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An Examination into the Learning Pattern Preferences of Students in Special Education

Jaime Lynn Thone

AN EXAMINATION INTO THE LEARNING PATTERN PREFERENCES OF

STUDENTS IN SPECIAL EDUCATION

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Jaime L. Thone

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Presented by:

Jaime L. Thone
B.S. Psychology and Philosophy, Allegheny College, 2000
M.S.Ed. School Psychology, Duquesne University, 2001

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OF STUDENTS IN SPECIAL EDUCATION

Approved by:

____, Chair
Jeffrey A. Miller, Ph.D., ABPP
Professor and Associate Provost/
Associate Academic Vice President
Duquesne University

____, Member
Tammy L. Hughes, Ph.D.
Fr. Martin A. Hehir Endowed Chair for Scholarly Excellence
Professor/Chair
Department of Counseling, Psychology & Special Education
Duquesne University

____, Member
Elizabeth McCallum, Ph.D.
Associate Professor
Department of Counseling, Psychology & Special Education
Duquesne University

ABSTRACT

AN EXAMINATION INTO THE LEARNING PATTERN PREFERENCES OF STUDENTS IN SPECIAL EDUCATION

By

Jaime L. Thone

May 2013

Dissertation supervised by Jeffrey A. Miller, Ph.D., ABPP

As educational professionals strive to help students become efficient and effective learners, they must assist in the development of student learning strategies and a greater understanding of the learning process. The purpose of this study was to analyze and compare the learning pattern preferences of middle and high school students in general education and special education settings. The results of this study were intended to help guide teachers and other education professionals to make informed decisions about differentiating instruction in a way to reach more, if not all, students in their classroom. The results could furthermore assist educators in fostering greater self-knowledge and self-advocacy in students, which then can assist them to become active participants of their own learning experiences. Archival data was examined using scores of middle and high school students on the Learning Connections Inventory (LCI), the survey associated

with the Let Me Learn Process®. 251 students LCI scores were studied on the basis of grade level and special education classification.

Research questions utilized one-way MANOVA's in order to determine preference for particular individual patterns on the LCI. The first set of research questions compared students in special education and students in general education. The second set of questions compared students in special education broken down by classification, specifically, Other Health Impairment and Specific Learning Disability. Analyses revealed preference for certain LCI patterns between the groups examined. This study was intended to be a starting point for the analysis of the learning patterns of special education students. Once pattern preferences and the interactions between preferences are identified, and the utility of the Let Me Learn Process® is examined, a greater understanding of learning will occur in combination with the development of self-advocacy skills in the classroom. Overall, the Let Me Learn Process® has been shown to have promise in utilizing cognition, conation and affectation approaches in order to assist in developing effective learning strategies. As each of these elements is taken into consideration, this process can allow learners to become active participants in their own learning process.

DEDICATION

This dissertation is dedicated to my great aunt, Clara Lou Moul and her life long friend, Bob Wilson. Without all of their love and support this would not have been possible. I only wish that they both could have been here to see me complete this process to the end. I hope that somehow they know that I finally finished "my paper" and I am profoundly grateful for everything they have done for me to make this possible.

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Based on the federal requirement of the No Child Left Behind [NCLB] (2002), all students should be demonstrating proficiency on grade level standards by the 2013-2014 school year. Therefore, it is imperative that educators deliver special education in a manner that ensures the most effective means of student learning. One of the first steps to begin this process is to be able to identify the different learning patterns of students in order to utilize these patterns in the hope to increase positive student outcomes.

Students that qualify for special education services may have considerable difficulty as a whole. As they move to middle and high school, there are increased demands in curriculum and a greater expectation for independent learning (National Joint Committee on Learning Disabilities, 2008). As these students enter the secondary grades research by the National Joint Committee on Learning Disabilities (2008) identifies several examples of the increasing demands of school specifically, (a) there are greater complexity of tasks, (b) increasing amounts of information, (c) a need for comprehension of complex linguistic forms and abstract concepts, (d) high stakes testing and graduation requirements, (e) greater demand for working memory for on the spot problem solving, (f) an increased focus on specific content with tightly scheduled time slots for acquisition of knowledge tied to high stakes testing, (g) an increased reliance on print, (h) increased expectations for greater output within shorter amounts of time requiring rapid and accurate retrieval of information and consolidation of learning into long term memory, (i) increased demands of digital literacy proficiency, and (j) an increased need for self-advocacy and individual responsibility (NJCLD, 2008). As a student in special education encounters these increased demands, there is a need to examine assessment and instruction to assist students in meeting such requirements and expectations.

For years, learning theory has highlighted differentiation of instruction. In order to help students excel, Kornhaber and Gardner (1993) explain that schools need to create conditions that "foster sustained engagement and encourage reflection" (p. 7), when learning about themselves and those around them. As we move towards a working education process we can begin to envision an understanding of the needs of teachers and students, as well as their impact on one another. This interaction can then result in positive school outcomes.

Johnston (2010b) explains, "learning involves taking in the world around you (sounds, sights, information, experiences, etc.) and making sense of it so that you can respond in a timely and appropriate manner" (p. 8). So how is this possible in the classroom? How do we do this with all different types of learners? The answer basically would lie within different methods of differentiated instruction which according to Tomlinson (2004) is "ensuring that what a student learns, how he/she learns it and how the student demonstrates what he/she learned is a match for that student's readiness level, interests, and preferred mode of learning" (p. 1). As we acknowledge that the concept of differentiated instruction is an important feature within the school process, especially with the special education population, we need to take it a step further to include learner-guided differentiation (Tomlinson, 2004). As teachers need to be able to reach varying levels of students, students need to be able to understand their learning processes in order to assist themselves in getting what they need to learn.

Research on learning patterns and the struggling student is rather limited as a whole. There have been a few studies that have been able to identify particular patterns of struggling students (e.g., see Brand, Dunn, & Greb, 2002; Hongsfield & Dunn, 2009; Lehman, 2011; Reaser, Prevatt, Petscher, & Proctor, 2007). The concept of learning styles has been prevalent in the literature explaining the learning process (Bedford, 2004; Cassidy, 2004; Coffield et al., 2004; Winzer, 2009). Some of these theories have been developed on paralleled tracks theoretically, while others overlap their concepts (Calleja, 2010; Slotnick & Maher, 2008). There has been an overwhelming amount of learning style models conceptualized to address questions on learning. Most, if not all of these models is combined with its own learning style "instrument" in order to label particular features or paths of learning.

When examining learning style theories, more confusion than clarity was found within the practice of education (Slotnick & Maher, 2008). In recent literature, there have been multiple analyses on the most prevalent learning style models (Cassidy, 2004; Coffield et al., 2004). Although these analyses were intended to highlight the most relevant and evidenced based research on learning styles, the overall findings resulted in highlighting the psychometric weaknesses of learning style theory (reliability and validity) which led to a considerable amount of concern regarding the usage of these instruments within today's education system (Slotnick & Maher, 2008). Overall, most theories were characterized as "small scale, non-cumulative, uncritical and inward looking" as well as sources of "confusion, serious failure of accumulated theoretical coherence, and the absence of well-grounded findings tested through replication." (p. 4).

Due to the limitations of learning style theory and its associated measures, another system of learning was developed in order to attempt to capture the essence of learning patterns. This system, more specifically, the *Let Me Learn Process® An Advanced Learning System* differs greatly from previous theories about the learning process. Overall, learning style theories identify a learner with a particular personality type or category rather than the integration of multiple interacting patterns (Johnston, 2009). Johnston (2009) noted that another differing concept between learning styles and the Let Me Learn Process® is that LML emphasizes the learner's ability to utilize patterns strategically. This then allows students to utilize all learning opportunities while others teach students to seek out learning conditions associated with their particular learning style.

The *Let Me Learn Process® An Advanced Learning System* integrates both teacher and student approaches to learning through metacognitive awareness. This comprehensive process allows for communication between students and teachers in order to obtain focused learning goals. This process looks at four learning patterns of Sequence, Precision, Technical Reasoning and Confluence and places them in one of three categories: Avoid, Use as Needed, and Use First. The purpose of this learning system is to explain how the learner interprets the world around them. It then teaches them how to advocate for themselves within their surroundings in order to produce an optimal learning environment.

Significance of The Problem

Students in special education have been considerably examined over the years. There have been several theories surrounding these students that have been developed to answer the following questions: How are they classified? Why are they in special education? How do they learn differently? Each of these questions examines why this group of students does not learn in the traditional means of education. There have been many experimental answers that try and “solve” the “problem” of special education. There is something about this group of students that does not let them access learning as the others do. These students need specialized differentiated instruction in order to be successful. This is not to say that other more traditional students do not benefit from differentiated instruction, but simply that it is not an essential part of the formula in order for a student in general education to be successful utilizing traditional educational practice.

What is it about special education students that actually make them classified students? There may be a common thread among classified students as a group. There may be a pattern of learning that does not mesh with our traditional education system. When taking the Let Me Learn Process® into consideration, traditional education is described as geared towards those students who are “Use First” Sequence and/or “Use First” Precision. As we begin to understand these two learning patterns further, words associated with these patterns emerge such as “alphabetize,” “compare and contrast,” “organize,” “label,” “measure,” “examine” and “detail.” These words encapsulate the essence of the traditional learning system that places significant emphasis on standardized assessments that utilize true organization, detail, and sequential processes.

What about the students who have patterns that do not work within our current education system? A student's cognitive skills are typically assessed based on standardized assessments surrounded around elements such as reading comprehension, recall of information, and mathematical computation (Johnston, 1996). More simply the process of receiving information and then being able to reproduce this information in standardized ways demonstrates much of the basis for our current education system. When taking this into consideration, those who demonstrate "Use First" Technical Reasoning and/or Confluence may be at a disadvantage if greater understanding of the individual learning process is not achieved. Descriptions of these patterns involve the other two extremes, one being a very "out of the box" thinker which has trouble conforming to the ideals of others and one is associated with the "do-er" of tasks. Both of these patterns are not consistent with the patterns of the traditional learning setting. In many cases, these patterns almost can be seen to go directly against it. Could this then result in a student being unsuccessful in a particular area of education that may then lead to the necessity of special education support services?

Due to this question, it would make sense hypothesize that when taking the Let Me Learn Process® into consideration, students who are classified for special education services may have a common interaction of patterns that are not in line with traditional educational processes, measures and goals. If we can determine that there is a pattern of these types of learners, then further understanding of the learning processes of all students could be obtained, then resulting in a shift in our views on public education as a whole.

Theoretical Basis for the Study

How do we learn?

For the last 50 years there has been the development of a variety of learning styles, learning patterns and instruments developed in order to encompass the etiology of learning and to promote success within our education system (Coffield, Moseley, Hall & Ecclestone, 2004). All of these models and instruments have been making varied attempts "to decipher the learning code of the mind" (Slotnick & Maher, 2008, p. 3). Some theories have been developed on a theoretically parallel track while others simply overlap in theory (Calleja, 2010).

Learning theory has been comprehensively studied throughout time. Ancient philosophers and psychologists have all contributed to the early foundations of the study of attitude and behavior (Johnston, 1994b). Greek philosophers laid the groundwork for what we now know as the scientific method (Pritchard, 2009). This shift led to the concept of consciousness. Consciousness later became associated with the concept of attitude and was broken down into three components: (a) cognition (thinking), (b) affectation (feeling/emotion), and (c) conation (acting/behaving) (Pritchard, 2009). These components were combined into one overarching theory, the tripartite theory. Allport (1954) argued that cognition (thinking), affectation (feeling) and conation (acting) served as a tripartite classification for the totality of the "attitude behaviors" in human experience.

Learning Styles

There have been a considerable amount of issues associated with the most widely identified learning styles theories (Cassidy, 2004; Pritchard, 2009). Primarily, learning styles theory has been considered to be disjointed and/or is limited in scope or application (Cassidy, 2004; Prichard, 2009). Cassidy (2004), in her analysis of various learning styles theories, voiced concerns regarding "ambiguous terminology and the lack of a unifying framework that is globally applicable of how learning occurs" (p. 78).

Other studies (e.g., Debello, 1990; Slotnick & Maher, 2008; Snow & Jackson, 1992) have documented the same concerns as Cassidy (2004). Debello (1990) called attention to the overlapping theoretical concepts and limited scope of learning style theories. Slotnick & Maher (2008) criticized learning styles models for having ambiguous terminology and a lack of unifying framework. Snow and Jackson (1992) noted that no model of learning style has been able to satisfy both the researcher and the educational practitioner, which suggested "a common theoretical base for the concept of style will be found in an integrated model which emphasize interaction and adaptation" (p. 85). In contrast, Coffield et al. (2004) did explore a total of 71 different learning style models. After further studying these models, 13 were utilized and examined. There were four major concepts identified within this analysis: (a) genetics and constitutionally-based learning styles and preferences; (b) cognitive structures and information processing capabilities; (c) one's stable and consistent personality traits and type; and (d) one's flexible yet stable learning preferences and learning approaches and strategies (Coffield et al., 2004).

Integrated Learning Processes

Throughout the learning style research there has been a need identified for the development of an instrument with strong reliability and validity while measuring learning within educational settings (Calleja, 2010). Due to this fact and the evident difficulty surrounding the theory behind learning styles and multiple intelligences, Johnston (1996) and her colleagues attempted to understand the learning processes as a function of the brain mind connection. Johnston utilized the concept of the brain mind connection within learning. As well, Johnston (1994a, 1994b, 1996) and her colleagues embedded their theory within the “tripartite theory of mind” which took into account three areas, cognition, conation, and affectation (Calleja, 2010, Snow & Jackson, 1992).

Johnston (1994a) took the tripartite theories in order to utilize each element of cognition, conation and affectation specifically and then emphasize their interaction. Johnston (2009) explains that the Let Me Learn Process® theory yields an “insight into intentional learning…the development of a unique set of learning tools, and an array of practical skills, and a set of terms to equip learners of all ages to communicate to others about their individual learning process” (Johnston, 2009, p.1, Calleja, 2010). Not only did would understanding of learning processes be evident, but this theory could take this concept a step further in order to have the learner use such information with intention (Johnston, 2009). The model that was ultimately developed by Johnston (1996) and her colleagues was embedded in research through elements of cognitive psychology, brain mind connection studies, and metacognition.

Let Me Learn Process® An Advanced Learning System

The Let Me Learn Process® captures the concept of the brain and mind interaction as it works to create an overall system of learning. This process explains that information from our senses (sight, sound, taste, touch and smell) travels through the brain through a complex neurocircutry. Within the brains electrochemical processing, stimuli are passed through the interactions of our patterns. As the information is filtered through, it is processed and acted upon through our own human consciousness. Then, it is translated by our working memory and stored until it is necessary to be used. From there, the working memory works to translate the stimuli into symbolic representations that are stored in our declarative or non-declarative memory. People have their own set of interacting patterns (Sequence, Precision, Technical Reasoning and Confluence) which then are processed within our metacognitive chatter and then utilized through our output to the learning experience. In each learning situation, a stimulus enters the brain, which is then converted, into symbolic representations that the mind can process. The four patterns work “synchronously” and in a very personal way for each of us (Jorgenson, 2006). Then, the mental processes of cognition, conation and affectation are incorporated into each of the four patterns, which then enable us to respond to a stimulus.

The observable, individually patterned, stable over time learning behaviors help individuals “take in the world around them and make sense of it” (Johnston, 2010a). We go through a series of processes in which we determine our overall patterns, indicating which we use first, which we avoid and those that we utilize as needed. Johnston and Dainton (1994c) developed a 28 item self-report instrument: the Learning Connections Inventory (LCI). Johnston (1994a, 1994b) contends that it is the knowledge of ones own learning process that makes it possible for an individual to develop personalized strategies to direct the path of his own learning. The knowledge of our learning patterns then allows us to participate in intentional learning (Osternman & Kottkamp, 2004).

Problem Statement

After a considerable review of the literature on learning styles and then the development of a more integrated theory of learning, it is important to understand their place within today’s classroom, specifically within students that can be experiencing difficulties in school. The Let Me Learn Process® appears to have a substantial and worthwhile premise as we attempt to further understand the learning process. Therefore, within this study, this process is highlighted and further examined within specific groups.

This study is intended to be a starting point for the analysis of the learning patterns of students in special education. Once pattern preferences and the interactions between preferences are identified, and the utility of the Let Me Learn Process® is examined, a greater understanding of learning will occur in combination with the development of self-advocacy skills in the classroom. Overall, the Let Me Learn Process® has been shown to have promise in utilizing cognition, conation and affectation approaches in order to assist in developing effective learning strategies. As each of these elements is taken into consideration, this process can allow learners to become active participants in their own learning. Finally, this concept of student self-advocacy and its importance with students in special education can be utilized for demonstration of the need for an integrated system overall in order to make students in special education most able to reach their optimal potential within the learning environment as a whole.

The overarching purpose of this study is to compare the learning pattern preferences as outlined by the Let Me Learn Process® across student groups. One purpose of this study is to compare learning preferences of learning patterns across two student groups: (a) students in general education and (b) students in special education. Another purpose of this study is to assess learning pattern preferences across two categories of students in special education: (a) students classified for special education under the disability category of Other Health Impairment (OHI); and (b) students classified for special education under the disability category of Specific Learning Disability (SLD). Students' learning pattern preferences were measured via the Learning Connections Inventory (LCI), which is the corresponding assessment to the Let Me Learn Process® theory. The LCI is used to determine scores on the four identified student learning patterns: (a) the sequential pattern, which seeks order and consistency; (b) the precision pattern, which wants to know details and exactness; (c) the technical reasoning pattern, which processes using stand alone, independent reasoning; and (d) the confluence pattern, which pulls together all areas of experience and forms them into new ideas and thoughts. If a determination can be made that certain student pattern preferences of learning exist based on a particular group, it may give educators insight into the learning, academic, and educational needs of these particular groups of students to best assist students to reach their optimum learning potential. This determination may also provide to educators a greater understanding about how these student learning pattern preferences exist within their current education system.

Research Questions and Hypotheses

This study investigated preference for the four learning patterns of students in grades 6-12, who had completed the Learning Connections Inventory. Specifically, this study examined the following research questions broken into two overarching sections: Section One: Is there a difference in preference based on LCI scores (Sequence, Precision, Technical and Confluence) when comparing students in general education and students in special education, specifically with classifications of Specific Learning Disability or Other Health Impairment?

i. Is there a difference in preference when comparing students in special education and students in general education in the category of Sequence based on their LCI scores?

ii. Hypothesis: Students classified for special education demonstrate less of a preference for Sequence based on their LCI scores more often when compared to students in general education.

iii. Research question two: Is there a difference between students classified for special education and students in general education in the category of Precision based on their LCI scores?

iv. Hypothesis: Students classified for special education show less of a preference for Precision based on their LCI scores more often when compared to students in general education.

v. Research question three: Is there a difference between students classified for special education and students in general education in the category of Technical Reasoning based on their LCI scores?

vi. Hypothesis: Students classified for special education demonstrate more of a preference for Technical Reasoning based on their LCI scores more often when compared to students in general education.

vii. Research question four: Is there a difference between students classified for special education and students in general education in the category of Confluence based on their LCI scores?

viii. Hypothesis: There is no difference in preference for Confluence when comparing LCI scores of students in special education and students in general education.

Section Two: Is there a difference in preference based on the LCI scores (Sequence, Precision, Technical Reasoning and Confluence) when comparing students classified for special education under the disability category of Other Health Impairment and students classified for special education under the disability category of Specific Learning Disability?

i. Research question five: Is there a difference between students classified for special education under the disability category of Other Health Impairment (OHI) and students classified for special education under the disability category of Specific Learning Disability in the category of Sequence based on their LCI scores?

ii. Hypothesis: Students classified under the disability category of Other Health Impairment demonstrate more of a preference for Sequence based on their LCI scores more often than students classified under the disability category of Significant Learning Disability.

iii. Research question six: Is there a difference between students classified for special education under the disability category of Other Health Impairment (OHI) and students classified for special education under the disability category of Specific Learning Disability in the category of Precision based on their LCI scores?

iv. Hypothesis: Students classified under the disability category of Other Health Impairment demonstrate more of a preference for Precision based on their LCI score more often than students classified under the disability category of Significant Learning Disability

v. Research question seven: Is there a difference between students classified for special education under the disability category of Other Health Impairment (OHI) and students classified for special education under the disability category of Specific Learning Disability in the category of Technical Reasoning based on their LCI scores?

vi. Hypothesis: Students classified under the disability category of Other Health Impairment demonstrate a less of a preference for Technical Reasoning based on their LCI score than students classified under the disability category of Significant Learning Disability.

vii. Research question eight: Is there a difference between students classified for special education under the disability category of Other Health Impairment (OHI) and students classified for special education under the disability category of Specific Learning Disability in the category of Confluence based on their LCI scores?

viii. Hypothesis: There is no difference in preference for Confluence when comparing students classified under the disability category of Other Health Impairment and students classified under the disability category of Significant Learning Disability.

CHAPTER II

LITERATURE REVIEW

The Individuals with Disabilities Education Act (IDEA) requires that children ages 3-21 with disabilities should be provided with a free and appropriate public education. According to the National Center For Education Statistics (2012), 13.1% of children are serviced under federally supported special education programs. Within the special education population, 38% are classified as having a Specific Learning Disability (SLD) and 11% are classified as having an Other Health Impairment. According to the No Child Left Behind Act (2002), these very students-- along with their peers in general education -- need to meet academic standards by the 2013/2014 school year. This study examined the learning pattern preferences of middle (grades 6, 7 and 8) and high (grades 9, 10, 11, and 12) school students and compared them to their general education peers.

A review of the literature associated with the features of this study is thoroughly examined. This review first includes information regarding the historical background of special education and current mandates through the NCLB (2002) as it pertains to students in special education. Next, there is an examination of the special education classification criteria, including both federal and state guidelines. Special education student outcomes are then discussed.

A considerable review is then completed on learning styles and learning patterns along with their associated instruments and their strengths and weaknesses within today's classroom. The Let Me Learn Process® is then highlighted, with specific emphasis on its paramount usage within the current study. Finally, the concept of student self-advocacy and its importance with students in special education is utilized for demonstration of the need for an integrated system overall in order to make students in special education most able to reach their optimal potential within their learning environment.

Historical Background

The History of Special Education

Special education has significantly evolved over the past 50 years (Winzer, 2009). The first significant report of federal involvement in the education of students with disabilities came with the passage of the Expansion of Teaching in the Education of Mentally Retarded Children Act of 1958 (Skiba et al., 2008). Within this act, congress appropriated funds for the training of teachers of children with mental retardation. The first identified law that has been said to make considerable impact on the field of special education is the Elementary and Secondary Education Act (ESEA) of 1965 (Fletcher, Lyon, Fuchs & Barnes, 2007). This law was passed as a part of President Johnson's "War on Poverty" and was intended to close skill gaps in reading, writing and mathematics of all students (Skiba et al., 2008). This act emphasized equal access to education and high standards and accountability. This was the law that authorized federally funded education programs that were administered by each state (Skiba et al., 2008). Grants were established through this law specifically for the education of students with special education needs (Fletcher et al., 2007). The educational amendments to the ESEA act were updated in 1974, and were considered to be the next important legal considerations of special education (Miller, Hess, & Brown, 2012). These amendments to the 1965 ESEA required each state receiving federal funding for special education to establish goals for providing full educational opportunities for children with disabilities (Millet et al., 2012).

In 1973, the Section 504 of the Rehabilitation Act of 1973 was created and implemented (Skiba et al., 2008). This act has been considered the legal foundation for subsequent special education mandates due to it being considered as the first major effort to protect people with disabilities against discrimination (Skiba et al., 2008). In 1975, the Education for All Handicapped Children Act (EAHCA) emerged (Skiba et al., 2008). Within this act there was a mandate that attempted to ensure that students with disabilities had the right to the following: (a) to receive nondiscriminatory testing, evaluation of impairments and strengths, and placement procedures; (b) to be educated in the least restrictive environment; to have the availability of procedural due process including parent involvement; and (c) to have the right to a free and appropriate public education (FAPE) (Winzer, 2009; Skiba et al., 2008).

It was within the EAHCA that the Individualized Education Program (IEP) document was introduced (Skiba et al., 2008; Winzer, 2009). This document included goals, objectives, education placement, school year length, and the evaluation and measurement criteria. This law established due process rights as well as a means of funding special education services (Skiba et al., 2008). In 1990, the EAHCA was renamed the Individuals with Disabilities Education Act (IDEA), to shift the focus to the child rather than the disability (Skiba et al., 2008). This document also placed requirements on transitional services for students with disabilities (Skiba et al., 2008). In 1997, IDEA was reauthorized and expanded to include the specification of measurement requirements, the availability and existence of a mediations process and a procedure for disciplining students with disabilities (Skiba et al., 2008, Winzer, 2009).

There have been numerous changes over the past ten years regarding special education within the reauthorization of IDEA in 2004 and the emergence of NCLB (2002) (Miller et al., 2012; Winzer, 2009). Within this reauthorization of IDEA, significant changes were made to the qualification process of students with Specific Learning Disabilities (SLD) (Miller et al., 2012). This change was the beginning of a shift in regards to qualification, indicating that there no longer needed to be a severe discrepancy between a student's intelligence quotient (IQ) and achievement. Practitioners could now also take into consideration a student's response to scientifically based interventions or response to intervention (RTI) (Miller et al., 2012).

The NCLB (2002) mandated that all children be proficient in standards by the 2013/2014 school year. Prior to this act, there was no accountability for schools to show academic performance for students who received special education services (Skiba et al., 2008; Winzer, 2009). The implementation of NCLB has shifted the focus in special education from a narrow focus on students to a more global consideration of school improvement and improved student learning. Under this act, students were delineated into specific student groups, including students in special education, English language learners, ethnic minority children, and students from lower socioeconomic households (Miller et al., 2012). These subgroups of students are also required to be evaluated on their own, and are required to meet proficiency standards by 2013/2014 (Miller et al., 2012).

Federal law surrounding special education policies has had many transitions since its inception (Skiba et al., 2008; Winzer, 2009). Federal law now mandates that all students must meet a certain level of academic achievement regardless of learning abilities and capabilities (Miller et al., 2012). Federal mandates -- specifically the NCLB requirement that all students be academically proficient – have placed tremendous pressure upon school system administrators and teachers to meet federal criteria (Hardman & Dawson, 2008). Educators are now at the forefront of accountability to these standards (Miller et al., 2012). Although the concept of all students meeting proficiency by 2013/2014 is seemingly a rather impossible task, educators may be able to understand and enhance the learning skills needs of special education students in order to attempt to improve the outcomes for all students. As educators begin to try to determine how each subgroup population demonstrate their learning on standardized tests, they must also examine the service delivery of teachers in supporting student learning (Bender, 2002; Winzer, 2009).

Some Children Left Behind

Historically, the American educational systems have been structured for a particular type of learning, which may not fit all students (Winzer, 2009). The American school system is based on instructional practices that Johnston (1994a, 2010) would argue is most aligned with sequential and precise learning patterns. That is, the instructional practices focus on (a) goals, objectives, and plans to meets these goals and objectives; (b) structured time for specific curricula, with little integration of multiple school subjects; and (c) rote practice and memorization of ideas (Skiba et al., 2008). However, every student is different and individual student differences within education pose definite challenges to educators. The combination of different learning patterns of students with one overarching means of assessment for all students makes student academic proficiency across the board a nearly impossible task (Hibel, J., Farkas, G. &

Morgan, P., 2010). NCLB (2002) required all public schools that receive federal funding to administer a standardized assessment annually to all students (Winzer, 2009). In terms of this act, children with disabilities were expected to take and pass the same tests as those students in regular education (Winzer, 2009). Students in special education have poorer outcomes as compared to students in general education, specifically in the area of promotion, school completion, and successful scoring on graduation-based tests (Hibel, et al., 2010). Hibel et al. (2010) argued that the current educational policies regarding high stakes testing might increase the likelihood that students in special education will have negative outcomes. What is it about our public education system that does not work for the student in special education?

Theory Relevant to Research Questions/Hypotheses

The Characteristics of Special Education Students

Who qualifies for special education services? According to IDEA (2004), a student must meet specific criteria due to a disability in order to receive special education services. The basic definition of a child with a disability from IDEA (2004) is a child evaluated and found to have (a) cognitive impairments, including mental retardation and cognitive issues resulting from traumatic brain injury; (b) sensory impairments, which can include hearing impairments such as deafness, speech or language impairments, visual impairments including blindness, or disorders such as autism or sensory integration disorders; (c) serious emotional disturbance (referred to in this part as ''emotional disturbance''); (d) health/medical impairments, such as ADHD/ADD and/or chronic diseases, such as Type I diabetes, seizure disorders, cancer, and multiple sclerosis; and (e) a specific learning disability, such as dysgraphia and dyslexia as well as learning disorders resulting from traumatic brain injury or brain dysfunction (Winzer, 2009). For the purposes of this study only two of these identified categories, Other Health Impairment (OHI) and Specific Learning Disability (SLD), were chosen as the foci for this study. Regardless of the elimination of the other classifying areas a common thread among students classified as students with disabilities hinge upon having an educational impact and requiring more service than students in general education, defined as students who do not qualify for services under IDEA (2004) (Skiba et al., 2008).

Characteristics of students in special education classified with a Specific Learning Disability.

Students with learning disabilities are the largest population of students served under special education law or the Individuals with Disabilities Education Act (IDEA). The National Center for Education Statistics (2012) documented that students with learning disabilities comprised about 38% of the special education population of students in 2011. According to the federal regulations of IDEA (2004), a learning disability is defined as a disorder in which one or more of the basic psychological processes involved in understanding or in using either written or spoken language is impaired, and as a result, negatively impacts learning in languages and mathematics (Skiba et al., 2008). Students identified as having learning disabilities would have conditions such as traumatic brain injury or brain dysfunction, dyslexia, dysgraphia, and/or developmental aphasia (Skiba et al., 2008). Additional personality and academic characteristics that are said to go along with this are vast, due to the fact that many different disabilities can be grouped within this category (Skiba et al., 2008). Therefore, these students overall have difficulties with achievement, especially in language arts and mathematics and difficulties on either cognitive input (i.e., processing incoming information) or output (i.e., ability to use practical information in reading, writing or math) (Skiba et al., 2008). They are, however; typically average to above average intelligence (Skiba et al., 2008).

Characteristics of students in special education classified as having an Other Health Impairment.

Students identified as OHI are the third largest population of students in special education, after students with learning disabilities and students with speech and language disabilities (National Dissemination Center for Children with Disabilities, 2012). The National Center for Educational Statistics (2012) reported that 11% of students in special education were categorized as OHI in 2011 (National Center for Educational Statistics, 2012). Moreover, it is expected that the number of students classified with OHI will double in the coming years (Scull & Winkler, 2011). The special education classification of OHI has been widely utilized across states, and federal and state definitions of the disability category of OHI for most states are very similar. According to the National Dissemination Center for Children with Disabilities (2012), students categorized as OHI have limited strength, vitality or alertness, including a heightened alertness to environmental stimuli, that results in limited alertness with respect to the educational environment" due to acute or chronic health conditions that adversely impact their learning and educational performance (para 2.). These health conditions include, but are not limited to asthma, diabetes, epilepsy, a heart condition, hemophilia, lead poisoning, leukemia, nephritis, rheumatic fever and sickle cell anemia (National Dissemination Center for Children with Disabilities, 2012). Students diagnosed as having ADHD or ADD are also categorized as being OHI (National Dissemination Center for Children with Disabilities, 2012). As most children diagnosed as OHI do not have typically have severe cognitive problems, most students are within the average range of intelligence (Scull & Winkler, 2011).

Special Education Students: The Learning Style Debate

"How can students be taught if we do not know exactly how they learn?" (Coffield et al., 2004, p. 1). There have been many theories surrounding the practice of learning and the inner workings of the human mind (Cassidy, 2004; Johnston, 1994; Pashler, McDaniel, Rohrer, & Bjork, 2008; Pritchard, 2009). Over the last 50 years – starting in the 1950s – there has been great growth in the development of learning theories, both in the fields of psychology and education (Pashler et al., 2008, Pritchard, 2009). The growth of theoretical frameworks on learning styles and learning patterns has led to the development of numerous learning style instruments developed in order to encompass the etiology of learning and to promote success within our education system (Coffield et al., 2004; Pashler et al., 2008). All of these models and instruments have been making varied attempts "to decipher the learning code of the mind" (Slotnick & Maher, 2008, p.3).

Considering the fact that learning styles have been quite extensively studied, one would assume that there would be a clear theoretical basis that answered many of the learning questions raised. Unfortunately, this is not the case. Coffield et al. (2004) stated that the vagueness in numerous learning style theories has led to a great deal of learning style models and instruments with consisting of a great deal of ambiguity and overlap. This school of thought on learning styles has been studied by multiple, yet separate, researchers (e.g., Cassidy, 2004; Coffield et al., 2004; Slotnick & Maher, 2008;

Pashler et al., 2008). All of these researchers concluded that there was no one learning style model that was considered to be both psychometrically and theoretically sound. These researchers (e.g., Cassidy, 2004; Coffield et al., 2004; Slotnick & Maher, 2008; Pashler et al., 2008) furthermore argued that learning style models (a) were too narrow in scope, (b) lacked the incorporation of the metacognitive aspects involved in learning, strategies, and (c) had limited practicality for applying the results in order to enhance the learning process. In order to move forward to grasp the learning process, previous theoretical frameworks must be identified and critiqued in order to best understand and assess learning styles (Pashler et al., 2008).

The Tripartite Theory of Mind

Learning theory has been studied throughout time. Ancient philosophers and psychologists have contributed to the early foundations of attitude and behavior (Johnston, 1994a). Greek philosophers laid the groundwork for what we now know as the scientific method (Pritchard, 2009). As this idea evolved, the concept of consciousness emerged. Consciousness later became attitude and was later delineated into three components: (a) cognition (thinking), (b) affectation (feeling/emotion), and (c) conation (acting/behaving) (Pritchard, 2009). These components were integrated into a learning theory termed as the tripartite theory by Allport (1954). Allport (1954) argued that cognition (thinking), affectation (feeling) and conation (acting) served as a tripartite classification for the totality of the "attitude behaviors" in human experience.

In order to understand the integration of these three terms it is necessary for them to be defined. Cognition refers to the internal processing of information: it is the "thinking" component of learning (Allport, 1954). Affectation refers to the feelings of worth and value received as learners: it is the “feeling” part of learning (Allport, 1954). Conation refers to the pace, skill, autonomy and manner in which one performs a task: it is the “doing” part of learning (Allport, 1954). Each component has its place within the overall integrated learning processing in individuals (Allport, 1954).

While the tripartite theory has been argued as being “the integral part of better understanding of the tripartite theory of the mind and its affect on the learning process,” little research has tested this theory within the educational domain (Cassidy, 2004, p. 420). The study of conation appears to be the least studied, but may quite possibly be the most important aspect of the learning process (Johnston, 1994a; Snow & Jackson, 1993, 1997). With the conative constructs considered a significant area of importance, it can be seen that in research studies on learning styles and brain science that while there is information about an individual’s construct of learning, there is less understanding of the learner’s “will to learn” (Johnston, 1994a).

Learning Styles Theories.

Curry’s (1987) Learning Styles Model. To further understand the elements of the varying research approaches to learning, Curry (1987) developed a model in order to explain learning theory and its associations. Curry (1987) examined many of the different research studies on learning approaches, with specific focus on psychometric studies of different learning style instruments. Curry (1987) defined learning styles as having many layers, like an onion, and she argued that the least stable style was the external layer, one that was very observable, while the deepest layer was the most stable learning style. Based on her analysis of the research, Curry (1987) identified four primary learning styles: (a) instructional preferences style, (b) social interaction style, (c) information processing style, and (d) cognitive personality style. The instructional preference style layer is defined by Curry (1987) as the level of the learner's comfort and ability to gain knowledge through particular instructional methods and materials. This style was the most observable; Curry (1987) described it as the individual preferred choice of learning environment that was susceptible to influence and thus the least stable. The next layer, labeled the social interaction style, was the individual preference for social interaction while learning (Curry, 1987). The third layer, the information processing style, was the individual's intellectual approach to the processing of information (Curry, 1987). Finally, the fourth layer was the cognitive personality style. This layer was considered a relatively permanent part of personality in which behavior could be observed across many learning environments (Riding & Cheema, 1991).

Gardner's (1983) Multiple Intelligences Theory. Kornhaber & Gardner (1993) wrote "human beings possess a varied array of mental competences, strengths or "intelligences" that they combine and call on in different ways to achieve excellence in different disciplines (p. 75)." Skill and excellence in these areas can be developed and demonstrated in several different ways. Gardner's (1983) theory of multiple intelligence was based on the belief that humans possess seven autonomous but coordinated intelligences: (a) linguistic, (b) logical-mathematical, (c) musical, (d) spatial, (e) bodily kinesthetic, (f) interpersonal, and (g)intrapersonal. Gardner (1983) argued, that in order to engage in diverse strengths of the learner, teachers should utilize a variety of instructional strategies to engage these various intelligences. This concept can be associated with collaborative learning wherein the learner begins to understand their own learning patterns as well as those learning patterns of his or her classmates. However, the theory of multiple intelligence theory falls short within the learning system: there is knowledge of how one learns, but there is no strategies employed to utilize this knowledge in order to excel in academics (Cassidy, 2004).

One of the best approaches to education in terms of Gardner's (1983) multiple intelligences theory is understood in terms of the profile of intelligence (Moran et al., 2006). Each learner's intellectual profile consists of the learner's strengths and weaknesses and as such, the theory of multiple intelligences can work across students into groupings of learners (Moran et al., 2006).

Gardner (1983) argued that, if one gave the same learning material to a class of students, each student would have a different experience, which is shaped by his or her background, strengths, and weaknesses. Gardner (1983) continued to state that each learning experience presented to a student should be rich, so that learners can shape that experience within their own learning perspective. It is certainly important to give students multiple ways to experience a concept. Gardner's (1983) theory of multiple intelligence stressed (a) the incorporation of musical, athletic, interpersonal, and intrapersonal intelligences into the learning process; and (b) the importance of students knowing their own learning style and that of others. However, the key area in which this theory falls short is within the concept of intentional learning (Moran, Kornhaber, & Gardner, 2006). The ability to utilize this information to access learning is key to the overall utility of learning as a whole. Moreover, those who make education policy sometimes are led astray when they attempt to integrate the theory of multiple intelligences into the school setting (Moran, Kornhaber, & Gardner, 2006). When trying to incorporate the theory of multiple intelligences, administrators often have mistakenly grouped students by separate types of intelligences rather that thinking about them in terms of intelligence as a whole (Moran, et al., 2006).

Summary of learning styles theories. There have been a considerable amount of issues with the most widely identified learning styles theories (Cassidy, 2004; Pritchard, 2009). Primarily, learning styles theories have been disjointed and/or are limited in scope or application (Cassidy, 2004; Prichard, 2009). Cassidy (2004), in her analysis of various learning styles theories, voiced concerns regarding "ambiguous terminology and the lack of a unifying framework that is globally applicable of how learning occurs" (p. 78). As well, other studies (e.g., Debello, 1990; Slotnick & Maher, 2008; Snow & Jackson, 1992) have documented the same concerns as Cassidy (2004). Debello (1990) called attention to the overlapping theoretical concepts and limited scope of learning style theories. Slotnick & Maher (2008) criticized learning styles models for having ambiguous terminology and a lack of unifying framework. Snow and Jackson (1992) noted that no model of learning style has been able to satisfy both the researcher and the educational practitioner, which suggested "a common theoretical base for the concept of style will be found in an integrated model which emphasize interaction and adaptation" (p. 85). In contrast, Coffield et al. (2004) did explore a total of 71 different learning style models. After further studying these models, 13 were utilized and examined. There were four major concepts identified within this analysis: (a) genetics and constitutionally-based learning styles and preferences; (b) cognitive structures and information processing capabilities; (c) one's stable and consistent personality traits and type; and (d) one's flexible yet stable learning preferences and learning approaches and strategies (Coffield et al., 2004).

Learning Styles Instruments.

Three learning styles instruments, based on learning style theories, were examined in order to further understand their theoretical foundations and their utility within the educational setting. Lane (2003) identified three learning style theories that are most used in education as (a) the Myers-Briggs Type Indicator; (b) Kolb's Learning Styles Inventory; and Dunn and Dunn's (year) Learning Style Inventory.

Myers-Briggs Type Indicator. One of the most well-known and often utilized instruments for learning styles is the Myers-Briggs Type Indicator (MBTI).

The MBTI, "the world's most widely used assessment," is a self-report assessment tool designed to identify personal perceptual; and judgment preferences that are integrated and "put to practical use" (Myers, 1980, p. 23). This instrument has a set of 93 forced choice questions that align related to four bipolar scales. The four scales include (a) extroversion versus introversion; (b) sensing versus intuition; (c) thinking versus feeling; and (d) judging versus perceiving (Myers, 1980; Myers & McCaulley, 1985). According to Myers (1980), individuals tend to prefer one pole of the scale versus the other and display polar traits. Extraverts try things out and focus on the outer world of people while introverts think through things and focus on the inner world of ideas (Myers, 1980; Myers & McCaulley, 1985). Sensors are practical, detail-oriented and focus on facts or procedures, whereas intuitors are imaginative, concept-oriented and focus on meanings and possibilities (Myers, 1980 Myers & McCaulley, 1985). Thinkers tend to be logical and use rational decision-making processes to understand concepts and ideas; in contrast, feelers are emotionally-driven and make decisions based on subjective emotions (Myers, 1980; Myers & McCaulley, 1985). Judgers set and follow agendas, seek closure even with incomplete data while perceivers adapt to changing circumstances and resist closure to gain more data (Myers, 1980). These four bipolar categories of the Myers Briggs Type Inventory can be combined to form 16 different learning style types (Myers, 1980).

The psychometric properties of the MBTI have received considerable research attention (e.g., Bess & Harvey, 2002; Harper, 2008; McCrae, & Costa, 1989; Pittenger, 2005; Sipps & DiCaudo, 1988). The results from studies have been equivocal. While the inter-item reliability for this instrument was considered good, with internal consistency alpha coefficients ranging from .57 to .85, the test-retest reliabilities have been poor to average (i.e., *r*s in the low .40s to low .70s) (Pittenger, 2005). Several studies (e.g., McCrae & Costa, 1989; Saggino, Cooper, & Kline, 2001; Sipps, Alexander, & Friedt, 1985; Sipps & DiCaudo, 1988) have furthermore documented that the four bipolar scales do not consistently emerge in factor analysis. One example was the study by McCrae and Costa (198), who found that the MBTI factor structures better assessed the 5-Factor personality traits than the four bipolar traits suggested by Myers (1980). Despite the research focus on the psychometric properties of the MBTI, few studies (e.g., Brown & Reilly, 2009) have examined its validity. In the MBTI manual, Myers (1980) referred to convergent and discriminant validity but did not report any validity findings in detail. Brown and Reilly (2009) found that the MBTI did not show criterion-related validity with the Multifactor Leadership Questionnaire nor did MBTI profiles discriminate between executive coaches with and without strong transformational leadership skills. .

Kolb's Learning Style Inventory. One of the most influential models of learning styles was developed by David Kolb (Kolb, 1984). Kolb differed from Myers (1980) in that he argued that learning styles were not fixed traits that were consistently used in the learning process but were instead preferences that were mutable across people and situations. Kolb's (1984) model consisted of three components: (a) his theory of experimental learning; (b) his learning cycle graphical model; and (c) his Learning Styles Inventory (LSI).

In Kolb's (1984) experimental learning model, he argued that learning was comprised of six characteristic features. First, Kolb (1984) argued that learning was best conceived as an ongoing process and not in terms of a consistent trait having consistent and concrete outcomes. Second, Kolb (1984) stated that learning was a continuous process grounded in experience. Third, Kolb (1984) stated that learning required the resolutions of conflicts between dialectically-opposed modes of adaptation to the world. Fourth, Kolb (1984) argued that learning was a holistic process of adaptation to the world. Fifth, Kolb (1984) stated that learning involved ongoing transactions between the person and his or her environment. Sixth, Kolb (1984) argued that learning was the process of creating knowledge, and knowledge was the result of the transaction between social knowledge, and personal knowledge. Overall, Kolb (1984), in his theory, maintained that learning was a process that involved the resolution of dialectical conflicts between opposing modes of dealing with the world.

Kolb (1984) in his experimental learning theory, described learning as a cognitive process involving consistent adaptation and engagement with the environment. Kolb (1984) argued that persons gain knowledge from both experience and instruction: individuals basically create their learning experiences by what they attend to in the environment and the choices they make. Kolb's (1984) graphical model depicted the process of learning in a cyclical model containing four different learning styles. The four learning styles were based on integration of the four-cycle constructs of (a) concrete experience (CE); (b) reflective observation (RO); (c) abstract conceptualization (AC); and (d) active experimentation (AE) (Kolb, 1984).

Within Kolb's (1984) theoretical model were four dominant learning styles: (a) diverging, which was a reflection of CE and RO traits; (b) assimilating, comprised of AC and RO traits; (c) converging, comprised of AC and AE traits; and (d) accommodating, which was constructed on CE and AE traits. Each of these styles is located in a different quadrant of the cycle of learning (Kolb, 1984). The diverging (CE/RO) style described learners who are abstract thinkers who excel at problem solving, seeing concepts via different viewpoints, decision making, conceptualization of ideas, and experimentation (Kolb, 1984). Diverging learners are often interested in cultural interests and people; they are imaginative, social, and often artistic (Kolb, 1984). The assimilating (AC/RO) style was exemplified by learners who are logical thinkers that excel at analytical thinking, organization, and long-range goal planning. Unlike the diverging (CE/RO) learners, assimilators are more interested in concepts and ideas than people (Kolb, 1984). The converging (AC/AE) style described learners who are practical and learn best from developing clear and concrete solutions to problems (Kolb, 1984). The converging (AC/CE) learning style is similar to the assimilating (AC/RO) style in the preference for ideas over people (Kolb, 1984). The accommodating (CE/AE) style of learning is exemplified by learners who are "hands-on" and practical (Kolb, 1984). Accommodaters prefer to obtain information from others but are also good team players (Kolb, 1984).

From his learning model, Kolb (1984) developed his method of assessing learning styles in the form of the Learning Style Inventory (LSI). This assessment tool is a 12-

item self-report survey using a forced-choice ranking method to assess individuals' preferred modes of learning based on categories created by Kolb (1984). The psychometric research on the LSI is robust (see Cassidy, 2004; Garner, 2000; Geiger, Boyle, & Pinto, 1992; Kayes, 2005; Koob & Funk, 2002; Loo, 1996; Metallidou & Platsidou, 2008) The test-retest and inter-item reliabilities for all four learning scales have been consistently sound, with ranges from .70 to .87 (Kayes, 2005; Loo, 1996; Metallidou & Platsidou, 2008) ranged from .53-.71. In contrast, the LSI has demonstrated poor construct and predictive validity across numerous studies (e.g., Garner, 2000; Geiger et al., 1992; Kayes, 2005; Koob & Funk, 2002; Loo, 1996, Matallidou & Platsidou, 2008). While the LSI considered one of the first learning styles assessment to be based on an explicit learning theory, it has not shown consistently strong psychometric properties, which lessen its impact on educational initiatives (Kayes, 2005; Metallidou & Platsidou, 2008).

Dunn and Dunn's Learning Style Inventory. Dunn and Dunn (1992) defined learning style as "the way in which individuals begin to concentrate on, process, internalize and retain new and difficult academic information" (p. 32). Within the Dunn and Dunn (1992) learning styles model, the concept of learning style is delineated into five separate components and each of these influences how individuals learn. Dunn and Dunn (1992) did argue that these learning style components were preferences and not consistent traits. These components were (a) environmental; (b) emotional; (c) physiological; (d) psychological; and (e) sociological (Dunn & Dunn, 1992). According to Dunn and Dunn (1992), the environmental component incorporated learners' sense and sensation preferences of the learning process (e.g., the lighting and structure of the classroom). The emotional component addressed students' levels of (a) motivation, (b) persistence, (c) responsibility and (d) need for structure (Dunn & Dunn, 1992). The physiological component focused on the learners' (a) perceptual strengths (i.e., as visual, auditory, kinesthetic, or tactile learners); (b) time of day energy levels; and (c) the need for food or drink intake and mobility while learning (Dunn & Dunn, 1992). The psychological component incorporated the information- processing elements of global versus analytic and impulsive versus reflective behaviors (Dunn & Dunn, 1992). Finally, the sociological component assessed students' preference for individual versus group learning and level of motivation based on authority figure support (Dunn & Dunn, 1992).

The Dunn and Dunn's Learning Styles Inventory (LSI) is designed for students, ages 9-18. The LSI for students in 3rd and 4th grade is a 104-item 104 self-report survey utilizing a 3-point Likert scale (i.e., true, uncertain, false). The LSI for students in 5th through 12th grade is an 104-item survey that uses a 5-point Likert scale (i.e., strongly disagree, disagree, uncertain, agree, strongly agree). The Dunn and Dunn (1992) LSI has received less research attention than the MBTI and Kolb's LSI (for exceptions, see Admundsen, 2005; Hermanussen, Wierstra, & Jong, 2000; Kavale & LeFever, 2007). While Dunn and Dunn (1992) reported adequate inter-item (i.e., alphas in the mid to high .60s) and inter-rater (i.e., *r*s in the low .60s), the reliabilities of the LSI were equivocal in subsequent studies, with internal consistency reliabilities ranging from the low .30s to high .80s (Kavale & LeFever, 2007) and the inter-rater reliabilities in the in the .50s to .60s (Admunsen, 2005; Hermanussen et al., 2000; Kavale & LeFever, 2007). In regards to validity, however, research has shown some strong indication of predictive validity for vocational employment (Hermanussen et al., 2000) and student college majors (Kavale & LeFever, 2007). Overall, this inventory has been considered to have a number of psychometric limitations (Kavale & LeFever, 2007).

Learning Style Theory + Multiple Intelligence = Possibilities?

Throughout the literature on learning styles and multiple intelligence theories there have been a considerable amount of criticism, which makes them less useful. Although these criticisms have prevailed somewhat in practice, there still seems to be some utility in the theories themselves. Researchers have attempted to evaluate these two theories together to see if their combination would be a successful and would remediate the weaknesses of one another (Silver, Strong, & Perini, 1997). Silver, Strong & Perini (1997) make the claim that learning style theories are concerned with the "process" of learning while multiple intelligence theories focus on the "content and products" of learning. If these two theories are integrated the learning styles focus on individual learning compliments the more content oriented model of multiple intelligences (Silver, Strong & Perini, 1997).

Summary of Learning Styles Theories and Instruments.

The concept of learning styles has been prevalent in the literature explaining the learning process (Bedford, 2004; Cassidy, 2004; Coffield et al., 2004; Winzer, 2009). Some of these theories have been developed on theoretically paralleled tracks, while some significantly overlap in concepts (Calleja, 2010; Slotnick & Maher, 2008). From this idea there has been an overwhelming amount of learning style models conceptualized within learning and most of these models is combined with its own learning style "instrument."

When examining learning style theories, much confusion was found when integrating these theories into practice of education (Slotnick & Maher, 2008). In recent literature, there have been multiple analyses on the most prevalent learning style models (Cassidy, 2004; Coffield et al., 2004). Although these analyses had intended to shed light the most relevant and evidenced based research on learning styles, the overall findings resulted in highlighting the psychometric weaknesses of learning style theory (reliability and validity) which led to considerable concern about the usage of these flawed theories utilized by todays educators (Slotnick & Maher, 2008). Overall, most theories were said to be "small scale, non-cumulative, uncritical and inward looking" as well as sources of "confusion, serious failure of accumulated theoretical coherence, and the absence of well-grounded findings tested through replication." (p. 4).

Johnston's Let Me Learn Process® An Advanced Learning System

Due to the ongoing concern regarding learning styles, Johnston (2009) and her colleagues worked to understand learning in a different way. The Let Me Learn Process® was developed beginning with the brain mind connection. Moving back to the tripartite theory, Johnston (1994a) took it to the next step in order understand a learners "will to learn" or volition. Specifically, they focused on the process of learning with intention. However, what is missing from the relevant literature, as a whole is the concept of the depiction of the interaction, which occurs during one's learning process between a learner's cognitive, conative and affective qualities. Johnston (1996) described her model of learning by the use of a combination lock to describe an individual's unique learning system: conation, cognition and affectation become an integrated progress. Each area is working to make an intentional learner. In other models, such as Gardner's

(1983) theory of multiple intelligences, learning styles and brain science that lack of the conative construct leaves these theories falling short within the full understanding of the learning process. The Let Me Learn Process® differs significantly from learning styles. Overall, most learning style theories will identify a learner with a particular personality type or category rather than "a profile reflecting the degree of reference for multiple interacting patterns (Johnston, 2010 p.10). Johnston (2010) noted that another main difference between learning styles and LML is that LML emphasizes the learners ability to utilize patterns strategically, which allows them to take advantage of all learning situations while other theories teach students to seek out learning conditions associated with their particular learning style.

Johnston (2010) describes learning as "taking in the world around you and making sense of it" (p. 10). As seen above, most measures of personality, multiple intelligences or learning style compartmentalize learners (Slotnick & Maher, 2008). The basis of this thought was well-ingrained on the brain-mind connection. As signals enter the brain from the five senses of hearing, sight, touch, smell and taste, the information needs to be translated into the mind so that one can make sense of the incoming data. During this process, the information is sifted and translated through a set of patterned operations specifically termed (a) sequence, (b) precision, (c) technical reasoning, and (d) confluence. Each pattern is available in every person's mind, however there is a unique combination in regards to the degree that we utilize each of these patterns. Within each of these patterns, there is the presence of the mental processes of cognition, conation and affectation. This allows for the ability to think, act and feel during the interaction of patterns. This interaction of pattern is otherwise termed as the "metacognitive chatter" of the working memory. Each individual's learning combination is comprised of the interaction between the patterns. This intricate interaction is the basis for intentional learning (Johnston, 2010).

One of the areas that set the Let Me Learn Process® apart from other models is that it hinges upon metacognition. This is where Johnston (2010) explained is the power of the personal learning processes. Metacognition is defined as the internal talk of thinking patterns as they collectively consider information and experiences, organize research, figure out, and evaluate the risk involved in taking on a new learning challenge and feel their responses to the situation they are facing. Until we learn how to utilize metacognition to our benefit the "internal chatter" of our patterns can be very distracting when attempting new tasks (Johnson, 2010).

Each of the learning patterns within the Let Me Learn Process® have their own separate and specific characteristics (Johnson, 2010). The sequential preference is described as the aspect of learning which one needs to follow step-by-step directions, carefully plan and organize tasks, and complete assignments from start to finish without interruption. Within the precise preference, this is the aspect of learning that one needs to process details and other information very carefully and accurately. Those that have a higher score in this preference take detailed notes, ask questions, know exact answers, and write in a highly specific manner. The technical reasoning preference is that aspect in which one requires practicality and relevance to all learning tasks. This pattern is the non-verbal processor that sees the mechanics of operations, the functions of pieces, and appreciates the "hands on" aspect of a task so they are not held back by paper and pencil tasks. Finally, the confluence preference is described as one that avoids conventional approaches, the “out of the box” thinker, one who seeks out unique ways of completing a learning task, ignores directions, and takes risks. Each of these patterns is in existence within every person but is just interactive at different levels therefore creating a unique learning combination (Johnson, 2010).

Within the Let Me Learn Process®, exists the Learning Connections Inventory or LCI (Johnson, 2010). This tool allows the learner to measure the level of the four learning patterns of sequential, precision, technical reasoning, and confluence. This awareness is just the start of this process. Once a learner can become aware of their individual learning processes, they will have the ability to become aware of themselves, the task and the options necessary to complete the task, therefore resulting in an integrated learning process. The LCI has 28 statements that reflect a person’s learning preference using a 5-point Likert Scale ranging from 1 = Never Ever to 5 = Always. There are three open-ended questions that are intended to validate a person’s answers and provide the scorer with some insight in regards to the learning patterns. Due to the fact that each person utilizes all of the patterns in some way, an overall profile is given for each pattern. These patterns are identified as Sequence, which includes organization, planning, order, and structure. The Precision pattern utilizes information, details, and knowing for the sake of knowing. The Technical Reasoning pattern utilizes hands on learning, relevance, and self-sufficiency. Finally, the Confluence pattern involves risk, innovation, alternative viewpoints and freedom from rules. Each pattern is given a score ranging from 7 to 35. Each individual pattern is measured along a continuum “Use First” (25-35), “Use As Needed” (18-24) and “Avoid” (7-17).

The process is not complete when a learner is given their profile of scores; it is just the beginning of the process. In accordance with the LML advanced learning system, students then learn to “forge,” “intensify” or “tether” (FIT) patterns as the need to when needing to be successful in a certain type of task. After understanding this process and how it works within them, it can also be utilized in order to gain what is needed from others with different patterns.

Unique Patterns-Combinations: Sequential, Confluence, Precision and Technical. Research does not show a hierarchy within these interactions but more of a unique composite of all four to make up an individuals interactive learning process. When we understand these unique combinations, it makes sense to assume that some patterns would be more significant then others. When we are able to efficiently understand our learning combination and begin to utilize this information, we then can begin the explanation of how and individual learns.

Every student is different. Individual differences within education poses a definite challenge to educators. Combine that with one overarching means of assessment, poses for even more of a challenge. The No Child Left Behind (2002) act required that all public schools that receive federal funding to administer a standardized assessment annually to all students. In terms of this act, children with disabilities are expected to take and pass the same tests as those students in regular education (Wynn, 2008). Special education students have poorer outcomes as compared to general education students specifically in the area of promotion and graduation based tests (Hibel et al., 2010). Drop out rates are higher for this population. Hibel et al., (2010) argued that current policies regarding high stakes testing may increase the likelihood that students in special education will have negative outcomes. What is it about our public education system that does not work for the special education student?

Special education student characteristics and how they differ from the general education population. Who qualifies for special education services? According to the federal guidelines set up in the Identification of Specific Learning Disabilities Act of 2004 (IDEA 2004), a student must meet specific criteria in order to receive special education services. For the purposes of this study, however, only two of these identified categories have been chosen as part of the sample, Other Health Impairment and Specific Learning Disability. Regardless of the elimination of the other classifying areas a common thread among students classified as students with disabilities hinge upon having an educational impact and requiring more service than general education students, defined as student who do not qualify for services under IDEA-2004.

There was a study completed by the United States Department of Education's Office of Special Programs known as SEELS which stands for Special Education Elementary Longitudinal Study. Data was collected in three waves from 2000 to 2006 documenting school experiences of a national sample of students as they moved from elementary school to middle school and middle school to high school. This study had an emphasis on special education students and programs, specifically characteristics of students within these programs and strengths and weaknesses of the programs as a whole.

Students in special education have a wide range of characteristics. Typically they are described as one or more of these characterizations, lack of interest in school work, distractible, respond better to active rather than passive learning tasks, have areas of talent or ability that are overlooked by teachers, limited verbal and/or writing skills, prefer concrete rather than abstract lessons, weak listening skills, and low achievement (Fletcher et al., 2007). Although these are a wide range of characteristics, they seem to all go against the typical learning environment within a public school.

Summary

The LML Learning Patterns and Special Education Students

Students with learning disabilities are considered to be the largest population of students served under special education law or the Individuals with Disabilities Education Act (IDEA) (Wagner, 2008). For this study, the focus is on students identified as SLD or OHI. Despite the plethora of research on learning styles and patterns, few studies (for exceptions, see Brand, Dunn, & Greb, 2002; Egeland, Johansen, & Ueland, 2010; Honisgfeld & Dunn, 2009; Lehman, 2011; Reaser, Prevatt, Petscher, & Proctor, 2007) have examined learning style or pattern differences between students identified as SLD and students placed in general education. Most of the existing research that does exist have focused on students with specific diagnoses such as ADHD (e.g., Brand et al., 2002; Egeland, Johansen, & Ueland, 2010) or have placed more of an emphasis on instructional practices for specific learning preferences (e.g., Honigsfeld & Dunn, 2009). One study conducted by Reaser et al. (2007) was the study most aligned with this study in that learning preferences were examined across college students with ADHD, college students with SLD, and college students without special education histories or current needs. A review of the literature yielded no study that addressed learning pattern preference differences in elementary and secondary school students.

Students who are classified for special education under the disability category of Significant Learning Disability (SLD) have numerous diagnoses, including (a) traumatic brain injury or dysfunction; (b) perceptual disabilities; (c) dyslexia; (d) dysgraphia; and/or (e) developmental aphasia (Scull & Winkler, 2011). This group should not be considered to have a single learning disorder or diagnosis; however, all students diagnosed as SLF do overlap on difficulties involving language, namely listening, speaking, reading, writing, reasoning or mathematical abilities (Scull & Winkler, 2011). Moreover, students identified as SLD tend to have average to above average intelligence (Scull & Winkler, 2011). In summary, students identified as SLD have a difficulty with achievement in the language arts and mathematics due to difficulties with written and spoken language but they do not lack in cognitive abilities (Scull & Winkler, 2011).

Students categorized as OHI have limited strength, vitality or alertness, including a heightened alertness to environmental stimuli, that results in limited alertness with respect to the educational environment" due to acute or chronic health conditions that adversely impact their learning and educational performance (National Dissemination Center for Children with Disabilities (2012, para 2.). These health conditions include, but are not limited to asthma, diabetes, epilepsy, a heart condition, hemophilia, lead poisoning, leukemia, nephritis, rheumatic fever and sickle cell anemia (National Dissemination Center for Children with Disabilities, 2012). Students diagnosed as having ADHD or ADD are also categorized as being OHI (National Dissemination Center for Children with Disabilities, 2012). As most children diagnosed as OHI do not have typically have severe cognitive problems, most students are within the range of average intelligence (Scull & Winkler, 2011).

Sequential and precision learning patterns and special education students. It was hypothesized that that students who have poor language abilities, both SLD and OHI students, would have a preference for a learning pattern wherein language is not often utilized as compared to students in general education. In other words, SLD and OHI students would likely not prefer sequential or precision learning patterns to the degree that students in general education would. As argued by Reaser et al. (2007) and Schirduan et al. (2002), students in special education may “possess a pattern of intelligence whereby they learn … different than the language-logical profile typically valued in schools and society” (Reaser et al., 2007, p. 635). Both the OHI and SLD special education categories of students demonstrate weaknesses within their abilities to progress in the general education system that has placed an emphasis on information gathering of fact and details and writing (Reaser et al., 2007).

The research (e.g., Brand et al., 2007; Egeland et al., 2010) conducted on learning styles or learning patterns is limited but has shown support for students in special education and their lack of a preference for characteristics associated with sequential and precision learning. For example, Egeland et al. (2010), in a study conducted with 67 children, ages 9 to 16 years of age, diagnosed with ADHD versus a matched group of 67 children, ages 9 to 16, without the diagnosis of ADHD adolescents found that the students diagnosed as having ADHD reported significantly lower preferences for sequential organization type learning than did students without the diagnosis of ADHD, even after controlling for IQ scores. This finding was further supported in a study with 4th and 5th grade conducted by Brand et al. (2002), who found that students who were diagnosed with ADHD were less likely to prefer the characteristics of a sequential learning pattern. While results from this study correspond with the results from Egeland et al. (2010) in that the special education student groups differed from the general education student group, there were not specific differences between the OHI students, of whom students having a diagnosis of ADHD were placed, and general education students. Results from this study also aligned with studies conducted with adolescents (e.g., Honigsfeld & Dunn, 2009) and college students (Lehman, 2011) that have documented those students without disabilities prefer the characteristics associated with sequential or precision learning pattern. However, it was also hypothesized that students in the OHI category will score significantly lower than those in the SLD category: OHI students specifically lack of attention to detail, have illogical expression of ideas, and poor time management (Egeland et al., 2010).

Technical reasoning and confluence learning patterns and special education students. It was hypothesized that students in special education (OHI and SLD) would have more of a preference for technical reasoning when compared to students in general education. Special education students may prefer the technical reasoning learning pattern due to the more hands-on assistance they would more likely receive in school than would general education students; in other words, as stated by Reaser et al. (2007), these students have been "accommodated" toward this learning preference (p. 635). However, it was hypothesized that students classified with OHI will score higher than their SLD counterparts. This is primarily due to characteristics of ADHD/ADD students that include excelling in hands on activities, good problem solving skills and their ability to grasp essentials quickly (Brand et al., 2002).

It was furthermore hypothesized that there would be no difference in confluence learning pattern preference when comparing students in special education (OHI and SLD) and students in general education students in the learning pattern of confluence based on their LCI or when comparing SLD and OHI students. Confluence learning pattern characteristics are comprised of learning qualities that involve a high level of information processing, advanced language, abstract reasoning and time management skills, abilities that are not frequently present in children in special education or in younger children (Atkins et al., 2010). Indeed, the sample overall may not be at the appropriate stage of cognitive development to state a preference for the confluence learning pattern (Honigsfeld & Dunn, 2009). The confluence learning pattern preference may also be a learning pattern that, due to its non-traditional approach to learning, is a pattern that is typically not promoted and thus not preferred among special education students. Lehman (2011), for example, in a study conducted with college students, showed that only 26% of females and 9% of males preferred this type of learning pattern. Due to the fact that the confluence learning pattern that requires language but in an alternate form from writing, there is less support for a difference in functioning between those learners who have more difficulty with language based learning when compared to those who are in general education (Honigsfeld & Dunn, 2009).

Chapter III

METHODOLOGY

The overarching purpose of this study is to compare the learning pattern preferences as outlined by the Let Me Learn Process® across student groups. One purpose of this study is to compare learning preferences of learning patterns across two student groups: (a) students in general education and (b) students in special education. Another purpose of this study is to assess learning pattern preferences across two categories of students in special education: (a) students classified for special education under the disability category of Other Health Impairment (OHI); and (b) students classified for special education under the disability category of Specific Learning Disability (SLD). Students' learning pattern preferences were measured via the Learning Connections Inventory (LCI), which is the corresponding assessment to the LML theory. The LCI is used to determine four identified student learning patterns: (a) the sequential pattern, which seeks order and consistency; (b) the precision pattern, which wants to know details and exactness; (c) the technical reasoning pattern, which processes using stand alone, independent reasoning; and (d) the confluence pattern, which pulls together all areas of experience and forms them into new ideas and thoughts. If a determination can be made that certain student pattern preferences of learning exist based on a particular group, it may give educators insight into the learning, academic, and educational needs of these particular groups of students to best assist students to reach their optimum learning potential. This determination may also provide to educators a greater understanding about how these student learning pattern preferences exist within their current education system.

Participants

In this study, archival data collected from January 2008 to December 2012 on 251 students in general education and special education extracted from a national dataset provided by the Let Me Learn Process'® organization was used. The Let Me Learn Process'® organization is a New Jersey based company that has been integral in the development of four distinct learning tools and four distinct learning skills resulting in a process that has been proven to be effective in helping children and adults take control of their learning processes and adapt them in order to meet learning expectations (Johnston, 2010). The specific criteria for the archival sample data was that data come from students in middle and high schools in New Jersey who were in 6th through 12th grades. Moreover, data was from students in general education or students classified for special education but only with the classification categories of OHI or SLD. The OHI special education classification refers to having limited strength, vitality, or alertness, including a heightened alertness to environmental stimuli, that results in limited alertness with respect to the educational environment, and that (a) is due to chronic or acute health problems and (b) adversely affects a child's educational performance. Students who have or example, attention deficit hyperactive disorder, epilepsy, asthma, or diabetes would be classified as OHI. The SLD special education classification refers to a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations. Students who have brain injuries, perceptual disorders, developmental aphasia, or dyslexia would, for example, be classified as SLD. Students who had visual, hearing, or motor, disabilities, mental retardation, or emotional disturbances were not included in the study dataset, per required criteria.

In addition to the education classification of the student, the dataset also included the students' LCI learning pattern preference scale scores. Group size requirements for power were given to the LML organization so that they would provide a sufficient number of students based on the criteria. Then the LML organization chose the data based on location. Specifically, schools were chosen based on proximity, classification and grade range sought by the examiner. This particular area was chosen in order to preserve the most consistency among classifications for special education. By utilizing data from one particular area, there is less of a chance to have different classification criteria due to the fact each of these schools were under the New Jersey state special education guidelines. Once the LCI scores with the outlined criteria were requested, student data was compiled and then coded to preserve student confidentiality. Specifically, each data point was given a specific number and then noted the student's grade, classification in special education, and LCI scores. The data compiled from the Let Me Learn dataset was given to the researcher in the form of an emailed Excel spreadsheet with no identifiable student data. The data was utilized to address the research questions outlined in this paper.

Power Analysis

A power analysis was completed with the G*Power 3.1 software in order to determine the minimum sample size needed to detect statistical significance. Power analyses were conducted for a one-way multivariate analysis of variance (MANOVA). Significance for this analysis was established at .05 ($\alpha = .05$). Effect size was determined to be *f* =. 30, as this is considered to be an appropriate level within social science research that is necessary to yield a moderate effect (Cohen, 1992). Power was determined to be at the level of .80 and was considered a reasonable value within current research (Cohen, 1992). After completing the analysis with the *G*Power 3.1* program, a total sample size of 46 was determined to be necessary overall which means that a minimum of 23 subjects were necessary within each group ($F(4,41)=2.5997$, $\lambda = 13.80$).

Measures

Learning Connections Inventory (LCI) (Dawkins, Kottkamp, & Johnston, 2010). The LCI is a 28-item self-report measure accompanied by three short answer questions. The LCI, developed based on Johnson's (1996) theoretical framework of interactive learning model, comprised of connections between cognition, conation, and affectation, and is a norm-referenced instrument. It can be utilized with seven different populations: (a) primary school students (i.e., 1st through 4th grade students); (b) middle school and secondary school students (i.e., 5th through 12th grade students); (c) adult students (i.e., adult students in college and/or continuing education); (d) working adults; (e) children, ages 6-12; (f) children, ages 13-18; and (g) adults ages 18 and above. The LCI scores result in four primary learning preferences: (a) the sequential preference; (b) the precise preference;(c) the technical preference; and (d) the confluent preference. Each preference scale yield scores from 7 to 35. Scores from 7-16 indicate a learning preference that the person avoids; 17-25 indicates a learning preference that will he person uses as needed; and 26-35 indicates a learning preference that the person uses first and most often.

According to the LCI manual, there have been six separate studies on the LCI and its administration at 16 national and international sites. The purpose of these studies was to confirm the reliability and validity of the instrument. In two separate studies, both McLaughlin & Angilletta (1995) and Johnston & Capasso (1995) completed test-retest studies on the LCI. Both demonstrated significance on a scale-by-scale basis, which was at <.01, with correlation coefficients of the test-retest reliability scores ranging from .54 to .81. These outcomes also confirmed the construct validity of the instrument identified by a factorial analysis when the items confirmed the cohesiveness of the variables of sequence, precision, technical reasoning and confluence (Johnston & Dainton, 2005).

A test of content validity was completed with research of 19 public elementary, middle and high school teachers and one non-public school educator, representing five separate school districts. They were given the descriptive definitions of the interactive learning patterns and asked to look at each the LCI questions and then to identify the corresponding subscale of each item. Out of 560 possible responses, there was a 95% success rate in choosing the subscale that correlated with the particular LCI question. This study demonstrated that the LCI had strong content validity.

According to Johnston & Dainton (2005), the LCI's predictive validity was studied in which teachers who were familiar with the four learning patterns of the LCI at four separate school sites were asked to predict to predict how their students would score on each of the LCI scales. Teacher's predictions of students performance on the different LCI pattern score scales were significant on three of the four scales, specifically sequential at .59, precision at .73, technical reasoning at .86, and confluence at .42.

Research Design

In this study, a quantitative non-experimental correlational research design was used. A quantitative method is selected due to its rigor in establishing statistical relationships between ordinal, interval, and ratio variables (Muijs 2010). A non-experimental correlational design was required as the study's focus is on pre-existing intrapersonal factors that cannot be manipulated by the researcher (Muijs, 2010). This study utilized archival data on 251 students collected between January 2008 and December 2012 through the LML organization.

Independent and Dependent Variables

Independent Variables. The independent variables in this study were categorical variables of student education classification type. For research questions one through four, students were classified into two education and three education groups for the two sets of analyses. For the two-group coding, the student classification categorical variable was coded as 1 = students in general education and 2 = students in special education. For the three-group coding, the student classification categorical variable was coded as 1 = students in general education, 2 = students in special education classified as OHI, and 3 = students in special education classified as SLD. For research questions five through eight, the student classification categorical variable was coded as 1 = students in special education classified as OHI and 2 = students in special education classified as SLD.

Dependent Variables. The four dependent variables in this study were the four learning preference (i.e., sequence, precision, technical, and confluence) scale scores as measured by the Learning Connections Inventory (LCI). Each preference scale yields scores from 7 to 35, with a higher score denoting a higher preference for that learning pattern.

Learning preference scale scores from 7-16 indicate a learning preference that the person avoids; scores from 17-25 indicate a learning preference that will the person uses as needed; and scores from 26-35 indicate a learning preference that the person uses first and most often.

Procedures

This study utilized archival data from the Let Me Learn Process'® organization. Data was extracted in the form of an Excel spread sheet from the larger dataset on the basis of geographical region (schools from the state of New Jersey), grade level (i.e., 6th through 12th grade), and special education classification status of general education and special education, further delineated into OHI and SLD categories. The overall dataset was coded to preserve student confidentiality. For data analyses, the archival dataset was transferred from the Excel spreadsheet into an SPSS 20.0 data file.

Data Analysis

The overall purpose of this study was to examine student learning pattern preferences as identified by the LCI across general education and special education student groups. The first purpose of the study was to determine whether students in general education and students in special education differed in regard to sequential, precision, technical, and confluence learning preferences as measured by the LCI. In addition, the individual special education classifications of OHI and SLD were examined in order to see if there was a preference for sequential, precision, technical, and confluence learning patterns.

Statistics were conducted for this study using SPSS 20.0. Descriptive statistics were calculated for frequency and percentages of students in the education classification categories. The statistical analyses for hypothesis testing utilized included several one-way MANOVAs in order to assess potential differences and similarities of the constructs being studied. Prior to hypothesis testing, data will be tested for assumptions of MANOVA. A one-way MANOVA is the preferred analyses when there are independent variables that are categorical and the dependent variables are ratio or interval coded variables that measure a similar construct (Muijs, 2010). An alpha level of .05 was used in order to determine statistical significance.

Assumptions and Data Analysis of Research Question One. The first research question investigated the relationship between those students in special education and those students in general education in terms of preference for the LCI construct of sequence learning. It was hypothesized that students in special education have less of a preference for sequence learning when compared to students in general education students. Two one-way MANOVAs were conducted to (a) assess the potential differences between those students classified for special education and those students in general education; and (b) those students classified for OHI special education, those students classified for SLD special education, and those students classified as general education.

Assumptions and Data Analysis of Research Question Two. The second research question investigated the relationship between those students in special education and those students in general education in terms of preference for the LCI construct of precision learning. It was hypothesized that students in special education have less of a preference for precision learning when compared to students in general education. Two one-way MANOVAs were conducted to (a) assess the potential differences between those students classified for special education and those students in general education; and (b) those students classified for OHI special education, those students classified for SLD special education, and those students classified as general education.

Assumptions and Data Analysis of Research Question Three. The third research question investigated the relationship between those students in special education and those students in general education in terms of preference for the LCI construct of technical learning. It was hypothesized that students in special education have more of a preference for technical learning when compared to students in general education. Two one-way MANOVAs were conducted to (a) assess the potential differences between those students classified for special education and those students in general education; and (b) those students classified for OHI special education, those students classified for SLD special education, and those students classified as general education.

Assumptions and Data Analysis of Research Question Four. The fourth research question investigated the relationship between those students in special education and those students in general education in terms of preference for the LCI construct of confluence learning. It was hypothesized that there was no difference in a preference for confluence learning when comparing students in special education and students in general education. Two one-way MANOVAs were conducted to (a) assess the potential differences between those students classified for special education and those students in general education; and (b) those students classified for OHI special education, those students classified for SLD special education, and those students classified as general education.

Assumptions and Data Analysis of Research Question Five. The fifth research question investigated those students in special education, specifically those that were classified in one of two categories, OHI or SLD, and their preference for the LCI construct of sequence learning. The hypothesis was that students classified under the disability category of OHI have more of a preference for Sequence when compared to students classified under the disability category of SLD. A MANOVA was utilized to assess the potential differences in preference when comparing those students classified for special education under the disability categories of OHI and SLD.

Assumptions and Data Analysis of Research Question Six. The sixth research question investigated those students in special education, specifically those that were classified in one of two categories, OHI or SLD, and their preference for the LCI construct of precision learning. The hypothesis was that students classified under the disability category of OHI have more of a preference for precision learning when compared to students classified under the disability category of SLD. A MANOVA was utilized to assess the potential differences in preference when comparing those students classified for special education under the disability category of OHI and those students classified under the disability category of SLD.

Assumptions and Data Analysis of Research Question Seven. The seventh research question investigated those students in special education, specifically those that were classified in one of two categories, OHI or SLD, and their preference for the LCI construct of technical learning. It was hypothesized that students classified under the disability category of OHI have less of a preference for technical learning when compared to students classified under the disability category of SLD. A MANOVA was utilized to assess the potential differences between those students classified for special education under the disability category of OHI and those students classified under the disability category of SLD.

Assumptions and Data Analysis of Research Question Eight. The eighth research question investigated those students in special education, specifically those that were classified in one of two categories, OHI and SLD, and their preference for the LCI construct of confluence learning. It was hypothesized that there is no difference in preference when comparing students classified under the disability category of OHI and students classified under the disability category of SLD. A MANOVA was utilized to assess the potential differences in preference when comparing those students classified for special education under the disability category of OHI and those students classified under the disability category of SLD.

CHAPTER IV

RESULTS

The results section is organized in the following manner. First, demographic information regarding their special education classification is discussed in order to understand participant characteristics. Student learning pattern scores were based on the Learning Connections Inventory (LCI), the measure associated with the Let Me Learn Advanced Learning System. Then the analyses of for the statistical assumptions for this study are examined. Overall descriptive statistics for the four LCI categories of Sequential, Precision, Technical Reasoning, and Confluence are discussed in detail with their means and standard deviations. Finally, the research questions are discussed along with their corresponding results based on the analyses conducted.

Sample

The total sample size for the study was 251 students. Of the 251 students, 120 (48%) were male and 131 (52%) were female. The sample was comprised of 14 (5%) 6th graders, 65 (26%) 7th graders, 24 (9%) 8th graders, 62 (25%) 9th graders, 22 (9%) 10th graders, 30 (12%) 11th graders and 34 (14%) 12th graders. Of the 251 students, 188 (75%) were students in special education (SE), and 63 (25%) were general education (GE) students. Of the 188 students in special education, 107 (57% of SE students) were students who had specific learning disabilities (SLD), and 81 (43% of SE students) were students who were other health impaired (OHI).

Assumptions

Testing for Violations of Assumptions for MANOVA

In this study, multivariate analyses of variances (MANOVAs) were the primary statistical analyses used to address the research questions. MANOVAs were utilized as the research questions required categorical group comparisons on dependent variables, i.e., learning preferences, which shared conceptual overlap and were components of the larger LCI learning pattern assessment tool (Muijs, 2010). A MANOVA allows for comparison on similar dependent variables while controlling for the shared variance among these variables (Muijs, 2010). A one-way MANOVA is used when there is a dichotomous independent variable and multiple dependent variables measured using a continuous scale; and a one-way MANOVA is used with an independent variable that has more than two levels and multiple dependent variables measured as continuous variables (Grice & Iwasaki, 2007).

Prior to hypothesis testing, data were reviewed and/or analyzed to test assumptions for MANOVA. One assumption for MANOVA is the assumption of independence, that is, that dependent variable scores for each participant are independent of other participants' scores (Grice & Iwasaki, 2007). This assumption was not violated, as all participants' LCI learning preference scores were independently obtained from individual students. A second assumption for MANOVA is that the sample size in each cell is at least $n = 30$ and is greater than the number of dependent variables (Grice & Iwasaki, 2007). This assumption was not violated. There were four dependent variables, and the cell sizes for each group were $n = 63$ GE students and $n = 188$ SE students, further delineated into 107 SLD students and 81 OHI students.

A third assumption, the assumption of multivariate normality, is that the dependent variable scores are normally distributed in each sample category. Normal distribution of scores can be determined by computing the skewness and kurtosis values of each dependent variable for each student category (see Table 1). Skewness values of > +/-1.00 indicates significant violation of a normal distribution of scores (Vogt, 2007). Kurtosis indicates the peakedness or flatness of the distribution of scores. The kurtosis value is computed by dividing the kurtosis statistic by the kurtosis standard error (*SE*): $\frac{Kurtosis\ Value}{Kurtosis\ SE}$ (Vogt, 2007). If the kurtosis value is >= +/- 2.00, there is significant peakedness (i.e., the distribution is leptokurtic) or flatness (i.e., the distribution is platykurtic) of the distribution of scores around the mean score (Vogt, 2007). In addition to the skewness and kurtosis values as indicators of a normal distribution, Kolmogorov-Smirnov goodness-of-fit chi-square (χ^2) tests were conducted. Kolmogorov-Smirnov χ^2 statistics determine normality in consideration of both skewness and kurtosis.

The LCI sequential, precision, technical reasoning, and confluence learning preference scores did not display significant skewness or kurtosis overall and across most student categories (see Table 1). The LCI confluence learning preference variable for OHI students had a computed kurtosis value of 2.90. However, the Kolmogorov-Smirnov test statistic, used to test the assumption of normality, was not significant, χ^2 (81) = .92, p = .37. Thus, the confluence learning pattern variable for OHI students had a normal distribution. The sequential learning pattern preference variable for GE students had a kurtosis value of 2.91. However, the Kolmogorov-Smirnov test statistic was not significant, χ^2 (81) = .88, p = .42. As such, the sequential learning pattern scores were normally distributed for GE students.

Table 1

LCI Learning Pattern Preferences: Descriptive Statistics across Student Categories

	N	M	SD	Min	Max	Skewness	Kurtosis
All Students							
Sequential	251	24.74	.44	9.00	35.00	-.38	.06
Precision	251	23.13	.04	10.00	33.00	-.10	-.38
Technical Reasoning	251	25.63	.00	9.00	35.00	-.57	-.18
Confluence	251	22.86	.42	10.00	34.00	.11	.09
SE Students							
Sequential	188	24.40	.37	11.00	35.00	-.20	-.25
Precision	188	22.04	.18	10.00	33.00	-.09	-.46
Technical Reasoning	188	26.40	.67	10.00	35.00	-.56	-.17
Confluence	188	22.93	.38	10.00	34.00	.01	.11
OHI Students							
Sequential	81	24.04	.21	15.00	32.00	-.24	-.76
Precision	81	23.15	.06	10.00	33.00	-.20	-.13
Technical Reasoning	81	26.67	.79	10.00	35.00	-.55	-.16
Confluence	81	23.28	.20	10.00	34.00	-30	1.54[a]
SLD Students							
Sequential	107	24.67	.48	11.00	35.00	-.20	.07
Precision	107	21.21	.13	11.00	33.00	-.00	-.59
Technical Reasoning	107	26.20	.60	10.00	35.00	-.59	-.12
Confluence	107	22.65	.51	13.00	33.00	.22	-.54
GE Students							
Sequential	63	25.76	.55	9.00	33.00	-.96	1.73[b]
Precision	63	22.38	.62	10.00	33.00	-.08	-.06
Technical Reasoning	63	23.33	.41	9.00	35.00	-.45	-.48

Confluence	63	22.68	.59	12.00	34.00	.38	.17

Note. [a]Kurtosis value = $\frac{Kurtosis\ Value}{Kurtosis\ SE}$ = 2.90; [b]Kurtosis value = $\frac{Kurtosis\ Value}{Kurtosis\ SE}$ = 2.91.

To test for multivariate normality of the distribution of scores, a Mahalanobis distance was computed. The critical value of a Mahalanobis distance chi-square (χ^2) with four degrees of freedom (i.e., four dependent variables) at $p < .001$ is 18.47 (Grice & Iwasaki, 2007). No outliers were identified via the Mahalanobis distance computation. As such, the assumption of multivariate normality was not violated.

A fourth assumption for MANOVA is homogeneity of covariance, that is, covariance is equal across groups (Grice & Iwasaki, 2007). To test for equality of covariance matrixes across groups, a Box's M statistic was computed for the three MANOVAs computed for this study. The recommended significance value for a Box's M statistic is $p = .001$, as this test is very sensitive to normality (Grice & Iwasaki, 2007). For the MANOVA analysis for the first set of research questions to determine whether there were any SE and GE student category differences on LCI learning pattern preferences of sequential, precision, technical reasoning, and confluence, the Box's *M* statistic was significant, $M = 21.81$, $F = 2.13$, $p =.02$. However, this statistic was not significant at the p = .001 level, the significance level used for Box's M due to its sensitivity to normality (Grice & Iwasaki, 2007). Therefore, the assumption of homogeneity of covariance was not violated for this analysis. A one-way MANOVA was also conducted to assess group differences when SE students were further delineated into SLD or OHI groups and then compared with GE students on preferences for sequence, precision, technical reasoning, or confluence learning. The Box's *M* statistic was not significant, $M = 27.30$, $F = 1.33$, $p = .15$; the assumption of homogeneity of covariance was not violated for this analysis. For the MANOVA analysis for the second set of research questions to assess whether SLD students and OHI students differed from one another on LCI sequence, precision, technical reasoning, and confluence learning preference mean scores, the Box's *M* statistic was not significant, $M = 6.41$, $F = .63$, $p = .79$. The assumption of homogeneity of covariance was not violated for this analysis.

A fifth assumption for MANOVA is that the dependent variables should be linear and should be moderately related to one another but should not display multicollinearity (Vogt, 2007). It is recommended that multicollinearity between dependent variables be tested via Pearson bivariate correlations for each independent variable group; an $r > .80$ signifies multicollinearity (Grice & Iwasaki, 2007). Pearson bivariate correlations between the dependent variables were conducted with the sample of 188 SE students (see Table 2), further delineated into OHI and SLD student categories (see Tables 3 and 4), and with the sample of 63 GE students (see Table 5).

Pearson bivariate correlations were conducted on the four LCI learning pattern preferences for the special education group of $n = 188$ students (see Table 2). Although precision learning pattern preference was significantly correlated with sequential learning pattern preference, $r(188) = .42$, $p < .001$, and confluence learning pattern preference was significantly correlated with technical reasoning, $r(188) = .39$, $p < .001$, the correlations were not greater than .80. As such, the LCI learning preference variables did not display multicollinearity in the sample of SE students ($n = 188$).

Table 2

Pearson Bivariate Correlations between LCI Pattern Preference Scores: SE Students (n = 188)

	Sequential	Precision	Technical Reasoning	Confluence
Sequential	1.00			
Precision	.42***	1.00		
Technical Reasoning	.06	-.03	1.00	
Confluence	.13	.04	.39***	1.00

Note. ***p < .001.

Pearson bivariate correlations between the dependent variables of LCI learning pattern preferences were conducted with the sample of 81 OHI students (see Table 3). The precision learning pattern preference was significantly correlated with sequential learning pattern preference, $r(81) = .41$, $p < .001$. In addition, the confluence learning pattern preference was significantly correlated with technical reasoning, $r(81) = .40$, $p < .001$. As the variables were not correlated with one another at the $r > .80$ level, the LCI learning pattern preference variables did not display multicollinearity for the sample of OHI students.

Table 3

Pearson Bivariate Correlations between LCI Pattern Preference Scores: OHI Students (n = 81)

	Sequential	Precision	Technical Reasoning	Confluence
Sequential	1.00			

Precision	.41***	1.00		
Technical Reasoning	.17	.09	1.00	
Confluence	.12	.15	.40***	1.00

Note. ***p < .001.

Pearson bivariate correlations between the dependent variables of LCI learning preferences were conducted with the sample of 107 SLD students (see Table 4). The precision learning pattern preference was significantly correlated with sequential learning pattern preference, $r(107) = .47$, $p < .001$. Results also showed that the confluence learning pattern preference was significantly correlated with the technical reasoning learning pattern preference, $r(107) = .38$, $p < .001$. As the variables were not correlated with one another at the $r > .80$ level, the LCI learning pattern preference variables did not display multicollinearity for the sample of SLD students.

Table 4

Pearson Bivariate Correlations between LCI Pattern Preference Scores: SLD Students (n = 107)

	Sequential	Precision	Technical Reasoning	Confluence
Sequential	1.00			
Precision	.47***	1.00		
Technical Reasoning	-.01	-.13	1.00	
Confluence	.14	-.06	.38***	1.00

Note. ****p* < .001.

Pearson bivariate correlations between the dependent variables of LCI learning pattern preferences were conducted with the sample of 63 GE students (see Table 5). For this group of students, the sequential learning pattern preference was significantly and positively correlated with the precision learning pattern preference, $r(63) = .58$, $p < .001$, and was significantly and negatively correlated with the technical reasoning learning pattern preference, $r(63) = -.37$, $p = .003$, and the confluence learning pattern preference, $r(63) = -.30$, $p = .02$. The precision learning pattern preference was significantly and negatively correlated with the technical reasoning learning pattern preference, $r(63) = -.40$, $p < .001$. Finally, the technical reasoning learning pattern preference was significantly and positively correlated with the confluence learning pattern preference, $r(63) = .38$, $p = .002$. As the variables were not correlated at the $r > .80$ level, multicollinearity was not evident.

Table 5

Pearson Bivariate Correlations between LCI Pattern Preference Scores: GE Students (n = 63)

	Sequential	Precision	Technical Reasoning	Confluence
Sequential	1.00			
Precision	.58***	1.00		
Technical Reasoning	-.37**	-.40***	1.00	
Confluence	-.30*	-.15	.38**	1.00

Note. ***$p < .001$; **$p < .01$; *$p < .05$

Testing Hypotheses

The first purpose of this study was to determine whether there were student group differences in learning pattern preferences based on sequence, precision, technical reasoning, and confluence mean scores when comparing students in general education and students in special education, specifically with classifications of SLD or OHI.

Research question one:

> Is there a difference in preference when comparing students in special education and students in general education in the category of Sequence based on their LCI scores?

Hypothesis one:

> Students classified for special education demonstrate less of a preference for Sequence based on their LCI scores more often when compared to students in general education.

Research question two:

> Is there a difference between students classified for special education and students in general education in the category of Precision based on their LCI scores?

Hypothesis two:

> Students classified for special education show less of a preference for Precision based on their LCI scores more often when compared to students in general education.

Research question three:

Is there a difference between students classified for special education and students in general education in the category of Technical Reasoning based on their LCI scores?

Hypothesis three:

Students classified for special education demonstrate more of a preference for Technical Reasoning based on their LCI scores more often when compared to students in general education.

Research question four:

Is there a difference between students classified for special education and students in general education in the category of Confluence based on their LCI scores?

Hypothesis four:

There is no difference in preference for Confluence when comparing LCI scores of students in special education and students in general education.

A one-way MANOVA was first conducted to determine whether there were any SE and GE student category differences on LCI learning pattern preferences of sequential, precision, technical reasoning, and confluence. The overall MANOVA model was significant, $F(4,246) = 4.57$, Wilks $\lambda = .93$, $p = .001$, with a small effect size, $\varepsilon^{2} = .07$ (Steyn & Ellis, 2009). When examining the univariate results, it was found that student groups significantly differed on preferences for sequential learning, $F(1, 249) = 4.50$, $p = .035$. Specifically, SE students ($n = 188$) reported a significantly *lower* preference for sequential learning ($M = 24.40$, $SD = 4.37$) than did GE students ($n = 63$, $M = 25.76$, $SD = 4.55$). Student groups also significantly differed on preferences for technical reasoning learning, $F(1, 249) = 12.90$, $p < .001$. SE students ($n = 188$) reported a significantly *higher* mean preference score for the technical reasoning learning pattern ($M = 26.40$, $SD = 5.67$) than did GE students ($n = 63$, $M = 23.33$, $SD = 6.41$).

Table 6

One-Way MANOVA Table: Comparisons of SE Students (n = 188) and GE Students (n = 63) on LCI Learning Pattern Preferences

Dependent Variable	Df	Mean Square	F	*p*
Sequential	1, 249	87.66	4.50	.035
Precision	1, 249	5.40	.21	.645
Technical Reasoning	1, 249	443.46	12.90	.000
Confluence	1, 249	2.79	.14	.707

A one-way MANOVA was also conducted to assess group differences when SE students were further delineated into SLD or OHI groups and then compared with GE students on preferences for sequence, precision, technical reasoning, or confluence learning (see Table 7). The overall MANOVA model was significant, $F(8,490) = 4.11$, Wilks $\lambda = .88$, $p < .001$, with a small effect size, $\varepsilon^{2 =}$ .06. When the univariate results were examined, it was found that student groups significantly differed on precision learning preference mean scores, $F(2, 248) = 3.61$, $p = .03$. Specifically, Tukey *post hoc* tests showed that students who were OHI ($n = 81$) had a significantly *higher* mean preference score for the precision learning pattern ($M = 23.15$, $SD = 5.06$) than did students who were SLD ($n = 107$, $M = 21.21$, $SD = 5.13$) and students who were GE ($n =$

63, *M* = 22.38, *SD* = 4.62). Results from univariate analyses also demonstrated that student groups significantly differed on the technical reasoning learning pattern preference mean scores, *F*(2, 248) = 6.58, *p* = .002. Specifically, Tukey *post hoc* tests showed that students who were OHI (*n* = 81) had a significantly *higher* technical reasoning learning pattern preference mean score (*M* = 26.67, *SD* = 5.79) then students who were GE (*n* = 63, *M* = 23.33, *SD* = 6.41). Furthermore, there was a trend toward significance on the sequential learning pattern mean score differences across student groups, *F*(2, 248) = 2.73, *p* = .067. Tukey *post hoc* tests showed that GE students (*n* = 63) had a *higher* sequential learning pattern mean score (*M* = 25.76, *SD* = 4.55) than did SLD students (*n* = 107, *M* = 24.67, *SD* = 4.48) and OHI students (*n* = 81, *M* = 24.04, *SD* = 4.21).

Table 7

One-Way MANOVA Table: Comparisons of SLD Students (n = 107), OHI Students (n = 81), and GE Students (n = 63) on Learning Pattern Preferences

Dependent Variable	Df	Mean Square	F	*p*
Sequential	2, 248	106.30	2.73	.067
Precision	2, 248	179.36	3.61	.029
Technical Reasoning	2, 248	453.66	6.58	.002
Confluence	2, 248	21.07	.54	.585

The second purpose of the study was to determine whether there were differences in sequence, precision, technical, and confluence learning pattern preferences when comparing SLD students and OHI students.

Research question five:

Is there a difference between students classified for special education under the disability category of Other Health Impairment (OHI) and students classified for special education under the disability category of Specific Learning Disability in the category of Sequence based on their LCI scores?

Hypothesis five:

Students classified under the disability category of Other Health Impairment demonstrate more of a preference for Sequence based on their LCI scores more often than students classified under the disability category of Significant Learning Disability.

Research question six:

Is there a difference between students classified for special education under the disability category of Other Health Impairment (OHI) and students classified for special education under the disability category of Specific Learning Disability in the category of Precision based on their LCI scores?

Hypothesis six:

Students classified under the disability category of Other Health Impairment demonstrate more of a preference for Precision based on their

LCI score more often than students classified under the disability category of Significant Learning Disability.

Research question seven:

Is there a difference between students classified for special education under the disability category of Other Health Impairment (OHI) and students classified for special education under the disability category of Specific Learning Disability in the category of Technical Reasoning based on their LCI scores?

Hypothesis seven:

Students classified under the disability category of Other Health Impairment demonstrate a less of a preference for Technical Reasoning based on their LCI score than students classified under the disability category of Significant Learning Disability.

Research question eight:

Is there a difference between students classified for special education under the disability category of Other Health Impairment (OHI) and students classified for special education under the disability category of Specific Learning Disability in the category of Confluence based on their LCI scores?

Hypothesis eight:

There is no difference in preference for Confluence when comparing students classified under the disability category of Other Health

Impairment and students classified under the disability category of Significant Learning Disability.

A one-way MANOVA was conducted to assess whether SLD students and OHI students differed from one another on LCI sequence, precision, technical reasoning, and confluence learning preference mean scores (see Table 8). The overall MANOVA model was significant, $F(4,183) = 3.46$, Wilks $\lambda = .93$, $p = .009$, with a small effect size, $\varepsilon^{2} = .07$. When examining the significant univariate results, however, only one significant result emerged, and that was precision learning mean scores, $F(1, 186) = 6.69$, $p = .01$. Students who were OHI ($n = 81$) had a significantly *higher* precision learning pattern mean score ($M = 23.15$, $SD = 5.06$) than did students who were SLD ($n = 107$, $M = 21.21$, $SD = 5.13$).

Table 8

One-Way MANOVA Table: Comparison of SLD Students (n = 107) and OHI Students (n = 81) on

Learning Pattern Preferences

Dependent Variable	Df	Mean Square	F	*P*
Sequential	1, 186	18.64	.98	.324
Precision	1, 186	173.96	6.69	.010
Technical Reasoning	1, 186	10.20	.32	.575
Confluence	1, 186	18.28	.95	.330

CHAPTER V

DISCUSSION

As educational professionals strive to help students become efficient and effective learners by assisting in the development of student learning strategies, a greater understanding of the learning process is necessary. The purpose of this study was to analyze and compare the learning pattern preferences of middle and high school students in general education and special education settings. The results of this study are intended to help guide teachers and other education professionals to make informed decisions about differentiating instruction in a way to reach more, if not all, students in their classroom. The results could furthermore assist educators in fostering greater self-knowledge and self-advocacy in students, which can assist them to become active participants of their own learning experiences.

A review of the literature has demonstrated that there have been a vast number of studies based on the theory of learning styles and their utilization via learning style assessment tools within the education system. Unfortunately, research has shown that many if not all of these associated learning styles instruments based on theoretical models fall short in regards to their reliability and validity (Coffield et al., 2004; Slotnick & Maher, 2008). The use of learning styles assessments, therefore, is limited in its utility in the current American education system. There have been multiple critical evaluations of learning style assessment tools (Bedford, 2004; Cassidy, 2004; Coffield et al., 2004; Slotnick & Maher, 2008). In each of these in-depth studies, the researchers noted great concern regarding learning style assessment tools' psychometric properties as well as their utilization within the American education system.

Due to the shortcomings of learning styles assessment tools – and the theories on which they were developed -- Johnston and colleagues (e.g., Johnston & Dainton, 1997the Let Me Learn Process® (LML) process theory and the learning assessment, the Learning Connections Inventory (LCI; Johnston & Dainton, 1997) was developed by Johnston (2006). The LML Process® theory (Johnston, 2006) integrated cognitive, conative, and emotional learning into a metacognitive system in which learners identify their learning pattern preferences (i.e., sequential, precision, technical reasoning, confluence) and then utilize them to learn (Johnston, 2006; Jorgenson, 2006; Osterman & Kottkamp, 2004). The LML Process® theory (Johnston, 2006) was developed in order to enhance the basic theoretical learning principals beyond the identification of types of learning, by increasing the utility within education by incorporating a means of self-understanding and self-advocacy and then allowing for active participation of the learner in their own individual learning process.

Johnston (2009) then developed a system that utilizes each of these necessary facets of learning within the Let Me Learn Process®. This theory along with its associated instrument, the Learning Connections Inventory, has demonstrated increased reliability and validity in the identification of learning patterns. This theory does not stop at identification, but utilizes this identification as a stepping stone into greater understanding of learning as well as the push to become an active participant in ones own learning process (Jorgenson, 2006; Johnston & Dainton, 2005). Therefore, research has demonstrated that this theory and process appears to have merit and can be efficiently utilized within our current educational system (Johnston & Dainton, 2005; Jorgenson, 2006; Osterman & Kottkamp, 2006; Slotnick & Maher, 2008).

Based on the federal requirement of NCLB (2002), all students should be demonstrating proficiency on grade level standards by the 2013-2014 school year. Therefore, it is imperative that educators deliver special education in a manner that ensures the most effective means of student learning. One of the first steps to begin this process is to be able to identify the different learning patterns of students in order to utilize these patterns in the hope to enhance positive student outcomes. Although the research on learning patterns and the struggling student is rather limited, there have been a few studies that have been able to identify particular patterns of struggling students (e.g., see Brand, Dunn, & Greb, 2002; Hongsfield & Dunn, 2009; Lehman, 2011; Reaser, Prevatt, Petscher, & Proctor, 2007).

In this study, student learning patterns as identified by the LCI were analyzed to determine if there were particular pattern preferences across different groupings of students, specifically those in general education compared to special education and those classified for special education under the disability category of Specific Learning Disability and those classified for special education under the disability category of Other Health Impairment. Pattern scores were analyzed based on the student's scores on the Learning Connections Inventory, which, as mentioned above, is the instrument that is utilized to identify the learning patterns associated with the LML Process. Aligned with the foundation of the LML Process, each student received scores on each of the four identified learning patterns identified as (a) sequential, (b) precision, (c) technical reasoning, and (c) confluence. The purpose of this study was to examine whether preferences for each of the four different individual learning patterns differed across general education and special education groups of students.

Summary of Results

In the first set of analyses, comparisons were made between special education students and general education students in the grades of 6-12, on each LCI learning preference pattern scores. Learning preference pattern scores were first examined between two groups of students, students in general education and students in special education. The special education group of students was further delineated into students who were identified as Other Health Impaired (OHI) and students who were identified as Specific Learning Disability (SLD), and were compared to students in general education. In the second set of analyses, the two special education groups of students, namely those classified under the disability category of Other Health Impairment and those classified under the disability category of Specific Learning Disability were compared in regard to their four LCI learning pattern scores.

Students who are classified for special education under the disability category of Specific Learning Disability (SLD) have some similar characteristics as a group. This group should not be considered to have a single specific learning impairment, but they share a collection of deficits that involve difficulties involving language, namely listening, speaking, reading, writing, reasoning or mathematical abilities. These students may demonstrate weaknesses in organizational skills, social skills, and reading skills. Those students with their primary weakness in reading can have confusion over words, a slow reading rate, difficulty with comprehension, and difficulty with the retention of material that is being read. Those students with their primary weakness in writing can have difficulties with sentence structure, spelling, difficulty copying from the board and poorly formed letters. Those students with their primary weakness in oral language may have difficulty with basic facts, confusion or reversals of numbers in a number sequence, difficulty reading or comprehending word problems as well as difficulty with reasoning and abstract concepts. Those students with a weakness in study skills may have poor organization, poor time management, difficulty following directions, poor organization of notes and printed materials, and need more time to complete assignments. These deficits can be compounded for students with a SLD due to the fact that there is a significant increase of academic demands encountered as they transition to middle and high school (National Joint Committee on Learning Disabilities, 2008).

Students that are classified for special education under the disability category of Other Health Impairment (OHI) have some similar characteristics as a group but can be considered to be one of the most varied categories within special education identification. Characteristics of students classified with an OHI may have difficulty staying on task or paying attention to important aspects for a long period of time, may be impulsive, have a need to move around more frequently, easily distracted, problems breathing, easily infected, energetic, and difficulty paying attention when not feeling well. Many of these outlined characteristics have many parallels to the Let Me Learn LCI's four identified patterns.

Students that qualify for special education services may have considerable difficulty as a whole. As they move to middle and high school there are increased demands in curriculum and a greater expectation for independent learning (National Joint Committee on Learning Disabilities, 2008). As these students enter the secondary grades research by the National Joint Committee on Learning Disabilities (2008) identifies the several examples of the increasing demands of school specifically, (a) there are greater complexity of tasks, (b) increasing amounts of information, (c) a need for comprehension of complex linguistic forms and abstract concepts, (d) high states testing and graduation requirements, (e) greater demand for working memory for on the spot problem solving, (f) an increased focus on specific content with tightly scheduled time slots for acquisition of knowledge tied to high stakes testing, (g) an increased reliance on print, (h) increased expectations for greater output within shorter amounts of time requiring rapid and accurate retrieval of information and consolidation of learning into long term memory, (i) increased demands of digital literacy proficiency, and (j) an increased need for self-advocacy and individual responsibility. As a student in special education encounters these increased demands there is a need to examine assessment and instruction to assist students in meeting such requirements.

Preference For Sequential Pattern

Those students who demonstrate a preference for the sequential pattern on the LCI need clear and specific instructions and directions; and adequate time for planning, practice, and completion of school work (Johnston, 2006). These students think in terms of goals, objectives, and steps to reach these goals and objectives (Johnston, 2006). . In this study, it was hypothesized that students in special education (i.e., SLD and OHI) would have *less* of a preference for a sequential learning pattern than would students in general education. This hypothesis was supported by the results of the analyses. The special education group of students demonstrated less of a preference for the sequential learning pattern as compared to the general education group of students. This finding was furthermore consistent in the second set of analyses when the special education group of students was delineated into OHI and SLD groups. Students in general education demonstrated more of a preference for the sequential learning pattern than did students in special education, both as the group as a whole and when delineated into OHI or SLD student groups.

There are several possible explanations for these findings. Those students who prefer the sequential learning pattern tend to (a) review and revisit directions repeatedly; (b) take time to develop goals, plans or outlines, and processes to reach these goals and plans; (c) utilize rehearsal and repetition when studying; and (d) perform best in an organized and neat environment (Johnston, 2006). As such, the sequential learning pattern is dependent on strong language and organizational skills (Johnston, 2006). Students identified as requiring special education are more likely to have difficulty with language, either expressive or receptive, or both. Beyond strong language skills, other skills attributed to this particular pattern include organization, planning, and order. Students classified with a significant learning disability are often identified as having trouble organizing thoughts, difficulties in written language, difficulty with order and sequence of different tasks, and not knowing where to begin a task and then how to follow through with that task (Pierangelo & Giuliani, 2007).

The overall lack of a sequential learning pattern preference in the special education group as compared to the general education group combined with lack of differences between special education groups suggests a distinct difference between general education and special education on the sequential learning preference. In contrast, special education groups of students identified as OHI or SLD were similar in their shared lack of preference for sequential learning. There are a limited number of research studies (for an exception, see Egeland, Nordby, & Ueland, 2010) that have examined learning pattern preferences across general education and specific special education groups of students. Egeland et al.'s (2010) research study was conducted with 67 children, ages 9 to 16 years of age, diagnosed with ADHD versus a matched group of 67 children, ages 9 to 16, without the diagnosis of ADHD adolescents. Egeland et al. (2010) found that the students diagnosed as having ADHD reported significantly lower preferences for sequential organization learning than did students without the diagnosis of ADHD, even after controlling for IQ scores. This finding was further supported in a study with 4th and 5th grade conducted by Brand, Dunn, and Greb (2002), who found that students who were diagnosed with ADHD were less likely to prefer a sequential learning pattern. While results from this study correspond with the results from Egeland et al. (2010) in that the special education student groups differed from the general education student group, there were not specific differences between the OHI students, of whom students having a diagnosis of ADHD were placed, and general education students. Results from this study also aligned with studies conducted with adolescents (e.g., Honigsfeld & Dunn, 2009) and college students (Lehman, 2011) that have documented that students without disabilities prefer sequential type learning.

These findings have significant applied importance, especially in relation to traditional instructional and teaching practices and outcomes on standardized testing (Honigsfeld & Dunn, 2009). Honigsfeld and Dunn (2009) found that students who perform well on standardized tests were students who tended to prefer sequential learning. This finding suggests that the standardized testing environment may be counter to the learning patterns most preferred by students diagnosed as needing special education students, which would likely influence these students' testing abilities and scores. As such, students whose preference for learning is not sequential would benefit from instructional practices that can help remediate their weakness in this area. Johnston (2006) recommended that teachers can encourage sequential learning among students by (a) working within a learning environment that is neat, free of clutter, and organized; (b) providing clear instructions with step-by-step directions; (c) helping students develop and follow learning activity lists, which include steps involved in the activity; and (d) offering students immediate clarification of tasks and feedback and verbal and written examples of the required learning activity outcome.

Preference for Precision Pattern

Those students who demonstrate a preference for the precision learning pattern are seekers of knowledge and information. These students often ask many questions and may become frustrated if they perceive explanations to be incomplete or ambiguous. They are detailed and meticulous and require accuracy, consistency, and perfection in the learning patterns. In this study, it was hypothesized that students in special education (OHI and SLD) would have *less* of a preference for precision learning when compared to students in general education. There was no significance found between the special education group as a whole and general education group. It was also hypothesized that students classified, as OHI would have *more* of a preference for precision learning compared to students classified as SLD. The statistical results did support this hypothesis: students classified for special education as OHI had a significantly higher preference for the precision learning pattern than did those students classified for special education under the disability category of SLD. When the three student education groups were compared, it was furthermore found that students in the OHI special education group had a significantly higher preference for precision learning than did students in the SLD special education group. However, students in the OHI group were similar to students in general education on having a preference for precision learning. In fact, the students in the OHI group had a higher precision preference mean score than students in the general education group. The finding that students identified as OHI had the highest mean preference for precision learning as compared to SLD and general education students was unexpected.

There are several possible explanations for the findings on student education group preference for precision learning. Precision learning entails engaging in learning patterns that involve a considerable amount of language learning. The students in the SLD group would be more likely than both the general education and OHI special education groups of students to avoid a learning pattern heavily laden with language learning due to the fact that their primary disability is based on a difficulty with the processing of language (Johnston, 2010; Schirduan, Case, & Faryniarz, 2002). The students in the OHI group, in contrast, may show a preference for precision learning more so than students identified as SLD and students in general education. Students identified as OHI have neurological and/or physical disorders that often require a structured and scheduled environment and accuracy and consistency in the treatment of their disorder (Atkins, Hoagwood, Kutash, & Seidman, 2007). Students identified as OHI may also engage in precision learning pattern behavior, such as asking numerous questions and having a desire for accuracy, but may not have the ability to utilize these skills effectively. For example, Reaser, Prevat, Petscher, and Proctor (2007), in a study examining learning and study strategies of college students with ADHD, SLD, or no disabilities found that while these three groups of students were similar in regard to attitudes about learning, the students identified as having ADHD had significant poorer concentration and time management skills. Students identified as OHI may therefore differ from students in general education and students identified as SLD in regard to precision learning in that, while they may prefer this pattern, they may "not always follow through on the approach due to their motivation and concentration difficulties" (Reaser et al., 2007).

The precision learning pattern is effective in learning tasks that require great attention to detail, accuracy in work, and substantial amounts of information (Johnston, 2006). Johnston (2010) suggested that teachers could enhance precision learning patterns among students whom have less of a preference for precision learning through a variety of means. Teachers can enhance students' attention to detail by allowing for sufficient time for the student to finish the learning task and providing clear and consistent communication and guidance. Teachers can furthermore promote students in their use of precision learning patterns by having students "grade" their own work, focusing on missed details, vague words or phrasings, and incorrect information. The use of graphs and diagrams to enhance understanding of content information may also enhance students' preference for precision learning (Johnston, 2010).

Preference for Technical Reasoning Pattern

Those students who demonstrate a preference for the technical reasoning pattern are autonomous and "hands-on" learners who need to see a practical purpose to the learning activity (Johnston, 2006). These students are interested in how things work and function, and they often enjoy using tools and instruments as part of their learning process (Johnston, 2006). It was hypothesized that students in special education (OHI and SLD) have more of a preference for Technical Reasoning when compared to students in general education. Results from the data analyses showed that the special education group had a significantly higher preference for technical learning when compared to the general education group. It was also hypothesized that students classified under the disability category of OHI would have *less* of a preference for Technical Reasoning when compared to students classified under the disability category of SLD. After completing this analysis, there were no significant differences found between the two groups.

There are several possible explanations for these findings. Those students who have a preference for the technical reasoning learning pattern (a) work well independently, (b) communicates better one-on-one rather than in writing, (c) prefer to construct things to demonstrate skills or knowledge, and (d) are excellent with hands-on learning. Results from this study were similar to those found by Johnston (1998), who documented that those students that demonstrated a pattern preference for technical reasoning "are more likely to be off grade level or referred to the Child Study Team" as compared to those students who lead with the patterns of sequence or precision (p.88). The significant differences between students in special education as a whole and students in general education is likely a result of language skills and learning: the technical reasoning can be considered the learning pattern with the least emphasis on language of the four patterns. It would be logical that students who have poor language abilities would prefer a learning pattern wherein language is not often utilized. As argued by Reaser et al. (2007) and Schirduan et al. (2002), students in special education may "possess a pattern of intelligence whereby they learn … different than the language-logical profile typically valued in schools and society" (Reaser et al., 2007, p. 635). Both the OHI and SLD special education categories of students demonstrate weaknesses within their abilities to progress in the general education system which has been seen as very language driven with emphasis on information gathering of fact and details and writing (Reaser et al., 2007). That there was no difference found between the two classification categories of special education may indicate that the non-traditional approach to learning – one that is more hands-on and multi-sensory -- is preferred for both groups.

Special education students may prefer the technical reasoning learning pattern due to the more hands-on assistance they would more likely receive in school than would general education students; in other words, as stated by Reaser et al. (2007), these students have been "accommodated" toward this learning preference (p. 635). In order to enhance the language skills of students who prefer technical reasoning learning, Johnston (2010) recommended that teachers can integrate hands-on and language learning by (a) engaging students in the ideas that a learning activity is something that requires tools and logical steps; (b) incorporating arts activities during language learning (e.g., having students illustrate a story they wrote); and (c) providing activities that are more information or technical based (e.g., having students write about how to perform a certain activity).

Preference for Confluence Pattern

Those students who demonstrate a learning preference for the confluence pattern are "out-of-the-box" intuitive thinkers who need to use their own ideas and imagination as part of their learning process (Johnston, 2006). These students prefer to start tasks first over asking direction and do not like following rule; they often learn best, however, by making mistakes and do not become frustrated if they do make mistakes (Johnston, 2006). It was hypothesized that there would be no difference in preference when comparing students in special education (OHI and SLD) and students in general education students in the learning pattern of confluence based on their LCI scores. After conducting analyses on these groups to determine preference of the confluence learning pattern, there were no significant differences between the special education groups and the general education group. It was also hypothesized that there would be no difference in preference for the confluence learning pattern between students classified under the disability category of OHI and students classified under the disability category of SLD. After completing this analysis, there were no significant differences found between the two groups.

The results for the confluence learning preference supported the study hypotheses and were similar to Brand et al.'s (2009) finding wherein they found no differences between special education groups on the need for kinesthetic learning. Those students who prefer the confluence learning pattern tend to connect quickly to assignments, need freedom to take a unique approach to learning, and prefer speaking and public performance to writing. These are learning qualities that involve a high level of information processing, advanced language, abstract reasoning and time management skills, abilities that are not frequently present in children in special education or in younger children (Atkins et al., 2010). Indeed, the lack of significant differences between student groups may reflect that all students simply may not have reached the formal operational stage of cognitive development (Honigsfeld & Dunn, 2009). The confluence learning pattern preference may also be a learning pattern that, due to its non-traditional approach to learning, is a pattern that is typically not promoted and thus not preferred among students. Lehman (2011), for example, in a study conducted with college students, showed that only 26% of females and 9% of males preferred this type of learning. Due to the fact that the confluence learning pattern that requires language but in an alternate form from writing, there is less support for a difference in functioning between those learners who have more difficulty with language based learning when compared to those who are in general education.

Conclusions

The current findings contribute to the understanding of learning preferences among students in special education and general education settings. Although this study did not ascertain that there was a significant difference as expected between the special education and general education population for all pattern measures, certain indicators emerged using the Learning Connections Inventory pattern identification and its usage with the special education population. This study begins to identify some common patterns among special education students, which can assist in creating a purposeful learning environment for those students as well as their general education counterparts.

This study substantiates that the Learning Connections Inventory measure can be a useful tool in helping students advocate for their own needs in learning. Although this study did not find considerable difference between students in special education and general education in regards to all patterns, its foundation and theory is strong for utility among all students. Once a student is able to understand their own learning patterns in terms of both strengths and weaknesses, they can begin to actively participate in their own learning process and success.

Limitations

There was much strength attributed to this study. It was one of very few research studies that have examined learning preferences across specific special education groups and in comparison to students in general education. Indeed, a significant strength is the large sample size of students in general and special education students specifically. The results from this study furthermore supported previous findings by Brand et al. (2002), Hingsfled and Dunn (2009), Lehman (2011), and Reaser et al. (2007). Although this research study was informative, some limitations do exist. Although this study demonstrated pattern preference among the different special education classified groups, the question still remains regarding whether these students were classified in the first place due to the fact that their patterns did not align themselves with the "typical" American education system that values and promotes a more sequential approach to learning. Those students with preferences for certain patterns that are not well supported by the traditional educational system may not be provided instructional practices that best meet their learning needs. This question certainly still remains and should be taken into consideration when understanding the results of this study.

Another limitation of this study surrounds the disability category of OHI. Although one purpose of this study was to create a comparison of verbal-based versus nonverbal-based learning categories, the wide variety of neurological and physical conditions collapsed into the category of OHI special education may be too dissimilar in totality to allow for adequate and meaningful comparisons across student education groups. This limitation could possibly be remedied if additional information on the OHI students was used to classify the student. If this information was collected, students could be grouped accordingly for analysis. This limitation is reflective of the comorbidity of different conditions among the special education population in general. This should be taken into consideration when interpreting these results.

Finally, Johnston (1998) indicated that this system could and should be used within the pre-referral process in school. Students in the current study had already been classified for special education and a possible limitation is that this classification was based on pattern preferences that did not line up with our traditional education system. If this process could be conducted with students during the pre-referral process, the findings might lead to greater understanding of the patterns of learning across specific student populations within and across school systems, and could provide practical applications to best assist students in successful learning prior to being classified for special education in the first place.

Recommendations for Future Research

The Learning Connections Inventory has been a successful indicator of determining pattern preference of learners (Jorgenson, 2006; Johnston, 1998; Slotnick & Maher, 2008). This instrument when combined with the Let Me Learn Process opens the door to understanding the implications of self-advocacy resulting in greater student success. The Let Me Learn Process® An Advanced Learning System is only theory that considers learning as an integrative process, comprised of cognitive, conative, and affective facets. More longitudinal studies should be conducted to determine the stability of learning patterns. Another recommendation for research is an in-depth special education comparison that could be conducted with specific special education groups to determine if a pattern preference exists within those groups. This research can be applied to assist educators in helping students to develop self-advocacy skills. If students could be taught a way to access education so that can they can utilize learning patterns in an understandable and functional way, it could help the individual learner who is attempting to be successful within the rigorous academic standards that are expected of them.

Overall, the Let Me Learn Process® has been shown to have promise in utilizing cognition, conation and affectation. As each of these elements is taken into consideration, this process can allow learners to become active participants in their own learning process. Public policy is not one that can be changed easily, and there are many students whose learning preferences do not align with the ideals of such initiatives. This should not be a hindrance to students, but just a means of understanding their learning patterns and needs as well as the patterns of others around them. By utilizing the metacognitive process of the Let Me Learn Process, any type of learner has the ability to be successful no matter what the mode of instruction is.

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