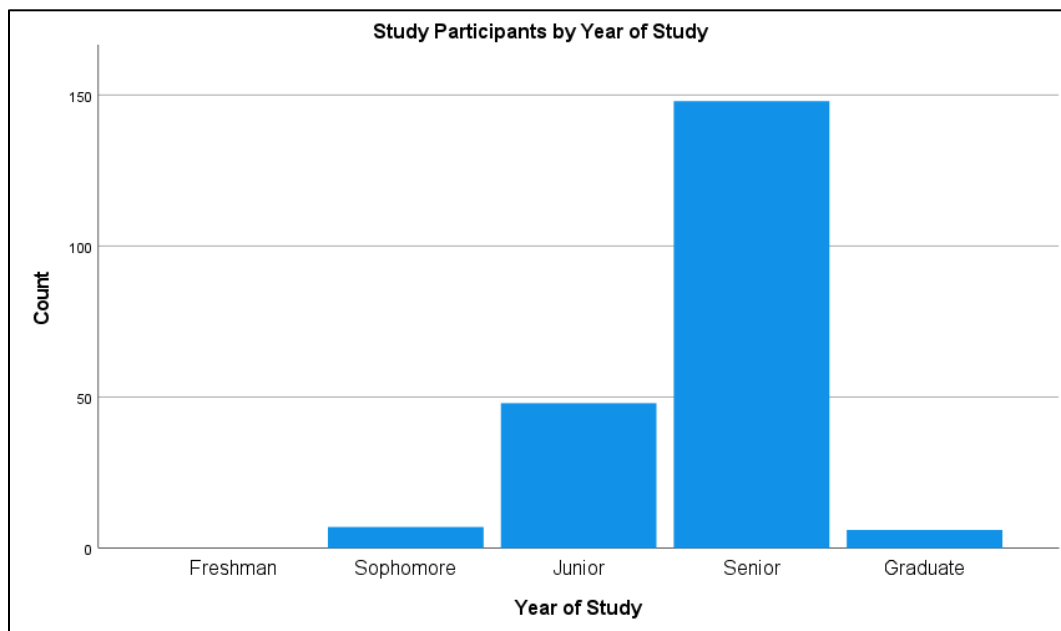
Descriptive Statistics for the Study Participants' Learning Style Preference

Table 9 shows the KLSI instrument cut-points which were used to determine the study

participant's learning style preferences, which were: Experiencing, Imagining, Reflecting,

Analyzing, Thinking, Deciding, Acting, Initiating, or Balancing.

Table 9

Cut-Points for Kolb Learning Style Types

IF	AND	LEARNING STYLE TYPE
$(AC - CE) < 6$	$(AE - RO) > 0$ and < 12	Experiencing
$(AC - CE) < 6$	$(AE - RO) < 1$	Imagining
$(AC - CE) > 5$ and < 15	$(AE - RO) < 1$	Reflecting
$(AC - CE) > 14$	$(AE - RO) < 1$	Analyzing
$(AC - CE) > 14$	$(AE - RO) > 0$ and < 12	Thinking
$(AC - CE) > 14$	$(AE - RO) > 11$	Deciding
$(AC - CE) > 5$ and < 15	$(AE - RO) > 11$	Acting
$(AC - CE) < 6$	$(AE - RO) > 11$	Initiating
$(AC - CE) > 5$ and < 15	$(AE - RO) > 0$ and < 12	Balancing

Note. Adapted from The Kolb Learning Style Inventory 4.0 Comprehensive Guide to the Theory,
Psycometrics, Research on Validity, and Educational Applications

Figure 6, which follows, shows the distribution of primary Kolb learning styles for the

study population.

Figure 6

Distribution of primary Kolb Learning Styles for the Study Population
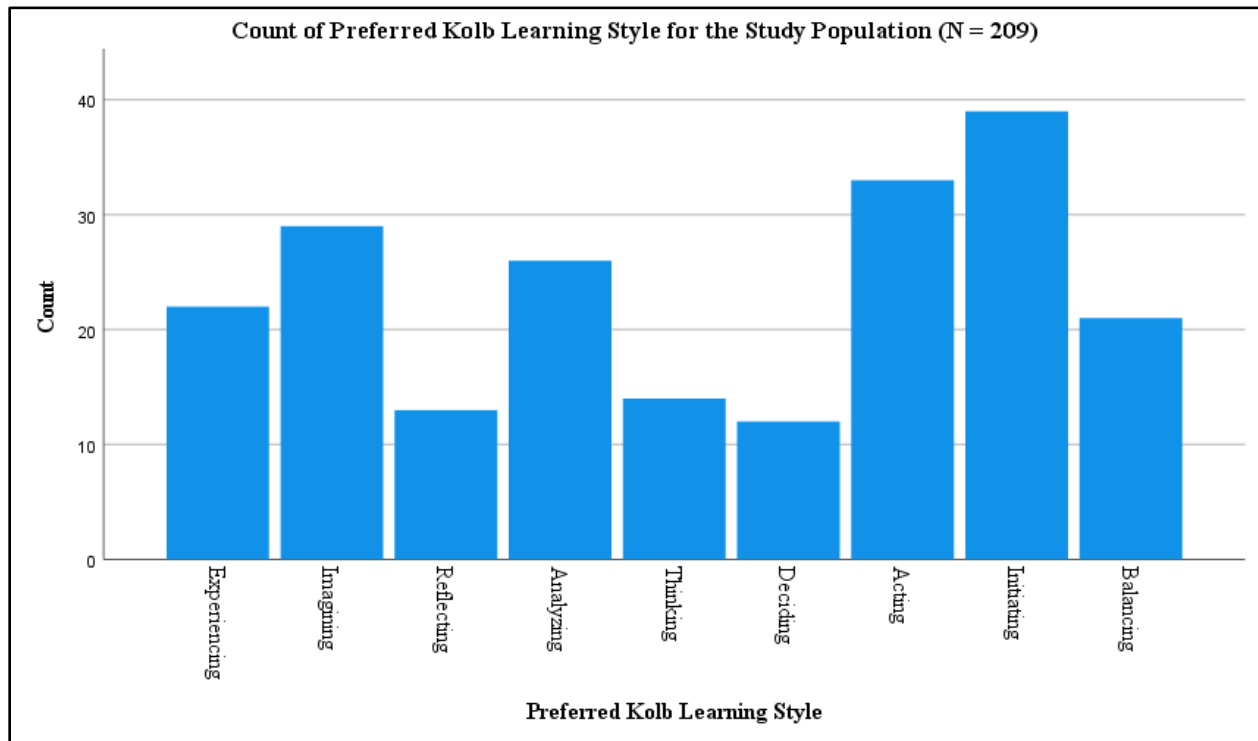
A visual inspection of the data indicated a bias toward action in the distribution of primary Kolb Learning Styles scores for the entrepreneurial study population with the initiating and acting styles having the highest counts. The lower counts for the deciding style and reflecting style, appeared to provide support to the suggestion that the study population had a bias toward action. Counts related to the imagining style and analyzing style were associated with students in the study population having a bias toward analytical thinking.

Figure 7, which follows, provides another view of the distribution of the primary learning styles of the study population, and supports the observation that the study population had a bias toward action.

Figure 7

Distribution of Primary Learning Styles of the Study Population (N = 209)

<div align="center">

**Concrete
Experience**

</div>

Initiating 18.7% $N = 39$	Experiencing 10.5% $N = 22$	Imagining 13.9% $N = 29$
Acting 15.8% $N = 33$	Balancing 10.0% $N = 21$	Reflecting 6.2% $N = 13$
Deciding 5.7% $N = 12$	Thinking 6.7% $N = 14$	Analyzing 12.4% $N = 26$

Active Experimentation (left) ... **Reflective Observation** (right)

<div align="center">

**Abstract
Conceptualization**

</div>

An analysis of the percentage distribution of the primary learning styles suggested a bias for action for the study population. The two learning styles with the highest percentage of student primary learning style responses were Initiating (18.7%) and Acting (15.8%).

Table 10, which follows, shows descriptive statistics for the study population KLSI Learning Style Inventory score categories.

Table 10

Descriptive Statistics for the Study Population KLSI Scores

	AC Score	CE Score	AC – CE Score	AE Score	RO Score	AE – RO Score
N Valid	209	209	209	209	209	209
N Missing	0	0	0	0	0	0
Mean	31.4498	24.6411	6.9330	34.6603	29.0861	5.7943
SE	.43547	.41292	.68165	.51734	.48516	.87871
Median	31	24	7	36	29	8
Mode	30	23	4[a]	38	30	18
SD	6.29550	5.96951	9.85449	7.47910	7.01388	12.70337
Variance	39.633	35.635	97.111	55.937	49.194	161.376
Skewness	0.31	.739	-.174	-.741	.204	-.508
SE	.168	.168	.168	.168	.168	.168
Kurtosis	.098	.588	.043	-.258	-.802	-.579
SE	.335	.335	.335	.335	.335	.335
Range	37	33	53	32	29	58
Minimum	10	12	-20	15	16	-27
Maximum	47	45	33	47	45	31
Sum	6573	5150	1449	7244	6079	1211

a. Multiple modes existed. The smallest value is shown

Comparison of Other KLSI Scores to the Research Study Population Scores

Table 11 shows a comparison of KLSI 3.1/3.2 scores (N = 6,799) and KLSI 4.0 scores (N = 10,423) compared to the study population KLSI scores (N = 209).

Table 11

Scores for Normative Groups

	N	CE	RO	AC	AE	AC-CE	AE-RO
KLSI 3.1 & 3.2	6,799						
Mean		25.39	28.19	32.22	34.14	6.83	5.96
SD		6.43	7.07	7.29	6.68	11.69	11.63
KLSI 4.0	10,423						
Mean.		19.84	26.22	28.99	31.84	9.16	5.62
SD		6.47	7.02	6.66	5.93	10.86	10.92
Study Population	209						
Mean		24.64	29.09	31.45	34.66	6.93	5.79
SD		5.97	7.01	6.30	7.48	9.85	12.70

Note. Sources of KLSI normative scores were from the KLSI Version 3.1 & 3.2 2013 Technical Specifications and the KLSI Version 4.0 2013 Comprehensive Guide

The study population (which used the KLSI 3.2 instrument) compared more closely to the KLSI 3.1&3.2 results than the study population compared with the KLSI 4.0 results. Since the KLSI 4.0 instrument only differed from the others by delivery method (online versus paper), it is possible that the differences resulted from differences in the characteristics of the populations surveyed.

Figure 8, which follows, shows a graphical representation of the normative scores for the three groups.

Figure 8

Scores for Normative Groups
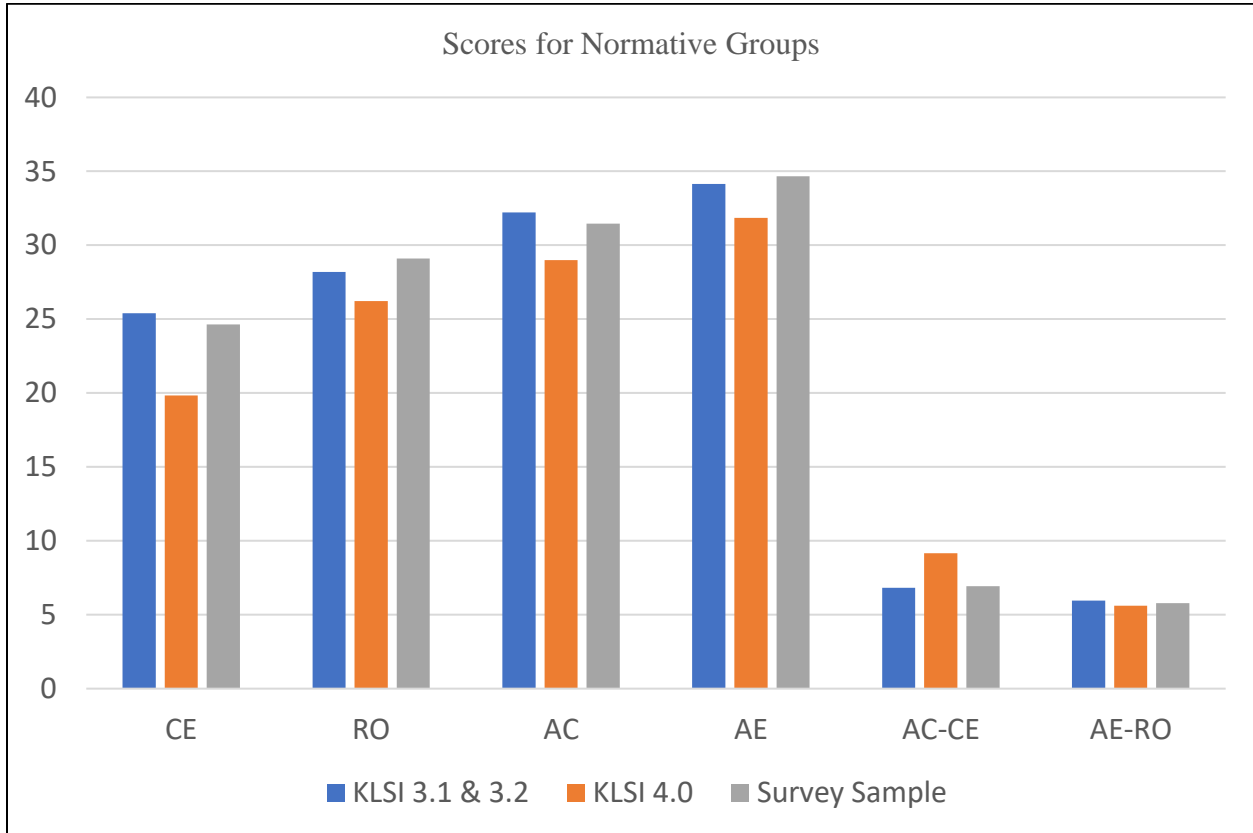
Table 12 shows the study population scores on AC-CE and AE-RO by gender.

Table 12 *Study Population Mean Scores on AC-CE and AE-RO by gender*

Abstract-Concrete Axis (AC-CE)			Active-Reflective Axis (AE-RO)		
Male	Female	Non-Binary	Male	Female	Non-Binary
7.7483	4.6071	10.5000	6.3377	4.5893	-1.5000
$SD = 9.426$	$SD = 10.729$	$SD = 10.606$	$SD = 12.690$	$SD = 12.371$	$SD = 27.577$
$N = 151$	$N = 56$	$N = 2$	$N = 151$	$N = 56$	$N = 2$

Using the full study sample (N=209), AC-CE and AE-RO scores by gender were analyzed for significance using the SPSS (Version 27) Multivariat General Linear model (Alpha = .05). The AC-CE differences by gender were not significant (Male-Female p = .103, Male-NonBinary p = .918, Female-NonBinary p = .681). The AE-RO differences by gender were not significant (Male-Female p = .654, Male-NonBinary p = .663, Female-NonBinary p = .784).

Figure 9 shows a graphical representation of the study sample mean scores on AC-CE and AE-RO by gender.

Figure 9

Study Population AC-CE and AE-RO Mean Scores by Gender
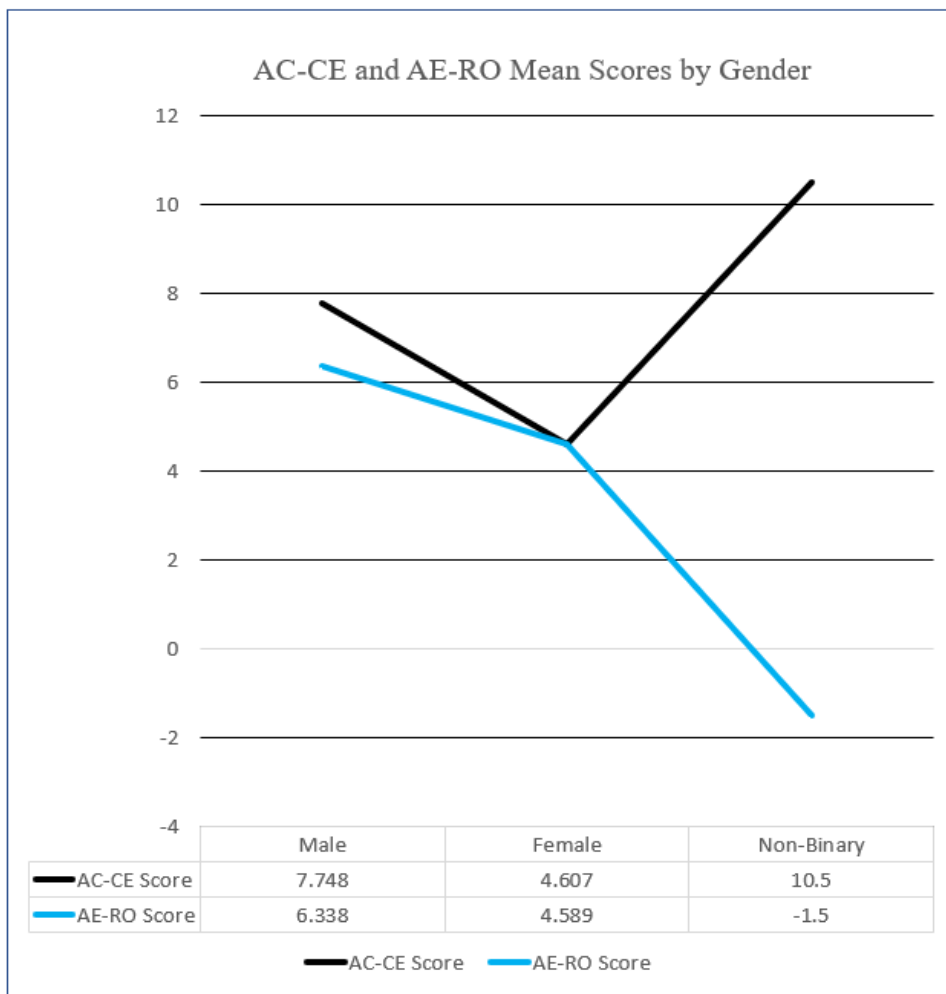
AC-CE and AE-RO Mean Scores by Gender

	Male	Female	Non-Binary
AC-CE Score	7.748	4.607	10.5
AE-RO Score	6.338	4.589	-1.5

Kolb and Kolb reported that research with previous LSI versions showed that Males were more abstract than Females on the AC-CE scale and that there were no significant gender differences on the AE-RO dimension (Kob 1976b, 1985b, Kolb & Kolb 2005b). Their studies only analyzed Male and Female responses. Non-binary gender was not included as a category. Because there were only two Non-binary responses in the study sample, the same analysis was performed with Male and Female responses with the two Non-Binary responses excluded (N = 207). The results were as follows: The AC-CE differences by gender were significant (Male-Female p = .042, $F_{1,207}$ = 4.203, Eta Squared = .020). The AE-RO differences by gender were not significant (Male-Female p = .376, $F_{1,207}$ = .786). With the two Non-Binary responses excluded (N = 207), the Male-Female results showed the same pattern as reported by Kolb and Kolb for Male and Female participants in their studies.

Table 13, which follows, shows the study sample scores on AC-CE and AE-RO by ethnicity.

Table 13

Study sample scores on AC-CE and AE-RO by ethnicity

Ethnicity	Abstract-Concrete (AC-CE)			Active-Reflective (AE-RO)		
	Mean	N	SD	Mean	N	SD
White	6.8580	176	9.85363	6.1875	176	12.79840
Black or African American	10.8000	5	5.26308	.80000	5	11.07700
Hispanic or Latino	.0000	4	14.76482	10.0000	4	22.81812
American Indian or Alaskan Native	5.0000	1	.	5.0000	1	.
Asian or Pacific Islander	8.1818	22	10.05052	2.8182	22	10.69774
Other	3.0000	1	.	11.0000	1	.

The study sample AC-CE and AE-RO scores by ethnicity were analyzed for significance using the SPSS (Version 27) descriptive statistics. ANOVA tests could not be performed for AC-CE and AE-RO by ethnicity because two groups had fewer than two cases. Those groups were American Indian or Alaskan Native *(*n = 1) and Other (n = 1). A visual inspection of the AC-CE and AE-RO scores by ethnicity (See Figure 10, which follows), indicated that differences in AC-CE and AE-RO scores existed across the six ethnic groups the participants self-reported themselves into. Figure 10, which follows, shows the study population AC-CE and AE-RO mean scores by ethnicity.

Figure 10

Study Population AC-CE and AE-RO Mean Scores by Ethnicity

Study Population AC-CE and AE-RO Mean Scores by Ethnicity

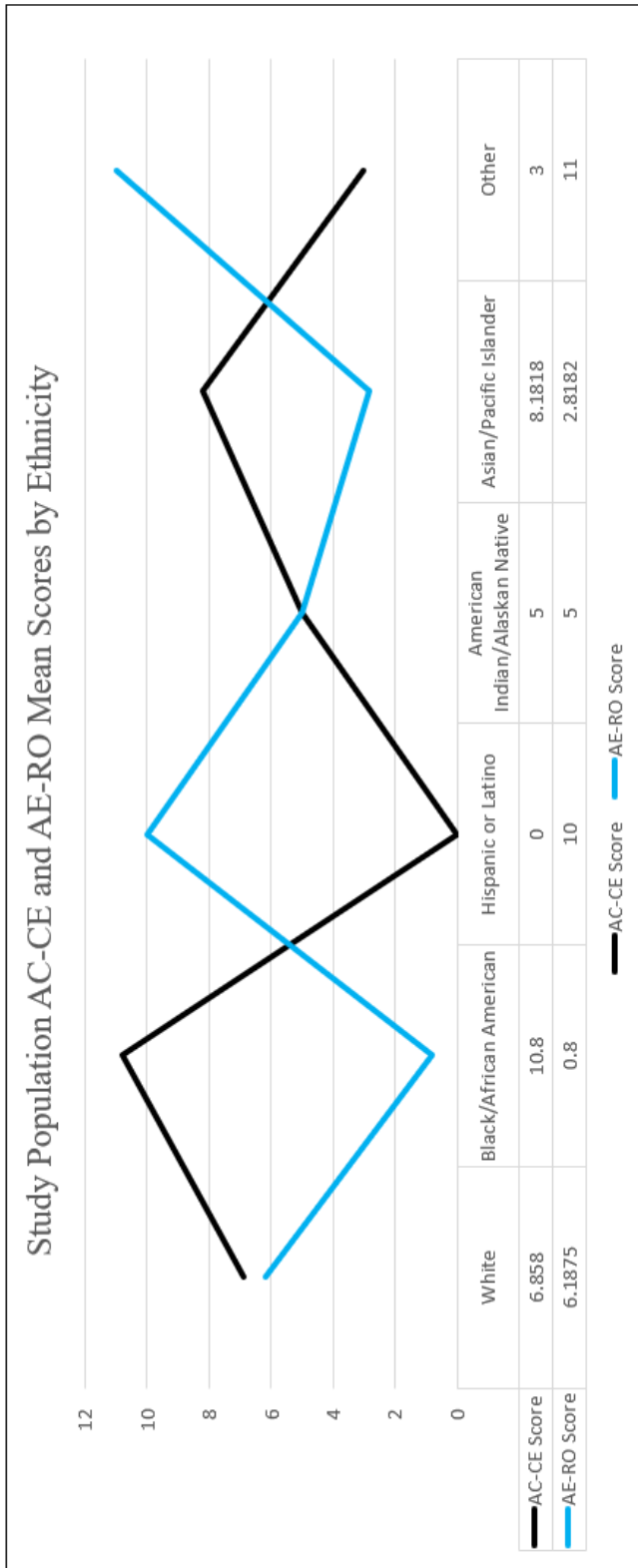|	White	Black/African American	Hispanic or Latino	American Indian/Alaskan Native	Asian/Pacific Islander	Other
AC-CE Score	6.858	10.8	0	5	8.1818	3
AE-RO Score	6.1875	0.8	10	5	2.8182	11

Table 14 shows the study population primary learning style count by gender and ethnicity.

Table 14

Study Population Count of Primary Learning Styles by Gender and Ethnicity

N = 209	White	Black/African American	Hispanic/ Latino	American Indian/Alaskan Native	Asian/Pacific Islander	Other
Experiencing						
Male	7	1	0	0	4	0
Female	9	0	0	0	0	1
Imagining						
Male	15	0	1	0	3	0
Female	7	0	0	0	2	0
Non-Binary	1					
Reflecting						
Male	12	0	0	0	0	0
Female	1	0	0	0	0	0
Analyzing						
Male	16	0	0	0	3	0
Female	6	1	0	0	0	0
Thinking						
Male	8	0	0	0	3	0
Female	2	0	0	0	1	0
Deciding						
Male	10	0	0	0	0	0
Female	0	0	1	0	0	0
Non-Binary	1					
Acting						
Male	21	0	0	0	2	0
Female	10	0	0	0	0	0
Initiating						
Male	28	0	2	0	2	0
Female	6	0	0	1	0	0
Balancing						
Male	11	1	0	0	1	0
Female	5	2	0	0	1	0

Figure 11, which follows, shows the study population primary learning style by gender.

Figure 11

Study Population Primary Learning Style by Gender
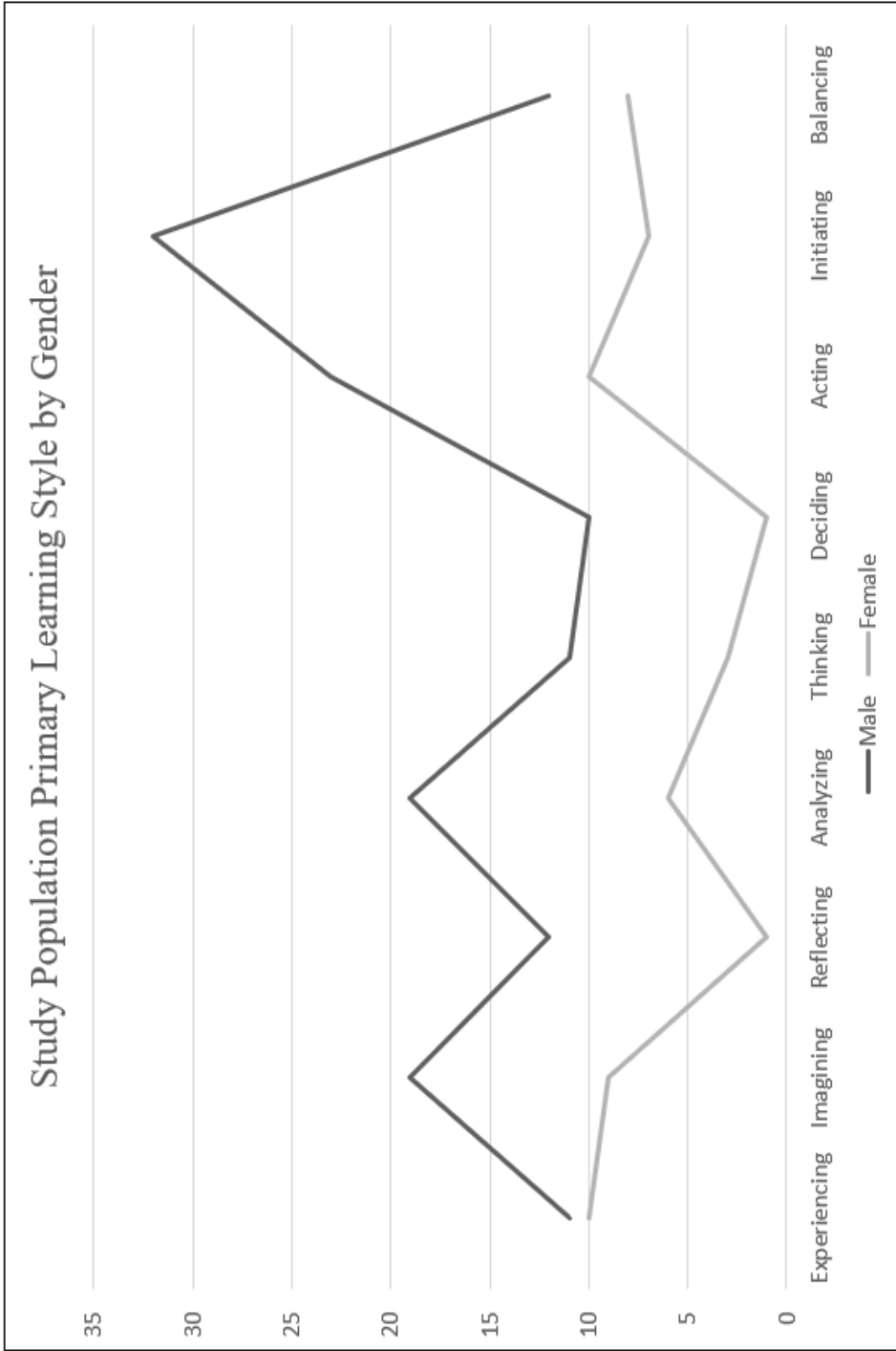
The SPSS (Version27) Univariate General Linear Model was used to analyze the study population primary learning styles by gender and ethnicity (Alpha = .05). Post hoc tests could not be performed for primary learning style by gender and ethnicity because two groups had fewer than two cases. Those groups were American Indian or Alaskan Native (n = 1) and Other (n = 1). Pairwise comparisons did not identify any significant differences between groups.

A visual inspection of Figure 11 suggested that Male and Female responses were closest for the Experiencing and Balancing learning styles. Their responses differed the most for the Initiating learning style. The plots of the other learning styles were similar in shape.

Summary

Faculty and staff at the university studied who interact with college and university students involved in entrepreneurial activities can expect the primary learning styles of the students to span the full range of the nine Kolb learning styles. They can also expect the students to have a slight bias toward action. Faculty and staff can expect Males to be more abstract than Females on the Kolb AC-CE scale and to see no significant gender difference on the Kolb AE-RO dimension. Faculty and staff can also expect Male students to outnumber Female students by a three to one ratio.

Compared to the enrolled population at the university studied, the sample population of student entrepreneurs had fewer Female students.

Faculty and staff can expect the six ethnic groups to be represented, but the majority of the students to be White, followed by Asian or Pacific Islanders, followed by Black or African American students.

The mean age of the study population was 22 and the majority of the study population were fourth-year students (70.8%). The next larger group were third-year students (23.3%).

The learning styles of the students involved in entrepreneurial activities at the university studied differed somewhat from the learning styles of the larger and more diverse populations studied by Kolb and Kolb but not in a material fashion.

Chapter V, which follows, discusses findings, conclusions and recommendations.

CHAPTER V

DISCUSSION OF FINDINGS AND CONCLUSIONS

Introduction

This study explored the learning styles of a sample population of students attending a land-grant university in the Southern region of the United States who were participating in entrepreneurial activities in parallel with their pursuit of an undergraduate or graduate degree. Research supports the theory that we all learn in different ways and that the acquisition of knowledge by students can be enhanced when they are taught with an understanding of their learning styles. Learning styles research provides a mechanism for educators to explore the ways in which students learn. The findings of this study present information which may be helpful in improving entrepreneurial education and learning for both educators and students at the university where the study was conducted. The results of the study may also encourage entrepreneurship faculty at colleges and universities in other geographic regions to undertake studies to explore the learning styles of the types of entrepreneurial-minded students who study at their institutions.

Chapter I introduced the study. Chapter II reviewed the related literature, Chapter III presented the method for the study, and the results were presented in Chapter IV. This Chapter V will offer a summary of the study. Conclusions and recommendations for future research will also be presented.

Purpose of the Study

The purpose of this study was to explore and compare the learning style profiles of sample population of university students engaged in entrepreneurial activities while pursuing an academic degree at a public university in the Southern region of the United States.

Research Questions

The study was designed to explore the following research questions:

1. What are the relationships among the learning style preferences of the entrepreneurial student population studied (as measured by the Kolb Learning Style Inventory Version 3.2) and the learning style preferences of the general population published in the Kolb Learning Style Inventory Technical Specifications documents, Versions 3.1, 3.2, and 4.0?

2. What are the relationships by gender identity among the learning styles of the entrepreneurial student population studied as measured by the Kolb Learning Style Inventory Version 3.2?

3. What are the relationships by ethnicity among the learning styles of the entrepreneurial student population studied as measured by the Kolb Learning Style Inventory Version 3.2?

4. How did the entrepreneurial student population studied compare by gender and ethnicity to the overall university enrollment by gender and ethnicity?

Discussion

Research Question 1

What are the relationships among the learning style preferences of the entrepreneurial student population studied (as measured by the Kolb Learning Style Inventory Version 3.2) and

the learning style preferences of the general population published in the Kolb Learning Style Inventory Technical Specifications documents, Versions 3.1, 3.2, and 4.0?

Kolb and Kolb observed that research with previous KLSI versions showed that males were more abstract than females on the AC-CE scale and that there were no significant gender differences on the AE-RO dimension (Kob 1976b, 1985b, Kolb & Kolb 2005b, 2013). They reported that results from the KLSI 4.0 normative sample showed similar results. Kolb and Kolb cautioned that gender results needed to be interpreted carefully since educational specialization and career choice could interact with gender differences making it difficult to determine how much variance in LSI scores could be attributed to gender alone and how much was a function of the person's educational background and career.

The study population also showed a pattern where males were more abstract (thinking) than females (experiencing) on the Abstract-Concrete scale. Males were more biased toward action than females on the Active-Reflective scale. With a study sample size of only two non-binary responses, the non-binary respondents were more abstract on the Abstract-Concrete scale than the male and female respondents and more reflective on the Active-Reflective scale than the male and female respondents. Care should be taken in interpreting those results due to the small number of participants who self-reported their gender as non-binary. Educational background and career were not part of the research study since the population studied were university students who had not yet graduated or entered a career field. It is plausible that Kolb and Kolb's caution that gender results need to be interpreted carefully applies to this study as well. Other factors, not included in the study, such as socio-economic background, may also interact with gender.
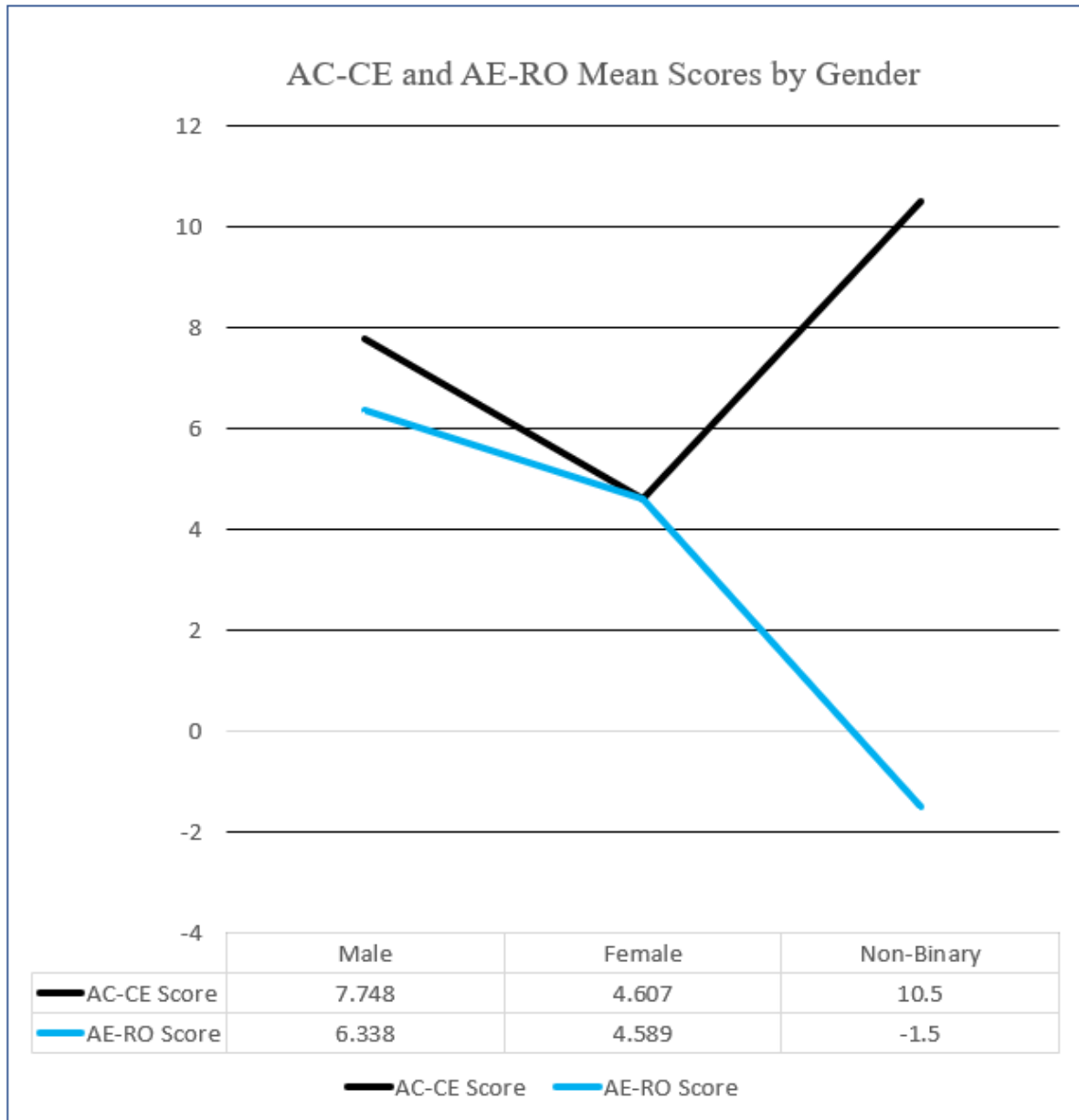
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Research Question 2

What are the relationships by gender identity among the learning styles of the entrepreneurial student population studied as measured by the Kolb Learning Style Inventory Version 3.2?

Using the full study sample (N=209), AC-CE and AE-RO scores by gender were analyzed for significance. The AC-CE differences by gender were not significant (Male-Female $p = .103$, Male-NonBinary $p = .918$, Female-NonBinary $p = .681$). The AE-RO differences by gender were not significant (Male-Female $p = .654$, Male-NonBinary $p = .663$, Female-NonBinary $p = .784$). Figure 9, which follows, provides a graphical representation.

Figure 9

Study Population AC-CE and AE-RO Mean Scores by Gender

AC-CE and AE-RO Mean Scores by Gender

	Male	Female	Non-Binary
AC-CE Score	7.748	4.607	10.5
AE-RO Score	6.338	4.589	-1.5

AC-CE Score   AE-RO Score

Because there were only two Non-Binary responses in the study sample, the same analysis was performed with Male and Female responses without the two Non-Binary responses ($N = 207$). The results showed that the AC-CE differences by gender were significant (Male-

Female $p = .042$, $F_{1,207} = 4.203$). The AE-RO differences by gender were not significant (Male-Female $p = .376$, $F_{1,207} = .786$). With the two Non-Binary responses excluded ($N = 207$), the results showed the same pattern as reported by Kolb and Kolb for male and female participants in their studies.
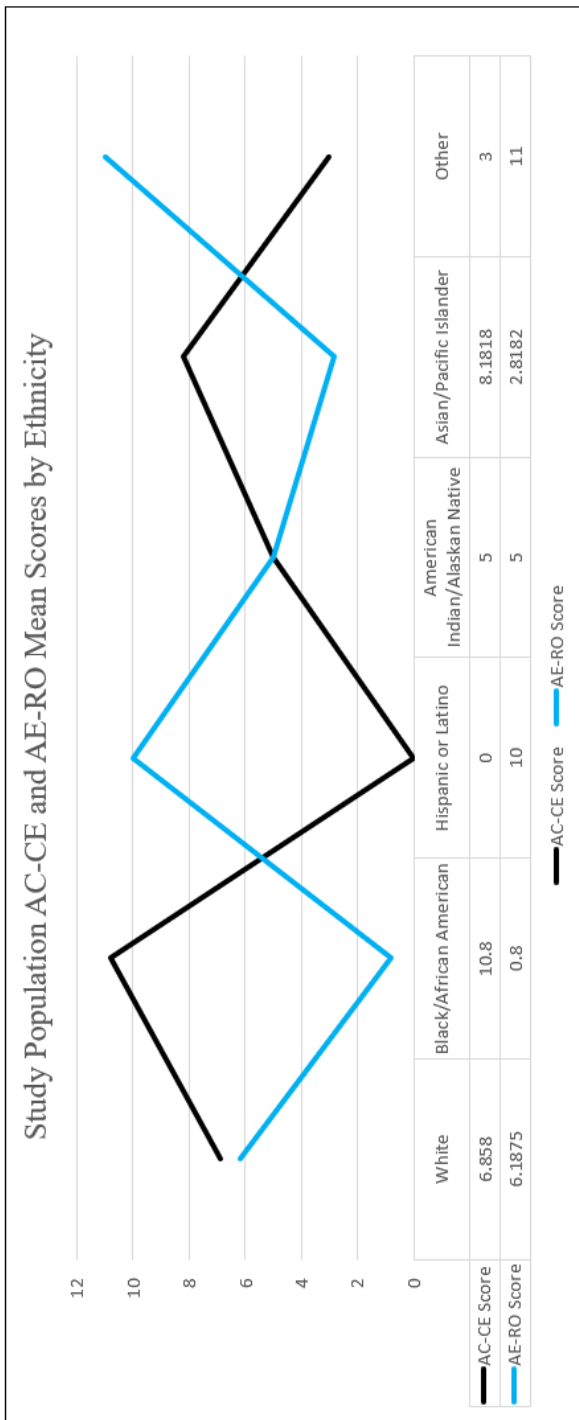
Research Question 3

What are the relationships by ethnicity among the learning styles of the entrepreneurial student population studied as measured by the Kolb Learning Style Inventory Version 3.2?

The study sample AC-CE and AE-RO scores by ethnicity were analyzed for significance using the SPSS (Version 27) descriptive statistics. ANOVA tests could not be performed for AC-CE and AE-RO by ethnicity because two groups had fewer than two cases. Those groups were American Indian or Alaskan Native $(n = 1)$ and Other (n = 1).

A visual inspection of the AC-CE and AE-RO scores by ethnicity indicated that differences in AC-CE and AE-RO scores existed across the six ethnic groups which the participants self-reported. See Figure 10, which follows, for a graphical representation.

Figure 10

Study Population AC-CE and AE-RO Mean Scores by Ethnicity

Study Population AC-CE and AE-RO Mean Scores by Ethnicity

	White	Black/African American	Hispanic or Latino	American Indian/Alaskan Native	Asian/Pacific Islander	Other
AC-CE Score	6.858	10.8	0	5	8.1818	3
AE-RO Score	6.1875	0.8	10	5	2.8182	11

AC-CE Score AE-RO Score

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Research Question 4

How did the entrepreneurial student population studied compare by gender and ethnicity to the overall student enrollment by gender and ethnicity?

The Chi-Square test result for gender identity indicated significant differences between the study population and the student population enrolled at the university ($\chi^2_{2,209} = 231.771$). Male study population students were over-represented (study population = 151, expected population = 104). Female students were significantly under-represented (study population = 56, expected population = 105). During the period the research study was conducted, the university studied did not publish information on non-binary student enrollment. As a result, it was not possible to compare the study Non-Binary population to the Non-Binary student enrollment at the university.

The Chi-Square test result for ethnicity indicated significant differences between the study population and the student population enrolled at the university ($\chi^2_{5,209} = 105.483$). White students were under-represented (study population = 176, expected population = 184). Black or African American students were significantly under-represented (study population = 5, expected population = 11.1). Hispanic or Latino students were under-represented (study population = 4, expected population = 8), however, the sample size was less than five. The sample size for American Indian or Alaskan Native was also less than five (one student in the study population compared to an expected population of .5). Asian or Pacific Islander students were significantly over-represented (study population = 22, expected population = 5.3). Note, one respondent in the study population of 209 reported ethnicity as Other, which was not a category in the university report on enrollment by ethnicity.

Observations

An analysis of the data suggested that two initiatives should be considered if the university's entrepreneurship faculty and staff wish to align the demographics for students involved in entrepreneurial activities more closely with the demographics for the overall student population enrolled at the university.

First, a program focused on increasing the number of female students engaged in entrepreneurial activities is suggested for consideration. The World Economic Forum (2022) reported that women represented 49% of new businesses in the U.S. in 2021, up from 28% in 2019, yet the percentage of female students involved in entrepreneurial activities at the university studied was only 26.8%. There may be societal value for the university studied to strive for parity between the percentage of male and female students involved in entrepreneurial activities.

Second, programs focused on increasing the number of students of color engaged in entrepreneurial activities is suggested for consideration by the university studied. Fetsch (2016) writing for the Kauffman Foundation discussed the need to include people of color in the promise of entrepreneurship. Fetsch observed that the continued disparity in entrepreneurship among people of color required understanding of the unique challenges people of color face and the need for private and public sectors to broaden their entrepreneurial activities. The university studied already has programs in place to focus on improving diversity and inclusion in its student population. Broadening that focus to encourage students of color to participate in entrepreneurial activities is suggested for consideration.

Implications

College and university students involved in entrepreneurial activities participate in a broad range of educational activities. These activities include academic coursework,

experiential learning projects, communications skills training, coaching, mentoring, and business idea competitions. Failure to adequately understand the learning styles of student entrepreneurs by educators, and other parties involved in the learning process may result in missed opportunities to enhance effectiveness and efficiency in entrepreneurial education and learning in colleges and universities. Because of the potential impact entrepreneurial-minded students can have on society after graduation, improving their learning experience becomes a desirable educational outcome.

Summary

This study was an effort to explore the learning styles of students engaged in entrepreneurial activities while pursuing an academic degree at a land grant university located in the Southern region of the United States. The goal of the study was to present information that might be helpful in improving entrepreneurial education and learning for both educators and students at the university where the study was conducted.

Over a broad span of years, new business starts have been viewed by researchers, business professionals, as well as U.S., state, and local governments as playing an important role in the United States economy. United States Census Bureau data for the period 2012 through 2021 show a continuing and growing number of new business venture formations. New business formations are generally viewed as one measure of economic growth and job creation in the United States. The U.S. Census Bureau reported 4.4 million applications to start new businesses filed in 2020, a 24 percent increase over the previous year. Growth continued in 2021 with a 23 percent increase and 5.4 million new business application filings.

In addition to innovation from the formation of new business ventures (startups), Boyles (2022) discussed how established companies in today's competitive environment also rely

heavily on innovation and entrepreneurial thinking. Boyles pointed out the need for business leaders to constantly look for new ways to be creative and foster unique and novel ideas.

Innovative solutions developed by entrepreneurial-minded women and men in startups and established companies have been regarded for decades as an instrumental contributor to driving economic growth and societal change.

Moussa (2014) suggested that understanding the various learning techniques (learning styles) preferred by students would allow educators to enhance teaching and the overall learning process. Kuratko (2005, p. 577) stated that "Entrepreneurship has emerged over the past two decades as arguably the most potent economic force the world has ever experienced. With that expansion has come a similar increase in the field of entrepreneurship education." Aldrich and Ruef (2018), wrote on the importance of a scholarly focus on business starts and the aspects of new business ventures. Focusing on the belief that universities are expected to contribute to entrepreneurial research, teaching, and transfer of technology, Laukkanen (2000) explored alternative strategies in university-based entrepreneurial education by conceptualizing the university as a regional evolution mechanism.

Recommendations

Two hundred nine students from an estimated population of 350 entrepreneurial-minded students participated in the research study. Conducting a new study with a larger number of participants and a more extensive set of demographic questions might provide information which would allow for deeper analysis of the interaction of gender, ethnicity, family background, culture, and socio-economic background among entrepreneurial-minded students enrolled at the university studied.

As mentioned earlier, a program focused on increasing the number of female students engaged in entrepreneurial activities is suggested for consideration. The World Economic Forum (2022) reported that women represented 49% of new businesses in the U.S. in 2021, up from 28% in 2019, yet females only represented 26.8% of the students involved in entrepreneurial activities at the university studied. There may be societal value for the university studied to strive for parity between the percentage of male and female students involved in entrepreneurial activities.

As mentioned earlier, a set of programs focused on increasing the number of students of color engaged in entrepreneurial activities is suggested for consideration by the university studied. Fetsch (2016) writing for the Kauffman Foundation discussed the need to include people of color in the promise of entrepreneurship. Fetsch observed that the continued disparity in entrepreneurship among people of color required understanding of the unique challenges people of color face and the need for private and public sectors to broaden their entrepreneurial activities. The university studied already had programs in place to focus on improving diversity and inclusion in its student population. Broadening that focus to encourage students of color to participate in entrepreneurial activities is suggested for consideration.

At the time this study was being conducted, there were a number of events in the business news related to CEO convictions for illegal behavior and investigations into potentially illegal behavior by the founders of a number of new business ventures – Theranos and cryptocurrency startup FTX serve as two examples. In addition to considering the recommendations listed above, entrepreneurship faculty and staff may wish to discuss how ethics and ethical behavior in entrepreneurial activities is addressed in the entrepreneurship curriculum at the university studied.

A final recommendation is to consider conducting research to study the teaching styles of faculty, staff, mentors, and coaches who participate in entrepreneurial activities at the university studied with the goal of improving the effectiveness of entrepreneurial education and experiential learning programs.

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APPENDICES

INFORMED CONSENT FOR A RESEARCH STUDY ENTITLED
EXPLORING THE LEARNING STYLE PROFILES OF UNIVERSITY STUDENTS
INVOLVED IN ENTREPRENEURIAL ACTIVITIES

You are invited to participate in a research study to explore the learning style profile of university students involved in entrepreneurial activities while pursuing an academic degree. The information you provide may be helpful in improving entrepreneurial education and learning for both educators and students. The study is being conducted by Lucian Bifano, Director, Entrepreneurship Strategy, Harbert College of Business under the direction of Dr. James Witte, Professor and Department Chair, Department of Aviation, College of Liberal Arts.

You were selected as a possible participant because you are an Auburn University student enrolled in entrepreneurship courses, a participant in the Auburn University Halloween Pitch Competition, a participant in the Auburn University Tiger Cage Business Idea Competition, a participant in the Auburn University Summer Accelerator Program, or a participant in the Auburn University New Venture Accelerator Program and are age 19 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to sign and return this consent form and complete a learning styles survey created by Dr. David Kolb and Dr. Alice Kolb. Your total time commitment will be approximately 30 minutes or less.

Are there any risks or discomforts? The probability and magnitude of any discomforts anticipated with participation in this research study is no greater than those ordinarily encountered in daily life or during the completion of routine surveys.

Are there any benefits to yourself or others? No incentives or benefits are being offered or will exist for your participation in this survey. The information you provide may be helpful in improving entrepreneurial education and learning for both educators and students.

Will you receive compensation for participating? Other than our thanks and appreciation for your participation in this research study, no compensation or benefits are being offered.

Will there be any costs? You will not incur any costs for participating in this research study.

What if I change my mind about participating? If you change your mind about participating, do not complete the survey. Your participation is completely voluntary. Once submitted, your data is not identifiable. Your decision about whether or not to participate, or to stop participating, will not jeopardize your future relations with Auburn University or any of its colleges, schools, or departments.
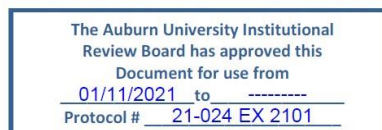
Participants Initials: _____

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Your privacy will be protected. All information obtained in connection with this study will remain anonymous. Information obtained through your participation may be used to fulfill an educational requirement, published in a professional journal, or presented at professional meetings. Albeit an unlikely possibility, there is always a potential risk of loss of confidentiality.

If you have any questions about this study, please ask them now or contact Lucian Bifano at ljb0022@auburn.edu. A copy of this document will be given to you to keep.

If you have any questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

Participant's Signature Date	Investigator Obtaining Consent Date
	Lucian Bifano
Printed Name	Printed Name

Version 1.0 - 02/08/2021

Appendix B – Demographic Questionnaire

The purpose of this study is to explore the learning style profiles of Auburn University students involved in entrepreneurial activities. The findings of the study may present information that will be helpful in improving entrepreneurial education and learning for both educators and students. The study may also add to the body of scholarly research related to the learning styles of college and university students involved in entrepreneurial activities. **Survey data will not directly or indirectly identify participants.**

Demographic Information:

Age in years: ⬚

Gender: Male ⬚ Female ⬚ Non-Binary ⬚

Ethnicity:

White ⬚ Black or African American ⬚ Hispanic or Latino ⬚

American Indian or Alaskan Native ⬚ Asian or Pacific Islander ⬚ Other ⬚

Field of Study:

Declared Major ⬚

Minor (if any) ⬚

Year of Study:

Freshman ⬚ Sophomore ⬚ Junior ⬚ Senior ⬚ Graduate ⬚

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Appendix C – Source for Copies of the Kolb Learning Style Inventory

Kolb Learning Style Inventory Workbook Version 3.2 – 12/2019
© Korn Ferry 2007-2019 and David A. Kolb, Experience Based Learning Systems, Inc.

Source: Korn Ferry

Phone Numbers: 800-633-4410 or 310-226-6352

URLs:

https://www.kornferry.com/contact

https://infokf.kornferry.com/US-PS-Talent-NUR-2015-12-Catalog-lead-nurtures-N-America-LANG-EN-X1Y3_CATALOG_US_LTSITE_LP_LSI32.html

Appendix D - Institutional Review Board (IRB) Approval

From: IRB Administration <irbadmin@auburn.edu>
Sent: Thursday, February 18, 2021 8:48 AM
To: Lucian Bifano <ljb0022@auburn.edu>
Cc: James Witte <witteje@auburn.edu>

Subject: Bifano Approval, Exempt Protocol #21-024 EX 2101, "Exploring the learning style profiles of University students involved in entrepreneurial activities"

Use IRBsubmit@auburn.edu for protocol related submissions and IRBadmin@auburn.edu for questions and information.
The IRB only accepts forms posted at
https://cws.auburn.edu/vpr/compliance/humansubjects/?Forms and submitted electronically.

Dear Lucian,

Your protocol entitled " Exploring the learning style profiles of University students involved in entrepreneurial activities" has been approved by the IRB as "Exempt" under federal regulation 45 CFR 46.101(b) (1,2). Attached is your approved protocol.

Official notice:
This e-mail serves as official notice that your protocol has been approved. By accepting this approval, you also accept your responsibilities associated with this approval. Details of your responsibilities are attached. Please print and retain.

Consent documents:
Attached is a copy of your consent form. You must provide a copy for each participant to keep.

Expiration:
Continuing review of this Exempt protocol is not required; however, all modification/revisions to the approved protocol must be reviewed and approved by the IRB.

When you have completed all research activities, have no plans to collect additional data and have destroyed all identifiable information as approved by the IRB, please notify this office via e-mail. A final report is no longer required for Exempt protocols.

Best wishes for success with your research!

IRB Administration
Office of Research Compliance
115 Ramsay Hall
Auburn University
334-844-5966

READ, PRINT, AND RETAIN THIS DOCUMENT

The Auburn University Institutional Review Board
Office of Research Compliance – Human Subjects
307 Samford Hall
334-844-5966, fax 334-844-4391, hsubjec@auburn.edu

Investigators: By accepting this IRB approval for this protocol, you agree to the following:

1. No participants may be recruited or involved in any study procedure prior to the IRB approval date or after the expiration date. (PIs and sponsors are responsible for initiating Continuing Review proceedings via a renewal request or submission of a final report.)

2. *All protocol modifications* will be approved in advance by submitting a modification request to the IRB unless they are intended to reduce immediate risk. Modifications that must be approved include adding/changing sites for data collection, adding key personnel, and altering any method of participant recruitment or data collection. Any change in your research purpose or research objectives should also be approved and noted in your IRB file. The use of any unauthorized procedures may result in notification to your sponsoring agency, suspension of your study, and/or destruction of data.

3. *Adverse events or unexpected problems* involving participants will be *reported within 5 days* to the IRB.

4. A *renewal* request, if needed, will be submitted three to four weeks before your protocol expires.

5. A *final report* will be submitted when you complete your study, and before expiration. Failure to submit your final report may result in delays in review and approval of subsequent protocols.

6. *Expiration* – If the protocol expires without contacting the IRB, the protocol will be administratively closed. The project will be *suspended* and you will need to submit a new protocol to resume your research.

7. *Only the stamped, IRB-approved consent document or information letter will be used* when consenting participants. Signed consent forms will be retained at least three years after completion of the study. Copies of consents without participant signatures and information letters will be kept to submit with the final report.

8. You will not receive a formal approval letter unless you request one. *The e-mailed notification of approval to which this is attached serves as official notice*.

All forms can be found at http://www.auburn.edu/research/vpr/ohs/protocol.htm